

Title: Energy efficiency Directive Articles 14(5)-(8) IA No: Defra 1540 Lead department or agency: Defra Other departments or agencies: DECC, WAG	Impact Assessment (IA)		
	Date: 01/11/2013		
	Stage: Consultation		
	Source of intervention: EU		
	Type of measure: Secondary legislation		
Contact for enquiries: richard.vincent@defra.gsi.gov.uk 020 7238 1678			

Summary: Intervention and Options	RPC Opinion: RPC Opinion Status
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Cost of Preferred (or more likely) Option			
Total Net Present Value	Business Net Present Value	Net cost to business per year (EANCB on 2009 prices)	In scope of One-In, Two-Out? Measure qualifies as
-£12.0m	-£11.7m	£1.0m	No NA

What is the problem under consideration? Why is government intervention necessary?

The European Commission adopted the Energy Efficiency Directive in October 2012. It establishes a common framework of measures for the promotion of energy efficiency within the EU, as part of the strategy to meet the 2020 20% headline target on energy efficiency. This IA considers transposition of Articles 14(5)-(8), which address the problem of untapped potential for energy saving via cogeneration and waste heat recovery. It is estimated that of 18GWe of cogeneration potential in the UK, just 8.4GWe will be built by 2020. Articles 14(5)-(8) will ensure that operators consider cogeneration and waste heat recovery options alongside single generation options. The UK must transpose the Directive to avoid the risk of infraction.

What are the policy objectives and the intended effects?

The policy objective is to increase the uptake of energy efficiency via cogeneration and waste heat recovery, where it is cost-effective for operators to do so. This will help the EU to meet its energy efficiency objectives. It will be done by requiring operators of certain installations to undertake a cost-benefit analysis (CBA) considering cogeneration and waste heat recovery options alongside single generation. Where these options are shown to be cost-effective and are developed, operators will achieve cost savings. There will also be social benefits from reduced carbon emissions and improved security of energy supply.

What policy options have been considered, including any alternatives to regulation? Please justify preferred option (further details in Evidence Base)

The option assessed here amends the Environmental Permitting Regulations which already apply to the industrial installations which the Directive subjects to requirements in respect of promoting efficiency in heating and cooling.

Option 0: Do nothing. For baseline purposes only as not transposing places the UK at risk of infraction.

Option 1: Transpose and implement requirements with no gold plating. Operators are required to undertake CBAs when developing new installations or significantly refurbishing existing installations, to assess whether alternative cogeneration/waste recovery options are cost-effective. Where such options are found to be cost-effective, permits for operation will only be granted where such options are taken up. Transposition by amendment of the Environmental Permitting Regulations.

Will the policy be reviewed? It will be reviewed. If applicable, set review date: 12/2017					
Does implementation go beyond minimum EU requirements?			No		
Are any of these organisations in scope? If Micros not exempted set out reason in Evidence Base.	Micro Yes	< 20 Yes	Small Yes	Medium Yes	Large Yes
What is the CO ₂ equivalent change in greenhouse gas emissions? (Million tonnes CO ₂ equivalent)			Traded:		Non-traded:

I have read the Impact Assessment and I am satisfied that, given the available evidence, it represents a reasonable view of the likely costs, benefits and impact of the leading options.

Signed by the responsible SELECT SIGNATORY: _____ Date: _____

Summary: Analysis & Evidence

Policy Option 1

Description: Transposition of Articles 14(5)-(8) with no gold plating

FULL ECONOMIC ASSESSMENT

Price Base Year 2013	PV Base Year 2013	Time Period Years 10	Net Benefit (Present Value (PV)) (£m)		
			Low: -17.6	High: -6.4	Best Estimate: -12.0

COSTS (£m)	Total Transition (Constant Price) Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low		0.7	6.4
High		1.8	17.6
Best Estimate		1.2	12.0

Description and scale of key monetised costs by 'main affected groups'

Costs to operators to conduct the CBAs and associated admin costs (preparing information, submitting CBA to regulator, follow up work with regulator). CBA costs £11.4m; admin costs £0.3m (central estimates, NPV). Costs to regulator to review the CBAs and follow up with operators, estimated to be £0.3m (central estimate, NPV).

Other key non-monetised costs by 'main affected groups'

In general, reduction in energy consumption has potential to improve air quality. However certain CHP options could worsen air pollution, such as diesel-fired reciprocating engine CHP plant. Costs related to specific options identified not assessed, although potential for technological lock-in and impacts on reliability suggested. Potential costs if investment is deterred as a result of the policy.

BENEFITS (£m)	Total Transition (Constant Price) Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low			
High			
Best Estimate			Not quantified

Description and scale of key monetised benefits by 'main affected groups'

Benefits not monetised at this stage. Outcomes of CBAs will be site-specific and benefits will depend on operators' decisions about how to proceed. Further evidence will be sought during consultation.

Other key non-monetised benefits by 'main affected groups'

Environmental benefits from reduced carbon emissions - not quantified due to uncertainty over how many plants will take up cogeneration/waste recovery options. Health benefits from reducing air pollution (depending on CHP type). Improved security of energy supply.

Key assumptions/sensitivities/risks

Discount rate (%) 3.5%

Costs associated with findings of CBA and subsequent action are not assessed. Key assumptions: (a) forecast number of new/refurbished plants, (b) cost of CBA. DECC data and expert knowledge/best available evidence used for both. Estimates here are low-low and high-high, combining low ends of both ranges and high ends of both ranges. Uncertainty around scale of benefits, as discussed above. Choice of alternative CHP approach could improve or worsen air quality, overall impact uncertain.

BUSINESS ASSESSMENT (Option 1)

Direct impact on business (Equivalent Annual) £m:			In scope of OITO?	Measure qualifies as
Costs: 1.0	Benefits: 0.0	Net: -1.0	No	NA

Executive Summary

Introduction and problem under consideration

This report sets out our assessment of the potential impacts associated with the transposition of Articles 14(5)-(8) of the Energy Efficiency Directive (EED; 2012/27/EU).

The Commission has introduced the EED as part of the strategy to meet the EU's 20% energy savings objective by 2020. It establishes 'a common framework of measures for the promotion of energy efficiency within Europe'. Chapter 3 of the Directive deals with promoting efficiency in heating and cooling. Articles 14(5)-(8) require that after 5th June 2014 a cost benefit analysis must be undertaken for the following installations where the total thermal input is above 20MW:

- new or substantially refurbished electricity generation installations;
- new or substantially refurbished industrial installations generating usable waste heat; and
- new district heating or cooling networks, or a new or substantially refurbished energy production installation within an existing network.

This cost benefit analysis (CBA) is intended to identify cost effective opportunities for cogeneration and waste heat recovery. Under the regulation the CBA is a financial analysis reflecting actual cash flow transactions from investing in and operating installations. Where cost effective and technically feasible opportunities are identified then national authorities are required to authorise only installations developed as co-generation or using waste heat recovery. If an operator chooses not to take such actions then they must not be granted a permit to operate.

Defra is responsible for transposing Articles 14(5)-(8) of the EED in England and Wales and has elected to do so through amendment of the Environmental Permitting (England and Wales) Regulations 2010 as amended subsequently.

The options that have been considered are:

- Option 0 (do nothing): For baseline purposes only as not transposing creates risk of infraction.
- Option 1 (preferred): Transpose and implement requirements with no gold plating. Operators are required to undertake CBAs when developing new installations or significantly refurbishing existing installations, to assess whether alternative cogeneration/waste recovery options are cost-effective. Where cost-effective options are identified, permits for operation will only be granted when these options are taken up. Transposition is by amendment of the Environmental Permitting Regulations.

Rationale for intervention and policy objective

The European Commission attributes the fact that the 2020 energy savings objective is unlikely to be met without the EED to a combination of regulatory and market failures. Specifically for Article 14 and cogeneration and waste heat recovery, it identifies barriers to uptake including high transaction costs and a lack of liquidity in the heat market. Articles 14(5)-(8) are intended to identify cost-effective potential for cogeneration and waste heat recovery, and to ensure that such opportunities are not missed.

The policy objective is to transpose Articles 14(5)-(8) of the EED, to increase the uptake of energy efficiency via cogeneration and waste heat recovery, which will deliver cost savings to installations and reduce carbon emissions. Transposition is required to avoid infraction.

Overview of analysis

To estimate the effects of transposition we have first estimated the number of new or significantly refurbished installations that will be affected between 2014 and 2024. This baseline

is set out in Section 3. The costs include the cost of undertaking a CBA (which is assumed to be completed by consultants) and the administrative costs for operators and regulators. Benefits have not been monetised at this stage.

Costs

Section 4 of the report describes the assessment of costs that has been undertaken. This assessment focussed on the costs associated with undertaking the CBAs themselves (operator time and independent consultant fees) and the time (and associated costs) for regulators to review them. Table 1 below provides a summary of costs by type of cost and group affected. The “central” values presented are simply the midpoint of the low and high ranges and are presented for ease of comparison between the two scenarios. The base year for the present value calculation is 2013 and a discount rate of 3.5% has been applied (HM Treasury Green Book).

Table 1 Summary of total costs for the period 2014-2024 (NPV, £m 2013 prices)

	Low	Central	High
Costs of CBAs – operators	6.0	11.4	16.8
Admin costs – operators	0.2	0.3	0.4
Admin costs - regulators	0.2	0.3	0.5
Total	6.4	12.0	17.6

Benefits

The transposition of Articles 14(5)-(8) of the EED requiring new and refurbished installations to carry out a CBA will first of all result in those electricity generators and industrial sites brought into scope of the amended Regulations making investment decisions on the basis of better information. In particular, acquiring information on relative costs and benefits of options for heat supply and heat sourcing will provide a solid basis for making an investment decision based on consideration of likely costs and benefits of available alternatives and avoid investing in sub-optimal options.

The extent of the benefits will depend on the number of new and refurbished installations carrying out CBAs and the outcomes of these. The technical options and outcomes of the assessments will be site- and installation- specific and no quantitative analysis of associated benefits could be performed at this stage. Furthermore, a number of other regulatory and economic drivers will influence any decisions that might be taken following a CBA. Whilst no quantitative estimate of potential benefits has been possible at this stage, Section 5 sets out the consultation questions intended to address the main evidence gaps.

Competition assessment and direct impact on business

Section 6 describes the competition assessment undertaken for the study. Overall, the proposed requirement to develop a CBA for new and refurbished installations is unlikely to have any adverse impacts on competition. While this IA is out of scope for One-In Two-Out, we present the direct cost to business with an estimated EANCB of -£1.0m (2009 prices).

Wider impacts

Section 7 describes the potential distributional effects focused primarily on small and micro-businesses, and Section 8 presents the social impact assessment.

No affected plants are expected to fall within the micro-business definition. Whilst some of the affected plants could fall within the small business definition it is considered highly unlikely. An assessment of potential financial implications has shown that possible impacts (if any plants are

in the small business category) are likely to be minimal and could be offset by any savings if potential for cogeneration or waste heat recovery are identified and taken forward.

A high level social impact assessment was undertaken and is described in Section 8. No implications for employment are expected (as a result of additional costs for compliance) and there could be impacts on the environment and human health (both positive and negative) as a result of any actions taken as a result of the findings of the CBAs.

Uncertainties and limitations

As with any assessment of this nature, there are a number of uncertainties and limitations that should be kept in mind when considering the findings. We have assumed that operators affected are not considering cogeneration options already. The number of CBAs that will be required is considered more uncertain relative to the cost of undertaking them. This is discussed in Section 9 alongside a summary of the main uncertainties and assumptions.

Conclusions

The transposition of Articles 14(5)-(8) will lead to additional costs being incurred by the operators of industrial installations comprising or incorporating combustion units with a total thermal input exceeding 20 MW. The central estimate is a net cost of £12.0m (present value, for the period 2014-2024), of which £11.4m is the cost of undertaking the CBAs and the remainder are admin costs. Regulators (primarily the Environment Agency) will also incur costs of £0.3m in reviewing the CBAs. These are expected to be passed onto operators through permit application charges.

Benefits have not been estimated at this stage, owing to uncertainties and a lack of evidence around the outcomes of the CBAs and what alternative cogeneration/waste heat recovery options might be taken up. Indicative switching analysis suggests that overall the benefits as a result of cost savings are likely to exceed the costs estimated in this impact assessment.

1. Introduction

1. This impact assessment concerns transposition of Articles 14(5)-(8) of the Energy Efficiency Directive (2012/27/EU) – “the EED” hereinafter¹. This report is structured as follows:
 - Further details of the Articles are covered in Section 2. This also includes an assessment of the need for legislation, its objectives and the stakeholders likely to be affected, ;
 - The baseline is defined in Section 3. This explores the number of existing and potential installations likely to be affected;
 - An assessment of costs and benefits associated with the proposals in the relevant articles are contained in Sections 4 and 5;
 - Sections 6, 7 and 8 contain a competition assessment, analysis of distributional and social effects; and
 - An overall summary is in Section 9.

2. Overview

2. This section provides further detail of the requirements of the relevant articles of the EED, including Annex IX as referred to in Article 14(5), which relate to the need to carry out a cost-benefit analysis (CBA) looking at the potential for CHP or use of waste heat when a new plant is constructed or an existing plant is substantially refurbished.

Problem under consideration

3. The European Commission considers energy efficiency to be important in limiting climate change, reducing dependence on energy imports and in supporting economic growth. The EED establishes ‘a common framework of measures for the promotion of energy efficiency within Europe’. It aims to support and accelerate the delivery of the European Union’s target for a 20% reduction in anticipated energy consumption by 2020 and to support further energy efficiency improvements beyond that date. Reductions in energy consumption achieved to date currently fall short of the 2020 target.
4. The requirements in the EED aim to remove barriers and overcome specific market failures in the energy market which impede efficiency in the supply and use of energy. The Directive sets out various provisions related to: energy efficiency in its buildings; energy obligation schemes, audits and management systems; the provision of consumer information, including on energy bills; and other incentives and penalties.
5. Article 14 of the EED deals with promoting efficiency in heating and cooling. The article stipulates that Member States: undertake assessments to establish the potential for high efficiency co-generation and district heating and cooling; enact policies designed to increase uptake, including supporting or accommodating the development of viable projects. Specifically, Articles 14(5)-(8) require that after 5th June 2014 a CBA must be undertaken for the following installations where the total thermal input is above 20MW:
 - New or substantially refurbished² electricity generation installations;
 - New or substantially refurbished industrial installations generating usable waste heat; and
 - New district heating or cooling networks, or a new or substantially refurbished energy production installation within an existing network.

¹ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:315:0001:0056:EN:PDF>

² Article 2(44) of the EED defines substantial refurbishment as “a *refurbishment whose cost exceeds 50 % of the investment cost for a new comparable unit*”. This is not to be confused with the term “substantial change” that is defined in Article 3(9) of the Industrial Emissions Directive.

6. This cost benefit analysis (CBA) is intended to identify cost effective opportunities for cogeneration and waste heat recovery – essentially, CHP and district heating or cooling. Under the regulation the CBA is a financial analysis of the operator’s actual cash flow transactions from investing in and operating installations. Where cost effective and technically feasible opportunities are identified, national authorities are required to authorise only installations developed as co-generation or using waste heat recovery. If an operator chooses not to take such actions then they must not be granted a permit to operate.
7. Defra is responsible for transposing the EED in England and Wales and has elected to do so through amendment of the Environmental Permitting (England and Wales) Regulations 2010 – “the EPR hereinafter”. This impact assessment examines the transposition of Articles 14(5)-(8) of the EED which is focussed on the ‘promotion of efficiency in heating and cooling’.

Rationale for intervention and policy objectives

8. The European Commission introduced the EED to address the problem that the EU’s 20% energy savings objective target for 2020 will not be met otherwise. They attribute this to market and regulatory failures.
9. Article 14 addressed promoting energy efficiency in heating and cooling. Regarding cogeneration, the Commission identify a number of barriers to uptake, including³:
 - High transaction costs because of lengthy administrative procedures
 - Cogeneration introduces additional complexity compared to single generation, as different output is sold to different markets.
 - There is a lack of liquidity in the heat market because of the limited customer base, which means if a customer is lost it can be hard to sell the heat elsewhere. This is considered to increase the investment risk and required rate of return.
 - For district heating, the historic prevalence of individual heating solutions is suggested to be a cultural barrier to uptake.

Consultation question: do you agree that these barriers may be encountered? Are there other barriers to uptake of these energy efficiency measures, or to the conduct of a cost-benefit analysis of potential cogeneration schemes?

10. The intention of the EED is to ensure that energy saving options are considered and opportunities are not missed, improving the ability of Member States to meet the energy savings target. Transposition of the EED is now required to avoid infraction. The policy will help us meet our carbon budgets and contributes to the Welsh Government’s 2026 vision that ‘our distinctive Welsh environment [will be] thriving and contributing to the economic and social wellbeing and health of all the people of Wales’.
11. The overall objective of Articles 14(5)-(8) of the EED is to promote efficiency in heating and cooling, through identification of cost-effective potential for cogeneration and waste heat recovery. These options are, generally speaking, combined heat and power (CHP) and district heating or cooling.
12. In the UK, there is large untapped potential for energy saving via cogeneration. DECC modelling estimates that this could be up to 18GWe in 2020 (Ricardo-AEA, 2013). Of this, 8.4GWe is projected to be built by 2020 under existing policy arrangements. Implementing regulations obliging plant of >20MW thermal input to consider opportunities to operate as

³ Commission impact assessment available at: http://ec.europa.eu/energy/efficiency/eed/eed_en.htm, accessed November 2013

cogeneration and/or supply their waste heat to third parties would mean that this untapped potential could be more quickly realised, providing savings and consequent economic benefits to operators. Such requirements would also help increase co-ordination between parties in different sectors, who perhaps wouldn't all usually be engaged in considering development of shared heat and power installations.

What is cogeneration?

13. Cogeneration integrates the production of electricity and useful heat in one single and energy efficient process. Cogeneration can result in up to a 30% reduction in primary fuel consumption, compared to the separate generation of heat and power. Delivering the same amount of electricity and heat, but more efficiently and using less fuel, lessens energy costs to the operator, reduces CO₂ emissions, and enhances security of energy supply.

What is district heating?

14. District heating supplies heat from a central source directly to homes and business through a network of hot water pipes. Currently they provide less than 2% of the UK's heat demand. Modelling for DECC suggests that district heating could supply up to 14% of the UK's heat demand, and be a cost-effective and viable alternative to individual renewable technologies while reducing the cost of energy for consumers.

Who is affected?

15. The main stakeholders who will be affected are the operators of planned new plants and those due to be refurbished which fall into one of the relevant categories. They will be required to undertake CBAs in line with the obligations set out in the Directive. The European Commission has published guidance on the Directive as a whole⁴ and on Article 14 specifically⁵ which address CBAs. Furthermore, the regulatory authorities (SEPA, EA, NIEA and, for the smallest plants in England, Wales and NI, local authorities) will also be affected by the transposition as they will be required to review and assess the CBAs submitted by operators to ensure they meet the requirements of the legislation.

Scoping of Impacts

16. The key impacts associated with the transposition of Article 14(5)-(8) of the EED are likely to be the costs associated with undertaking a CBA (probably incurring consultancy costs as well as the operator's own costs) and the regulator's costs for reviewing these assessments. The benefits that may be realised are entirely dependent upon the outcomes of the CBA and any decisions that result from it. These will be site specific and linked to a number of other drivers including achieving compliance with other related legislation such as the European Emissions Trading Scheme (EU ETS).

17. To estimate the effects of transposition we have first estimated the number of new or significantly refurbished installations that will be affected between 2014 and 2024. These use DECC projections supplemented where necessary with estimates by AMEC based on the turnover of plants. The baseline number of plants is set out in Section 3. The costs include the cost of undertaking a CBA (which is assumed to be carried out by consultants, although some operators may choose to use their own staff) and the administrative costs for both operators and regulators. Benefits have not been monetised at this stage, but are discussed qualitatively in Section 5.

⁴ At <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2013:0762:FIN:EN:PDF> .

⁵ At <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=SWD:2013:0449:FIN:EN:PDF> .

Options considered

18. The following options have been considered for assessment:

- Option 0: Do nothing (baseline). If the UK were to not transpose the requirements of Articles 14(5)-(8) then they would be at risk of infringement. The baseline is set out in Section 3.
- Option 1 (preferred): Transpose and implement with no gold plating. Operators would be required to undertake CBAs in line with the requirements of the Directive.

19. No further options have been considered realistic. The reasons for transposing through the EPR are set out in Annex B.

3. Baseline definition

Overview

20. This section sets out the baseline that has been developed for the assessment. It focuses primarily on the number of plants likely to be affected by the transposition of Articles 14(5)-(8).

21. For the purpose of this assessment three rated thermal input capacity ranges have been considered:

- 20 – 50 MWth input (equivalent to approximately 6 – 20 MWe or 16 – 45 MWth output);
- 50 – 300 MWth input (equivalent to approximately 18 – 135 MWe or 40 – 270 MWth output); and
- >300 MWth input (equivalent to approximately > 105 MWe or >240 MWth output).

Evidence Review

22. This section presents the data used in the IA. It comprises the numbers of plants in each category covered by Article 14(5) over a 10 year timeline (July 2014 to July 2024). Based on the data available, the assessment has been made for the whole UK. We have sought to identify the total number of installations affected, and have assumed that the operators affected would not be considering cogeneration or waste heat recovery options already.

New installations

23. Two sets of data were used for estimating the number of new installations:

DECC data

24. The first dataset was provided by DECC and included forecasts for electricity generation and district heating. No data were provided for installations of 20 – 50 MWth or for industrial thermal plants.

25. Many of the existing coal and oil fired electricity generation plant are close to the end of their operating life and therefore can be expected to shut down and be replaced during the assessment period. According to DECC forecasts, a total of 76 plants for electricity generation and 45 district heating combustion plants are expected to be commissioned between July 2014 and July 2024. DECC data for electricity plants included annual figures for each thermal input range. Data for district heating was in five-year intervals. It was assumed that plants were being commissioned evenly across the years covered by each interval. Numbers for the years 2014 and 2024 were halved in order to account only for the relevant time period (from July 2014 to July 2024).

26. Original data provided by DECC was based on DECC analysis and the Consultation on the draft Electricity Market Reform Delivery Plan (2013). An upper and lower range number of plant numbers was provided for these projections, which have been used in the analysis to calculate the potential range of impacts. These figures include existing plants that close and then open as a new technology (i.e. CCGT upgrades to CCGT with CCS and coal plant conversions to biomass). Installations fitting CCS would be exempt from conducting a CBA under Article 14(6)(c). As CCS on CCGT has yet to be demonstrated on a commercial scale plant, it is assumed that the number of such installations commissioned before 2024 will be low and within the uncertainty range. Therefore no further adjustment to the plant numbers has been made to subtract these possible installations.

Gap filling

27. In order to fill the gap for industrial thermal plants and for installations of 20 – 50 MWth, a second set of data was developed by AMEC based on the total turnover of plants. This was calculated using the number of existing plants in 2014, average operating lifetime of plants and the expected annual growth for each type of fuel.

28. For industrial plants with a rated thermal input capacity above 50MWth the current number of 162 plants was extracted from the LCP Inventory (Defra 2009) and modelled by fuel type and capacity range category. The number of existing plants of 20-50 MWth is estimated to be 451 in an AMEC (2012) study for the European Commission on 1-50 MWth plant. That estimate was based largely on an earlier IA carried out by AMEC (then Entec) in 2009 during the early discussions on the proposed industrial emissions Directive when the Commission were proposing to lower the threshold for combustion installations in Annex I of the Directive to 20MWth (subsequently dropped during negotiations). These plant have been assumed to be gas fired for the growth modelling, as this is by far the most widely used fuel type in this size range, and divided evenly into each category (electricity, industry and district heating).

29. The table below shows the estimated number of plants for 2014. Since the DECC dataset only provided estimates for future projections, the following table also includes estimates for existing plant numbers for electricity generation and district heating plant with a capacity greater than 50 MWth (also taken from the Defra 2009 LCP Inventory).

Table 2 Estimated number of plants in 2014

Plant type	Fuel	Plant numbers 2014 ¹		
		20-50 MW ²	50-300 MW	>300 MW
Thermal - electricity generation	Coal	0	1	18
	Gas	150	31	59
	Oil/diesel	0	11	6
	Biomass	0	2	0

		150	46	83
Thermal - industrial	Coal	0	2	0
	Gas	150	156	12
	Oil/diesel	0	3	1
	Biomass	0	1	0

		150	163	13
District heating/cooling	Coal	0	0	0
	Gas	150	11	2

Plant type	Fuel	Plant numbers 2014 ¹		
		20-50 MW ²	50-300 MW	>300 MW
	Oil/diesel	0	0	0
	Biomass	0	0	0
		150	12	2
Overall total		451	220	98

Notes

1. Values are rounded, hence difference between totals
2. As indicated above the estimate of plant numbers for the 20-50 MW category has been based on AMEC (2012) data. We have assumed an even distribution of installations between each of the categories (electricity generation, industry and district heating). For calculation purposes all plant have been assigned as gas fired, as this is the most common fuel, and because for the results, plant numbers are aggregated by category, without distinguishing fuel type.

Electricity generation plants >50MW

30. The number of new electricity generation plants in the table above could be overestimated. This is because new plants >50MW electrical capacity (approximately 100-150MWth depending on fuel) already have to consider the potential for waste heat recovery as part of the consenting regime. Consents can include conditions for plants to be built in such a way that it could supply heat in the future if a suitable recipient became available. Industrial or district heating/plants are not covered by equivalent requirements. This existing assessment means that transposition of Articles 14(5)-(8) may not result in additional costs for operators and regulators as they could already be covered by the existing regulatory regime.
31. Furthermore, >50MWth power stations currently have to undertake a BAT (Best Available Techniques) assessment as a requirement of the Industrial Emissions Directive. BAT for energy efficiency for combustion plants includes operating as a cogeneration/CHP plant. The assessment justifies the chosen techniques to minimise environmental impact, taking into account their cost and the location-specific characteristics of the installation. If an operator does not meet BAT, the Environment Agency can refuse the permit or may issue a permit which includes pre-operational or improvement conditions.
32. These BAT requirements will effectively be superseded by the combined requirements of Article 14(5) as considered in this impact assessment and Article 14(3) (which is being transposed separately). The installation-level CBA under Article 14(5) requires a financial analysis to determine the financial viability of supplying heat. Article 14(3) considers the wider economic, socio-economic and environmental benefits of potential cogeneration and district heating schemes.
33. We have included new electricity generation plants >50MW in our analysis at this stage, to present a conservative interpretation of the costs of transposing Articles 14(5)-(8). This is because there is uncertainty over the extent to which operators are already covered by existing permitting requirements. This approach allows us to use the consultation period to test whether operators of these plants are expected to incur additional costs or not.

Questions for consultation:

Do you expect transposition of Articles 14(5)-(8) to result in additional activity and cost, above what is already incurred given the existing requirements of the consenting regime and BAT assessments?

In the absence of this policy, do you think you would you have considered cogeneration any way for any new or refurbished installations?

Plant lifetimes and annual growth estimates

34. The average operating lifetime of plants provided by DECC is presented in the following table. The DECC estimates are not fuel specific, therefore the lifetimes provided were compared against information derived from DUKES (DECC, 2013) which lists the age of currently operating installations in the electricity generation sector, by fuel type and capacity. The DECC lifetime estimates are considered to be too low for coal and oil fuelled plant, and biomass fired plant >300 MW, since the majority of existing installations are already much older than those estimates. Therefore in these cases an estimate of 50 years, based on the oldest existing plant in DUKES, have been used in the modelling for this assessment.

Table 3 Average operating lifetime

Capacity (MWth)	Lifetime		
	Low	High	Average
<20	20	28	-
20 – 50 ¹	-	-	25.5
50 - 300	24	31	27.5
>300	22	25	23.5

Notes

1. No data estimate provided – therefore average calculated using <20 (low) and 50-300 (high)

35. The current average plant age was also taken into account when estimating the number of new build plant that would occur during the 2014-2024 assessment period. This average age of electricity generating 20-50 MWth plant was based on DUKES (DECC, 2013). For industrial and district heating facilities, the current average age was assumed to be half of the estimated lifetime, assuming there is an even distribution of plant of each age (e.g. if the lifetime is assumed to be 28 years the current average age is assumed to be 14 years).

36. The annual growth by fuel type was estimated from DECC Updated Energy Projections (DECC 2013b). For industrial plants, the “Iron and steel” and “Other industrial sectors” categories were used. For district heating, the categories “Domestic”, “Public administration” and “Commercial” were used. CHP plants were assumed to be evenly distributed between the three plant categories considered (electricity, industrial and district heating).

Table 4 Estimated annual growth

Plant type	Fuel	Annual growth
		%
Thermal - electricity generation	Coal	-17.0
	Gas	4.0
	Oil/diesel	0.0
	Biomass	8.6
Thermal - industrial	Coal	-0.8
	Gas	-1.1
	Oil/diesel	-1.1
	Biomass	11.7

Plant type	Fuel	Annual growth
		%
District heating/cooling	Coal	-0.9
	Gas	-0.5
	Oil/diesel	-5.6
	Biomass	12.3

37. Table 5 in the summary section below presents the forecasted number of plants covered by Article 14(5) for the period 2014-2024 based on the DECC forecast and AMEC gap filling.

Installations envisaged for substantial refurbishment

38. In order to estimate the number of plants requiring substantial refurbishment during the considered period, the current number of plants and their average lifetime, presented in Section 3.2.1 above, were considered. Plant lifetime, by category, thermal input range and fuel type, was estimated from DUKES (2013) and from information provided by DECC. It was assumed that plants are subject to one substantial refurbishment (as defined in Article 2(44) of the EED) during their lifetime with the exception of coal and oil plants, as well as large (<300MW) biomass plants, which are assumed to conduct two refurbishments due to the longer lifetime and higher overall capital value of plant.

Baseline summary

39. As detailed above, projections of new installations for electricity generation and district heating plant >50 MWth have been provided by DECC. Projections for new installations in the industrial sector and installations of 20 – 50 MWth in all three sectors have been developed by AMEC based on the current number of plants and the projected changes in fuel consumption. Number of plants requiring substantial refurbishment was calculated by AMEC from the average plant lifetime and making assumptions on the number of refurbishments per plant.

40. The period between July 2014 and July 2024 has been modelled. The DECC projections of new installations are variable over the time period. District heating plant projections have been provided for five year intervals and electricity plant projections per year. The AMEC based estimates have assumed a constant rate of turnover and refurbishment for this period.

41. Table 5 below summarises the forecasted number of plants covered by Article 14(5) based on the AMEC model and the DECC forecast.

Table 5 Estimated number of new and refurbished plants for the period 2014-2024

Plant type		Plant numbers 2014-2024		
		20-50 MW	50-300 MW	>300 MW
Thermal - electricity generation	New plants (AMEC)	79	-	-
	New plants (DECC forecast)	-	45	32
	Refurbishment	59	17	35
Thermal - industrial	New plants (AMEC)	58	59	5
	New plants (DECC forecast)	-	-	-
	Refurbishment	59	59	6
District heating/cooling	New plants (AMEC)	59	-	-

New plants (DECC forecast)	-	20	25
Refurbishment	59	4	1

42. To reflect the uncertainty associated with developing any projections, a high and low range of plant number projections has been modelled. The associated uncertainty estimates are presented in the following table, based on AMEC’s judgement, or DECC’s reported range where indicated. A full statistical uncertainty analysis has not been performed for this assessment. Uncertainties are discussed in greater detail in Section 9.

Table 6 **Uncertainty range for plant number projections**

	Low			High		
	20 – 50 MW	50 - 300 MW	>300 MW	20 – 50 MW	50 - 300 MW	>300 MW
New	-20%	0% ¹	-13% ¹	20%	10% ¹	26% ¹
Refurbishment	-20%	-20%	-20%	20%	20%	20%

Notes

1. Calculated from DECC range

Consultation question: Have you any further evidence that could inform our projections for the number of new and refurbished plants? In what proportion of cases do you believe operators will be considering cogeneration or waste heat recovery options already?

4. Costs

Overview

43. This section sets out the costs that are expected to be incurred as a result of transposition of Articles 14(5)-(8) of the EED. This assessment is focussed on the costs associated with undertaking the CBAs themselves (operator time and independent consultant fees) and the time (and associated costs) for regulators to review them. It should be noted that the cost assessment does not include the potential costs associated with any decisions and subsequent actions that result from the findings of the CBA as these will be site specific and influenced by a number of other drivers such as compliance with other legislation (e.g. EU ETS) and other economic factors. As discussed previously, if potential is identified for cogeneration/heat recovery then an operator will only be granted a permit if they implement the findings. If they choose not to then the plant would not be granted a permit.

Cost of Compliance

44. The cost of an independent consultant undertaking a cost-benefit analysis has been based on estimates provided by DECC for this study in their initial draft IA for the overall Directive (dated 17/05/12), and AMEC’s judgement as a consultancy providing such services to industry. It has been assumed that the requirements, and therefore the cost, will be the same for new build or a significant refurbishment. Furthermore, the cost is also assumed to be the same for each category (electricity generation, industry and district heating/cooling).

However, the cost is assumed to be higher for larger installations due to the additional information that would need to be assessed. There is likely to be variation in cost for different complexity of installation and therefore a high and low cost estimate has been developed. We do not know the frequency with which operators consider the options covered by the CBA, so have assumed that they would not otherwise consider them. It is possible that this will overestimate the cost of compliance. If operators are already considering some of the options we would only count their additional costs, which would be lower than the total estimated here. The assumed costs are presented in the following table.

Table 7 Assumed cost of a CBA (£2013/installation)

Capacity (MW _{th})	Low	High
20-50	10,000	25,000
50-300	15,000	30,000
>300	20,000	40,000

Consultation question: Have you any evidence of the likely costs of the CBAs, based on similar analyses you have undertaken?

45. The costs above were applied to the low and high range forecast number of new and refurbished installations per year, to calculate a low-low and high-high cost per year. The number of plants affected per year changes through the 2014-2024 period for new >50MW_{th} plant in the electricity generation and district heating categories. For other categories the number of plants, and therefore the costs, are estimated to be constant across the period. The table below presents the low and high range of the costs of conducting CBAs (constant prices – no discount) for the first complete year (2015– not considering 2014 for which only half of the year is included in the assessment). This can be used to understand the range of annual costs which could be expected.

46. The present value of the projected annual costs of undertaking CBA for the period 2014-2024 by plant type are detailed in Table 8 below. The base year for the PV calculation is 2013 and a discount rate of 3.5% has been applied (HM Treasury Green Book).

Table 8 Total PV costs of conducting CBAs for the period 2014-2024

Installation type		£m, 2013 prices (low)			£m, 2013 prices (high)		
		20-50 MW	50-300 MW	>300 MW	20-50 MW	50-300 MW	>300 MW
Thermal - electricity generation	New	0.41	0.56	0.39	1.55	1.24	0.78
	Refurbishment	0.39	0.17	0.45	1.45	0.33	0.91
Thermal - industrial	New	0.38	0.72	0.08	1.43	1.58	0.22
	Refurbishment	0.39	0.58	0.07	1.45	1.16	0.14
District heating/cooling	New	0.38	0.25	0.34	1.44	0.55	0.98
	Refurbishment	0.39	0.04	0.01	1.45	0.08	0.02

Administrative Burden

47. There will be an administrative burden on the operator to prepare information for the CBA, to engage with the provider of the CBA, to submit the CBA to the regulator and to respond to any queries that arise from the application. There will also be time required by the

regulator to review the CBA and follow up on any gaps and uncertainties with the regulator. In each case the cost of this administrative burden has been estimated using an assumed associated time requirement and an appropriate wage rate from the UK Standard Cost Model. The time assumption is based on AMEC’s judgement, informed by information from the EA indicating that to review the recent Tilbury Power Station CBA (refurbished biomass - 870MW output power) took the permitting officer 5 days. The wage rates have been taken from the ONS’s Annual Survey of Hours and Earnings 2011, assuming the operator time is £20.11 per hour for category 112 Production Manager and the regulator time is £14.51 per hour for category 3551 Conservation and Environmental Protection officers. Wage rates are median values in 2011 prices, inflated to 2013 prices using HMT’s GDP deflator, and uplifted by 30% to account for non-wage costs in accordance with the Standard Cost Model (2005).

48. The assumed hours and the resulting costs are presented in the following table. A low-high range is presented to reflect the variation in complexity of different installations.

Table 9 Assumed administrative burden of a CBA (per installation)

Capacity (MW _{th})	Operator time (hours)	Operator cost (£)	Regulator time (hours)	Regulator cost (£)
20-50	14-28	358-715	21-35	459-764
50-300	14-28	358-715	21-35	459-764
>300	21-35	536-894	28-45	611-983

Consultation question: Can you provide any evidence to inform our assumptions of the time requirements for operators or regulators to review and process the CBAs?

49. The present value of the projected total administrative burden associated with the preparation and review of CBA for the period 2014-2024 is detailed in the table below for both operators and regulators. The base year for the PV calculation is 2013 and a discount rate of 3.5% has been applied (HM Treasury Green Book).

Table 10 Total present value of administrative burden for operators and regulators for the period 2014-2024 (2013 prices, £m)

		£m (low)			£m (high)		
		20-50 MW	50-300 MW	>300 MW	20-50 MW	50-300 MW	>300 MW
Operator	New	0.04	0.04	0.02	0.13	0.09	0.04
	Refurbishment	0.04	0.02	0.02	0.13	0.04	0.03
Regulator	New	0.05	0.04	0.02	0.12	0.08	0.03
	Refurbishment	0.05	0.02	0.01	0.12	0.04	0.02

Non-quantified costs

50. While the majority of the costs have been quantified, some possible non-quantified costs have been identified. If CBAs identify cost-effective options which operators are unwilling or unable to pursue, it is possible that some development will be deterred. This could occur if the operators are capital-constrained so cannot afford to invest in a more expensive cogeneration development. This is likely to be specific to installations and sites. However, the exemption provided by Article 14(8) of the Directive, relating to ‘imperative reasons of law, ownership or finance’, from proceeding with cost-beneficial schemes may reduce this possibility. Additionally it is possible that operators might decide to develop smaller

installations than they would otherwise have done, so as to keep below 20MW total thermal input and avoid the need to complete a CBA. This would result in potential benefits from cogeneration being missed. Where CBAs do not identify cost-effective options, or where cost-effective options are not pursued, Article 14 will result in net costs to individual operators.

51. CHP options vary in their impact on air quality and certain options could worsen air quality. Other possible non-quantified costs could include technological ‘lock-in’ into cogeneration or waste heat recovery options. It is unclear how lock-in to these options might differ to lock-in to the technologies operators might have chosen in the baseline. The reliability of CHP compared to grid electricity and gas could also generate some non-quantified costs, although this could be reflected in the CBA.

Consultation questions:

Are there any other non-quantified costs, or have you any views on the potential significance of the costs identified here?

In particular, how significant might be the deterrence of development that might arise from a requirement to include co-generation in a capital-constrained scheme? Can you estimate the costs to business of such deterrence?

With regard to the CBA itself, are there any costs or benefits that you consider potentially significant but difficult to monetise? Please provide details.

Summary of costs

52. The table below provides a summary of costs by plant capacity category and new/refurbishment. The “central” values presented are simply the midpoint of the low and high ranges and are presented for ease of comparison between the two scenarios. The base year for the PV calculation is 2013 and a discount rate of 3.5% has been applied (HM Treasury Green Book).

Table 11 Disaggregated costs for the period 2014-2024, present value (£million, 2013 prices)

	Low (£m)			Central (£m)			High (£m)		
	20-50 MW	50-300 MW	>300 MW	20-50 MW	50-300 MW	>300 MW	20-50 MW	50-300 MW	>300 MW
New	1.3	1.6	0.9	3.0	2.6	1.5	4.7	3.5	2.1
Refurbishment	1.2	0.8	0.6	2.9	1.2	0.8	4.6	1.7	1.1
Total	2.5	2.4	1.4	5.9	3.8	2.3	9.3	5.2	3.2

53. Total costs are presented in the table below.

Table 12 Summary of total present value costs for the period 2014-2024 (£million, 2013 prices)

£m	Low	Central	High
Costs of CBAs – operators	6.0	11.4	16.8
Admin costs – operators	0.2	0.3	0.5
Admin costs - regulators	0.2	0.3	0.4
Total	6.4	12.0	17.6

Consultation question: Have you any additional evidence on the likely costs? For instance, concerning the cost and time associated with conducting or commissioning a CBA?

5. Benefits

54. The transposition of Articles 14(5)-(8) of the EED requiring new and refurbished installations to carry out a CBA will first of all result in those installations brought into scope of the amended Regulations making investment decisions on the basis of better information. In particular, acquiring information on the relative costs and benefits of options for heat supply and heat sourcing will provide a solid basis for making an investment decision based on consideration of likely costs and benefits of available alternatives and avoid investing in sub-optimal options.
55. The extent of the benefits will depend on the number of new and refurbished installations carrying out CBAs and the outcomes of these. Recommendations and the choice of options stemming from the assessments will be site and installation specific. No quantitative analysis of associated benefits could be performed at this stage as the required evidence is not available.
56. The likely benefits associated with the proposed requirement and subsequent improvements in energy efficiency include the economic benefits resulting from reduced costs and /or additional income from sale of waste heat. The savings of interest are the net savings, taking into account the associated costs of the technology installed. CHP is likely to have higher capital costs compared to the technologies operators would otherwise use, and it is important the higher costs are included in the cost saving calculations of the CBA.
57. The CBAs will also need to use an appropriate cost of capital to ensure that any cost savings identified are feasible. This is important because the limited customer base for the heat output means there is a risk of stranded capital if an operator loses its heat customer. This increases the investment and social risk linked to cogeneration. It is important that the CBAs that installations undertake reflect an appropriate cost of capital in order to identify feasible options for the operator. This will reduce the possibility that the CBAs identify cost-effective options which operators do not pursue.
58. To improve the evidence on the likely benefits of this policy, further information is being sought during the consultation period. In particular, we would like:
- an estimate of the likely proportion of installations for which the CBA will identify cost-effective cogeneration or waste heat recovery options;
 - evidence on the marginal cost of developing cogeneration rather than single generation, for installations within the range covered by the amended Regulations;
 - further information on the savings that may result from the implementation of cost-beneficial schemes. This requires information on the annual saving to the operator from installing cogeneration rather than single generation (taking into account cost differences, following the previous point).
 - any evidence on the cost of capital for cogeneration;

Consultation questions:

Have you any information on the marginal cost of developing cogeneration rather than single generation installations greater than the 20MW total thermal input?

Have you any information on the annual savings that can be achieved from cogeneration or waste heat recovery measures for installations with thermal input >20MW?

Have you any evidence to inform the likely proportion of installations for which such measures could be found to be cost-effective?

What cost of capital do consider appropriate for cogeneration investment?

59. The recovery and use of heat that would otherwise be ‘wasted’ should give additional benefits which have not been quantified in this assessment. These include:

- reduced carbon emissions, contributing to the achievement of set targets and low carbon economy and potentially improving air quality (see Section 8). This cannot currently be quantified due to uncertainty over the number of plants that will install cogeneration or waste heat recovery;
- improved security of energy supply through a reduction of fuel use and exposure to domestic and international energy market risks.

Consultation question: Have you any further evidence on these, or other, possible benefits?

6. Competition assessment and direct impact on business

60. The competition assessment guidelines⁶ set out four questions to establish whether a proposed policy is likely to have an effect on competition. In particular, the assessment needs to establish whether the requirement to carry out a CBA across a range of new and refurbished combustion installations >20MWth would affect the market by:

- directly limiting the number or range of suppliers;
- indirectly limiting the number or range of suppliers;
- limiting the ability of suppliers to compete; or by
- reducing suppliers’ incentives to compete vigorously.

61. A brief summary of the four questions and a response considering the proposed requirement is presented in the table below.

Table 13 Competition Assessment Filter Questions

Do the proposed requirement to carry out a CBA	Response	Comment
Q1. ...directly limit the number or range of suppliers?	No	The proposed requirement to carry out a CBA does not seek to directly limit the number of suppliers
Q2. ...indirectly limit the range of suppliers?	No	The proposed requirement to carry out a CBA is not likely to limit the range of suppliers. In particular, the proposed requirement does not prevent entry or exit from the market for any of the sectors affected, e.g. Electricity Supply Industry (ESI), refineries, iron and steel, chemical industry etc. Furthermore, the cost associated with developing a CBA account for less than 1% of Gross Operating Surplus available to plants even in the case of small enterprises and, therefore, are unlikely to create further barriers and limit the range of suppliers.
Q3. ...limit the ability of suppliers to compete?	No	Carrying out the required CBA will provide new and refurbished installations with better information on relative costs and benefits of alternative heat supply and waste heat management options available to them and avoid investing in sub-optimal options. In the longer-term the proposed policy option should result in increased energy efficiency and, potentially in cost savings. Furthermore, taking into account the relatively low compliance costs, the proposed requirement is not likely to affect the ability of suppliers to compete.
Q4. ...reduce suppliers’ incentives to compete vigorously?	No	The proposed requirement does not seek to limit the incentives for suppliers to compete. In particular, implementing energy saving measures in line with CBA recommendations could result in reduction of (energy) cost or additional revenue and place the installation in an advantageous position.

62. Overall, the proposed requirement to develop a CBA for new and refurbished installations is unlikely to have any adverse impacts on competition.

⁶ OFT http://www.of.gov.uk/shared_of/reports/comp_policy/Quick-Guide1-4.pdf

Direct cost and benefit to business

63. As this impact assessment concerns the transposition of a European Directive, it is out of scope of “One-In, Two-Out” (OITO). The direct impact on business has nevertheless been calculated. The net present value of the cost to business for the period July 2014 to July 2024 is £11.68 million (£6.18 to £17.18 million).
64. The Equivalent Annual Net Cost to Business (EANCB) incorporates only the direct costs and benefits associated with the policy change that would be incurred by businesses. The EANCB is £0.96 million (2009 prices)⁷.
65. No quantitative estimates of benefits have been produced in this impact assessment. The likely benefits to business are the cost savings that result from operators taking up cogeneration/waste heat recovery options. These benefits would not count towards the EANCB calculation as they are not direct.

7. Distributional effects

Definitions and the Small and Micro-business Assessment

66. Small and micro-businesses are affected disproportionately by the burden of regulation and all new regulatory proposals should be designed and implemented in a manner aiming to mitigate disproportionate burdens. The default assumption set in the Better Regulation Framework Manual (June 2013) is that there will be a legislative exemption for small and micro-businesses where a large part of the measure can be achieved without including such businesses in the scope of the policy proposal.
67. The Better Regulation Framework Manual defines micro and small businesses according to a staff headcount. Micro-businesses are those employing up to 10 FTE staff members while small businesses employ between 11 and 49 FTE staff. The Manual provides guidance on Small and Micro-business Assessment including a range of potential mitigation measures if the proposed policy option does have an impact on small and micro-businesses.

Assessment of Businesses likely to be affected

68. Annex A sets out the consideration given to the businesses that are likely to be affected. Overall, the key sectors affected include Electricity Supply Industry (ESI sector), Iron and Steel, Petroleum Refineries and other industrial sectors, including non-ferrous metals, chemical, food and drink, pulp and paper production etc.
69. This analysis concludes that operators of combustion plants >50MWth are unlikely to fall within small and micro-business categories. Similarly operators of combustion plants between 20 and 50MWth in the electricity supply and refinery sectors are not expected to be small or micro-businesses. However in the industrial sector it is possible that some operators of combustion plants between 20 and 50MWth may fall within the small enterprise category. None are expected to be micro-businesses.

Measurement of the Impact on Micro and Small Enterprises

70. The impact of the proposed regulation on micro and small enterprises relates to whether the operators are able to meet the costs of compliance i.e. costs associated with carrying out CBA for planned or refurbished installations as well as the administrative costs associated

⁷ For the purpose of OITO, net costs to business are to be presented in 2009 prices and discounted to 2010 using the GDP deflator, in order to enable all policies to be compared using consistent pricing and discounting.

with the regulation. These costs can then be assessed by comparing the compliance and administrative cost per plant against the level of financial resources available to the operator for investment.

71. In the case of 20-50 MW plants the costs of undertaking a CBA range between £10,000 (low estimate) and £25,000 (high estimate). Administrative costs range between approximately £360 up to £715 per plant. The lifetime of a new installation is around 26 years while that of refurbished installations is about 13 years. The equivalent annual compliance and administrative cost ranges between £620 and £1,020 per new/refurbished installation as a low cost estimate and £1,540 and £2,530 per new/refurbished plant as a high cost estimate.
72. Information available in Eurostat Structural Business Statistics includes gross operating surplus (GOS), which is the capital available to companies which allows them to repay their creditors, to pay taxes and eventually to finance all or part of their investment⁸. Considering that GOS can be used for financing investment, total cost per plant are compared against GOS per operator to assess the economic impacts of proposed regulation. For each enterprise size category and per sector, GOS was divided by the number of operators to estimate the level of capital available at the operator level on an annual basis and compared with the cost estimates. The table below provides an indication of the regulatory burden⁹ in general and for small businesses in particular on a sectoral basis.

Table 14 Total Annual Compliance and Administrative Costs per Enterprise as a Proportion of GOS

20-50 MWth	GOS: small enterprises (10 to 49 employees)	Low cost estimate		High cost estimate	
		New, % of GOS	Refurbished, % of GOS	New, % of GOS	Refurbished, % of GOS
Basic metals manufacturing	372,212	0.17	0.27	0.41	0.68
Chemical production	706,008	0.09	0.14	0.22	0.36
Pulp and Paper	359,567	0.17	0.28	0.43	0.70
Food Industry	545,512	0.11	0.19	0.28	0.46
Textiles	416,906	0.15	0.24	0.37	0.61
Manufacture of vehicles	533,556	0.12	0.19	0.29	0.47
Manufacture of coke, refined petroleum products	1,962,963	0.03	0.05	0.08	0.13

Note: Total annual costs per enterprise consist of annualised compliance costs (i.e. annualised capital costs) and annual administrative costs. Administrative costs only include those for operators. The assessment is relevant to the installations with the thermal input 20-50 MW and concern small businesses only. No micro businesses (0-9) are assumed to operate installations of such size.

73. The assessment suggests that even in the case of small enterprises (10-49 FTE), the expected annual compliance and administrative cost per enterprise is negligible and corresponds to 0.03%-0.7% of the average GOS across the affected sectors. Furthermore, the adverse impacts, if any, are likely to be counteracted by the financial savings associated

⁸ [http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Glossary:Gross_operating_surplus_\(GOS\)_-_\(NA\)](http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Glossary:Gross_operating_surplus_(GOS)_-_(NA))

⁹ By dividing total annualised cost per enterprise by the GOS for the relative size class to express the costs as a percentage of the GOS.

with increased energy efficiency and additional revenues if waste heat is used on site or sold to a third party.

8. Social Impact Assessment

74. The proposed policy option requires a cost benefit analysis (CBA) to be undertaken for a range of new and refurbished plants > 20MWth. The policy requirement per se would only affect the installations concerned and environmental and energy consultancy sector that is likely to be assisting in carrying out these CBAs.
75. While the proposal could give rise to some negative implications for employment in the sectors affected as a result of additional costs for compliance (including administrative), in practice such implications are not anticipated. In particular, the costs of developing CBAs are estimated to be below 1% of annual Gross Operating Surplus across the sectors affected even in the case of small enterprises. These costs, therefore, are not expected to have a detrimental employment and labour market impact within the sectors affected, including ESI, refineries, iron and steel, pulp and paper, chemical industry and others. Furthermore, the sectoral costs will also represent income for the consultancy sector supporting the CBA resulting in a potential positive impact on employment.
76. Depending on the outcomes of the CBAs carried out on new and refurbished installations, a range of energy efficiency measures might need to be implemented resulting in further costs and potentially employment impacts. However, the results of these assessments will be site and installation specific and no predictions with regard to the associated costs can be made at this stage.
77. The reduction in total energy consumption has the potential to lead to environmental and health benefits of reducing air pollution, including NOX, SO2 and dust (PM) as well as other air pollutants. However, this cannot be determined without further information on the originally proposed schemes and the alternative approach taken as a result of a requirement to fit CHP. For example, installation of a diesel fired reciprocating engine CHP plant instead of meeting the same demand using a gas fired boiler and grid electricity can actually lead to an increase in air pollutant emissions.

9. Uncertainties and assumptions

78. As with any assessment of this nature, there are a number of uncertainties and limitations that should be kept in mind when considering the findings, these include:
- DECC provided data covering new electricity and district heating plants for two of the three considered thermal input categories. This was complemented with AMEC estimations based on plant turnover to fill the gaps. Although filled using the best available estimates, this adds a degree of uncertainty to the final results. In particular, no information on industrial plants was provided by DECC and therefore the forecast applied in the analysis is solely based on AMEC modelling. Similarly, no data was provided for plants between 20-50MW.
 - Uncertainty over how many of these plants may already be required to undertake a CBA as part of existing permitting requirements.
 - Plant forecasts in the model also rely on a number of assumptions. For example, growth data is based on energy consumption projections by fuel type and sector. However, it is impossible to discern if the projected change in consumption is directly linked to a proportional change in the considered plant types or is the result of other factors. Assumptions regarding the number of refurbishments in current and future plants are also applied introducing uncertainty in the results of the model. Emerging technologies may

increase the lifetime of the plant but may also trigger more frequent refurbishments. Future regulations may also alter the lifetime and the number of required refurbishments.

- Uncertainties with respect to the costs associated with undertaking and reviewing a CBA. This will depend largely on the complexity of the plant in question. We have applied ranges to try and reflect this variation.
- Uncertain what benefits the CBAs might identify (and what benefits would result in practice).

79. There is greater uncertainty associated with the number of CBAs compared to the cost of the CBAs. The estimated number of plants affected was developed based on the best available information from DECC and AMEC, however the range remains uncertain. In view of the uncertainty we have taken a conservative approach, for instance by including all generators >50MW because the extent to which they are already covered by existing requirements is unclear.

Assumptions

80. The key assumptions are listed in the table below, along with their source.

Table 15 Assumptions and sources

Assumption		Source
Wage costs: operator	£27.14/hour	ONS Annual Survey of Hours and Earnings (2011). 2011 prices inflated to 2013 (HMT GDP deflator) and uplifted by 30% for non-wage costs (Standard Cost Model, 2005). Operators assumed to be Production Manager (112) and regulator assumed to be Conservation and Environmental Protection Officer (3551).
Wage costs: regulator	£19.58/hour	
Costs of CBA	£10,000-£40,000/CBA	From DECC's consultation stage impact assessment on the EED and supplemented by estimates from AMEC.
Time: operator	14-35 hours/CBA	Larger installations assumed to require more time. AMEC expert judgement plus information from Environment Agency on the time taken to review the recent Tilbury Power Station CBA (870MW output power). Time for operator could be higher if they don't commission consultants to complete the CBA. Total costs of this are not expected to be greater than when consultants are commissioned.
Time: regulator	21-45 hours/CBA	
Number of installations affected	See Table 3.4 for summary	DECC forecasts and data (included DUKES, 2013; Updated Energy Projections 2013); AMEC – previous analysis and expert judgement; Large Combustion Plant Inventory (Defra, 2009);
Price year	2013	Except for direct impact on business, when 2009 prices are used.
PV base year	2013	

Implementation

81. Implementation will be a matter for the regulators, in accordance with guidance from the European Commission [footnote ref to Guidance published on 6 November 2013] and, if necessary, from the Government.

82. The preferred option will be delivered through amendment of the Environmental Permitting (England and Wales) Regulations 2010. As already amended¹⁰, these Regulations as a whole have to be reviewed in relation to England and a report published by 6 April 2017. This review will therefore provide a means of **post-implementation review**.
83. Article 24(6) of the EED requires Member States to submit to the European Commission before 30 April each year statistics on:
- national electricity and heat production from high and low efficiency cogeneration
 - cogeneration heat and electricity capacities and fuels for cogeneration, and
 - district heating and cooling production and capacities, in relation to total heat and electricity production and capacities.
- In that way, information relevant to the effectiveness of the measures covered by this impact assessment will be accumulated.
84. Defra has a long established arrangement through which representatives of industry organisation, environmental regulators, environmental NGOs, the devolved administrations and other Government Departments meet regularly to discuss issues arising from the EPR as they concern pollution control at industrial installations component Directives. This arrangement will continue to provide an effective means of reviewing the implementation of Articles 14(5)-(8) of the EED.

10. Conclusions

85. Overall the transposition of Articles 14(5)-(8) will lead to additional costs being incurred primarily by developers/operators as a result of needing to undertake CBAs of the potential for using waste heat. Regulators will also incur costs as a result of needing to review any CBAs provided to ensure they meet the requirements of the legislation and agree what further actions, if any, may need to be undertaken. In practice these costs for the regulators are likely to be passed onto operators.
86. As highlighted above, a CBA must be undertaken by developers of installations above 20MW_{th} and if the result is positive, the appropriate authorisation criteria and/or permit will require operation as cogeneration or with waste heat recovery. A permit will not be granted for operation without cogeneration / heat recovery where the CBA is positive.
87. Overall, the total additional costs for both regulators and developers/operators associated with the transposition of these articles is around £12 million (£6-18 million range) over the assessment period (2014-2024) assuming that all new or refurbished plants in scope are required to undertake a detailed CBA. This cost assessment may be an overestimate as some of the larger new power plants already have to consider recovering waste heat as part of the existing consent regime.
88. Benefits have not been quantified due to their site specific nature and current evidence gaps. They are likely to include improvements in energy efficiency and associated reductions in carbon emissions as well as potential economic benefits for the use of waste heat (either on site or elsewhere). More evidence on the likely benefits is being sought during consultation.

¹⁰ Specifically, by regulation 11 of the Environmental Permitting (England and Wales) (Amendment) Regulations 2012 (SI 2012 No.630) which inserts a review requirement.

References

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Annex A: impact on small and micro-businesses

Overview

89. The scope of Articles 14(5)-(8) of the Energy Efficiency Directive (2012/27/ EU)¹¹ includes the following installations:

- New or refurbished electricity generation installations;
- New or refurbished industrial installations generating usable waste heat; and
- New district heating or cooling networks, or a new or refurbished energy production installation within an existing network.

90. The requirement to undertake a CBA concerns only new or refurbished installations. The number and the size of new or refurbished installations, in particular across different industrial sectors, is highly uncertain. For the purpose of the assessment, it is assumed that the existing composition with regard to the sectors affected and typical size of the companies remains over the assessment period.

91. Overall, the key sectors affected include Electricity Supply Industry (ESI sector), Iron and Steel, Petroleum Refineries and other industrial sectors, including non-ferrous metals, chemical, food and drink, pulp and paper production etc.

Combustion plants >50 MWth

92. The assessment of the number and size of the businesses likely to be affected was based on the analysis of the UK LCP 2009 emissions inventory¹² that captures plants >50MWth and DUKES 2013 data.

Electricity Supply Sector

¹¹ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:315:0001:0056:EN:PDF>

¹² Available from: <http://cdr.eionet.europa.eu/gb/eu>

93. According to the inventory there were about 130 large combustion plants within the electricity supply sector split equally between 50-300MW and >300MW plants. In total, about 30 companies are operating these plants including E.ON, EDF Energy, Scottish and Southern Energy, Scottish Power, AES Corporation, Centrica, GDF Suez, RWE Npower, Drax Power Limited and others. Overall, the operators within the sector tend to be large multinational corporations (e.g. GDF Suez, AES Corporation etc.) employing up to tens of thousands of employees or large plant operators, e.g. Eggborough Power Ltd or Drax Power Ltd employing 800 staff members. It is, therefore, unlikely that companies operating LCPs within electricity supply sector fall within small and micro-businesses category.

Refineries

94. The LCP Inventory 2009 reports about 55 combustion plants within refinery sector with the capacity above 50MWth located on about twelve sites (although as of 2013 there are only seven operational sites), including, for instance, Grangemouth, Fawley, Humber and other refineries. The analysis of their ownership and operation indicates that these refineries are owned and operated by large international corporations, including, for example, Valero Energy Corporation, Essar Energy, Philips66, Ineos, Murco, ExxonMobil, and Total. The majority of these plants have a capacity of 50-300MWth and there are no refineries with a capacity between 20 and 50MWth. No small and micro-businesses within refineries sector will be affected by the new requirements.

Iron and Steel Sector

95. The UK LCP 2009 inventory suggests that there are about 10 plants within the iron and steel sector >50MWth situated on four different industrial sites. All of these steelworks are owned and operated by two international corporations employing thousands of people on the affected industrial sites alone. All these plants except for one fall within 50-300 MWth capacity.

Other Industrial Sectors

96. A wide range of sectors also appear on the UK LCP Inventory including, in particular, chemical sector (organic and inorganic), pulp and paper production, food manufacturing, textiles production, manufacturing of cars as well as specialised utilities services companies and gas compressor stations.

97. The majority of these plants, i.e. about 95% are between 50-300 MWth. Like with the other sectors, large national and international companies that employ hundreds and thousands of staff dominate the list. For instance, food production is represented by companies such as British Sugar, British Salt, Tate & Lyle; while chemical sector combustion plants are owned by companies such as Shell, BP, Ineos, SABIC Petrochemicals, Ciba UK etc. No impact on small and micro-businesses is anticipated for plants > 50MWth.

Combustion plants 20-50 MWth

Electricity Supply Sector

98. The assessment of the data available (DUKES) suggests that it is unlikely that companies operating installations with a capacity between 20MWth and 50MWth within the electricity supply sector fall within small and micro-businesses category

99. According to DUKES 2013 data, as of May 2013 there were in total 18 plants with a capacity between 20-50MWth. All of these installations are owned and operated by the same large energy companies, including E.ON, Scottish and Southern, EDF Energy, GDF Suez and others.

Refineries

100. No small and micro-businesses within the refineries sector are likely to be affected by the new requirements as there are no further refineries with a capacity between 20 and 50MWth.

Industrial Sectors

101. No data is available on operators of the installations with a capacity below 50 MWth across a wide range of sectors.

102. For some of these sectors, Eurostat Structural Business Statistics (SBS) provides sectoral data on enterprise size categories, thus allowing for a preliminary assessment of SMBA-relevance to be made. The key sectors affected may include iron and steel, pulp and paper, chemical industry, textiles, food production, car manufacturing etc.

103. Eurostat data suggests that a significant proportion of the industrial sectors affected fall within micro enterprise group (0-9 employees). In practice, however, installations with a thermal input of 20-50MW are typically a part of a bigger complex requiring more than 9 employees to maintain and operate, and therefore it is highly unlikely that any micro-size enterprises would operate such installations.

104. A number of the plants within 20-50 MWth are directly associated to an IED regulated installation, which is extremely unlikely to be an SME and are assumed to be large-size enterprises. Furthermore, 20-50 MWth plants are captured under the EU ETS and unlikely to be micro or small enterprises.

Table 16 Enterprise Size Categories per Sector in 2007 for UK (numbers and %)

Sector	Micro (0-9)	Small (10-19)	Small (20-49)	Notes
Basic metals manufacturing	21,604 75%	3,469 12%	2,440 8%	Basic metals and fabricated metal products
Chemical production	2,369 64%	368 10%	381 10%	
Pulp and Paper	24,053 83%	2,426 8%	1,405 5%	
Food Industry	4,006 57%	1,021 14%	862 12%	
Textiles	6,585 79%	817 10%	573 7%	
Manufacture of vehicles	2,017 66%	329 11%	270 9%	Manufacture of motor vehicles, trailers and semi-trailers
Manufacture of coke, refined petroleum products	184	14	13	Manufacture of coke, refined petroleum products and nuclear fuel

Sector	Micro (0-9)	Small (10-19)	Small (20-49)	Notes
	76%	6%	5%	

Note: Number of enterprises per size category, available in Eurostat Structural Business Statistics (SBS) for various sectors in 2007, used to estimate the proportions of different enterprise size categories for the sectors considered in this report.

105. Based on these arguments it can be assumed that no plant operators are micro-sized enterprises, although some of the installations could fall within the small enterprise category.

Non-industrial sectors

106. In addition to the sectors discussed above, 20-50MWth plants can also be found in non-industrial sectors such as public buildings (e.g. hospitals and universities) as the 20MWth threshold is aggregate.

107. In some cases they are owned and operated by specialist companies providing such services. As such, the size of the organisation(s) using the output of a combustion plant (e.g. a hospital) may not be the same as the size of the enterprise operating it. In addition, as demonstrated by the analysis of plants >50 MWth, in many cases an enterprise owns and operates more than one combustion plant.

108. It is unlikely that any of these plant operators are micro-sized enterprises although some could potentially fall within the small enterprise category.

Annex B: reasons for transposing through the Environmental Permitting Regulations

Defra has elected to effect the transposition of those Articles through amendment of the Environmental Permitting (England and Wales) Regulations 2010 – the “EPR”.

Article 14(5) states that:

‘Member States shall ensure that a cost-benefit analysis (CBA) in accordance with Part 2 of Annex IX is carried out when, after 5 June 2014:

- (a) a new thermal electricity generation installation with a total thermal input exceeding 20 MW is planned, in order to assess the cost and benefits of providing for the operation of the installation as a high-efficiency cogeneration installation;
- (b) an existing thermal electricity generation installation with a total thermal input exceeding 20 MW is substantially refurbished, in order to assess the cost and benefits of converting it to high-efficiency cogeneration;
- (c) an industrial installation with a total thermal input exceeding 20 MW generating waste heat at a useful temperature level is planned or substantially refurbished, in order to assess the cost and benefits of utilising the waste heat to satisfy economically justified demand, including through cogeneration, and of the connection of that installation to a district heating and cooling network;
- (d) a new district heating and cooling network is planned or in an existing district heating or cooling network a new energy production installation with a total thermal input exceeding 20 MW is planned or an existing such installation is to be substantially refurbished , in order to assess the cost and benefits of utilising the waste heat from nearby industrial installations.’

Nearly all of the installations subject to Article 14(5) are already subject to the EPR. That is because:

- combustion installations with a rated thermal input (“RTI” hereinafter) of 50 MW require a permit from the Environment Agency or from National Resources Wales which embodies the integrated pollution prevention and control requirements now set out in Chapter II of the industrial emissions Directive (2010/75/EU).
- combustion installations burning fuel in a boiler, furnace, gas turbine or compression ignition engine with a RTI of between 20 MW and 50 MW require a permit from the local authority in which they are situated, embodying controls upon significant pollutant emissions to air ; and
- permits for installations incinerating or co-incinerating waste also have to embody the stringent requirements now set out in Chapter IV of the industrial emissions Directive. There is no RTI threshold for these requirements. The Environment Agency or National Resources Wales is generally the regulator for installations with a capacity equivalent to 20 MW .

So installations in any of those categories which are new after 5 June 2014 will in any case need to apply for an environmental permit. The permit application process requires the operator to supply a range of information about the installation’s technical characteristics. To that will now be added a CBA in fulfilment of the requirements of Article 14(5). Just as the regulator is already required to determine, from the information provided with the application, whether a permit can be granted and, if so, with what conditions, so the regulator will determine from the

CBA whether the installation can be permitted only on the basis of incorporating high efficiency co-generation or district heating and cooling.

Similarly, an already-existing installation in those categories will have a permit which would in any case need to be varied if the installation were to be substantially refurbished. It would be for the operator to apply for a permit variation, providing technical information on how the refurbishment would change the installation. To that information will be added the CBA if the refreshment takes place after 5 June 2014. The regulator will accordingly determine what conditions would need to be set in varying the permit.

Use of the existing permitting process therefore enables the Article 14(5) requirements to be met without the construction of a separate process and the attendant burden upon operator and regulator in operating it.

The only installations subject to Article 14(5) (as qualified by Article 14(6)) of the Directive but to which the EPR do not currently apply are those where there is more than one combustion unit and the aggregate RTI to the those units is 20 MW or more. The EPR will be amended so as to draw such installations in but in such a way that only the Article 14(5)-(8) requirements apply.

Consideration had been given to using the land use planning system as a vehicle for implementing the requirements of Articles 14(5)-(8). However, that system would not necessarily be engaged in instances where installations are substantially refurbished. Moreover, assessment of the CBA is a relatively technical task which sits more easily with regulatory staff who are accustomed to dealing with the environmental permitting of the installations concerned.

Hence the proposal to use the environmental permitting option.

ANNEX

Reasons for choice of EPR for the transposition

1.1. The Environmental Permitting Regulations¹³ require operators to obtain environmental permits for certain facilities and technologies, to register others as exempt from the requirements of obtaining a permit, and provide for general on-going supervision by regulators. The aims of the Regulations are to:

- protect the environment so that statutory and Government policy environmental targets and outcomes are achieved;
- deliver permitting and compliance with permits and certain environmental target effectively and efficiently in a way that provides increased clarity and minimises the administrative burden on both the regulator and the operators;
- encourage regulators to promote best practice in the operation of regulated facilities; and
- to transpose European legislation fully.

1.2. Environmental Permitting is an established process for regulating the development, operation and refurbishment of industrial installations in England and Wales. Nearly all of the installations subject to Article 14(5) are already subject to the EPR. That is because:

- combustion installations with a rated¹⁴ thermal input (“RTI” hereinafter) of 50 MW or more require¹⁵ a permit from the Environment Agency or from National Resources Wales which embodies the integrated pollution prevention and control requirements now set out in Chapter II of the industrial emissions Directive (2010/75/EU);
- combustion installations burning fuel in a boiler, furnace, gas turbine or compression ignition engine with a RTI of between 20 MW and 50 MW

¹³ The Environmental Permitting (England and Wales) Regulations 2010, SI 2010 No. 675, as subsequently amended.

¹⁴ Note that Article 14(5) of the EED uses ‘total thermal input’, not “rated thermal input”. See paragraph **Error! Reference source not found.** of this consultation paper.

¹⁵ Required because they carry out the activity described in Part A(1) of Section 1.1 of Part 2 of EPR Schedule 1.

require¹⁶ a permit from the local authority in which they are situated, embodying controls upon significant pollutant emissions to air¹⁷; and

- permits for installations incinerating or co-incinerating waste also have to embody the stringent requirements now set out in Chapter IV of the industrial emissions Directive¹⁸. There is no RTI threshold for these requirements. The Environment Agency or National Resources Wales is generally the regulator for incineration/co-incineration installations with a capacity equivalent to 20 MW¹⁹.

1.3. So installations in any of those categories which are new after 5 June 2014 will in any case need to apply for an environmental permit. The permit application process requires the operator to supply a range of information about the installation's technical characteristics. The EPR amendments proposed in this paper would add to that the supply of a CBA in fulfilment of the requirements of Article 14(5). The regulator is already required to determine, from the information provided with the application, whether a permit can be granted and, if so, with what conditions. With the proposed amendments, the regulator would determine from the CBA whether the installation can be permitted only on the basis of incorporating high efficiency co-generation or district heating and cooling.

1.4. Similarly, an already-existing installation in those categories will have a permit which would in any case need to be varied if the installation were to be substantially refurbished. Article 2(44) of the EED states that "substantial refurbishment" means a refurbishment whose cost exceeds 50 % of the investment cost for a new comparable unit. That scale of investment would almost certainly involve changes to the technical characteristics of the installation which would necessitate a variation in the environmental permit. The operator would be expected to apply for the permit variation, although the regulator would initiate variation if the operator were unwilling. In either case, the EPR amendments proposed in this paper would have the effect of requiring the supply of a CBA in fulfilment of the requirements of Article 14(5).

¹⁶ Required because they carry out the activity described in paragraph (a) of Part B of Section 1.1 of Part 2 of EPR Schedule 1.

¹⁷ This requirement stems from long-standing national legislation.

¹⁸ Schedule 13A of the EPR requires regulators to apply these requirements.

¹⁹ Local authorities regulate small waste incineration plants which are those with a capacity of less than 10 tonnes/day for hazardous waste or 3 tonnes/hour for non-hazardous waste. However, plants below those thresholds will not individually reach the 20 MW threshold, although the possibility exists of an installation comprising several such plants with an aggregate capacity equivalent to at least 20 MW.

We therefore believe that use of the existing permitting process enables the Article 14(5) requirements to be met satisfactorily without the construction of a separate process and the attendant burden upon operator and regulator in operating it.