Summary: Intervention & Options

Department /Agency:	Title: Impact Assessment of EuP Implementing Measure for External Power Supplies	
Stage:	Version: 1.0	Date: 6th October 2008
Related Publications:		

Available to view or download at:

http://www.

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

The level of carbon emissions and energy usage in the UK and globally remain a concern to the UK as a result of global warming, the emissions reduction targets the UK has set itself and the threat to the country's energy security. Climate change means that the UK must reduce emissions quickly and the carbon emission caps established with the EU Emissions Trading Scheme will need to be met in the most cost-effective manner. Power supply units contribute significantly to the electricity consumption of households in Europe. The study of Miscellaneous Standby Power Consumption of Households Equipment (Molinder, 1997; in EC, 2004) calculated an increase in standby losses, including no-load losses for wall packs and chargers from about 8 TWh in 1996 to about 14 TWh in 2006. Whilst the UK market is moving towards the use of more energy efficient power supply units, there are still significant numbers of inefficient products being sold on the market. Expert opinion estimates the current share of the market covered by inefficient products at approximately 25% and, although energy efficient solutions are widely available and which use significantly less power, behavioural barriers and information failures mean that some of the more energy efficient products are not being taken up quickly enough. The market itself has not moved sufficiently quickly to higher use of these more energy efficient power supply units in response to the price signal provided through the ETS on energy use and, as a result, it is felt that government intervention (at the EU level due to the Single Market) in the form of regulation setting minimum energy standards for power supply units should be introduced to achieve the desired cost-effective abatement.

What are the policy objectives and the intended effects?

The new Energy White Paper, issued on the 23 May 2007 announced a renewed commitment from the Government to improve the performance of energy using products over the next 10–20 years, with this including proposals for product standards and targets to phase out the least efficient products. The objective of implementing restrictions for power supply units is to contribute to realising the CO2 savings required to achieve the EU ETS cap in the most cost-effective way, by breaking down barriers to behaviour change. Product policy is considered as a necessary complement to the EU ETS overall ambition to reduce CO2 in the most cost-effective manner possible. Lower energy usage as a result of the lower power consumption of power supply units (and therefore lower energy demand) will also contribute to the energy security of the UK.

What policy options have been considered? Please justify any preferred option.

The UK, as a Member of the European Union, has implemented Framework Directive 2005/32/EC of 6 July 2005 establishing a framework for the setting of Ecodesign requirements for energy-using products. A draft Implementing Measure has been issued by the Commission setting out requirements for power supply units. This impact assessment sets out the potential costs and benefits of implementing the measure on power supply units for a sub-set of products according to currently drafted requirements. This IA does not consider alternative requirements and/or propose different standards for power supply units other than those proposed by the IM due to the limited time available for detailed technical appraisal of such alternative standards and for modelling the potential impacts. Any costs and benefits presented here are considered against the counterfactual of “no implementation” of the measure.

When will the policy be reviewed to establish the actual costs and benefits and the achievement of the desired effects?

The IM will be subject to review not later than 5 years after it enters into force.

Ministerial Sign-off For SELECT STAGE Impact Assessments:

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 Minister:

.... Date:

Summary: Analysis & Evidence

Policy Option:	Description: Restrictions on power consumption and efficiency from potential Commission Regulation implementing Directive 2005/32/EC with regard to ecodesign requirements for power supply units

COSTS

ANNUAL COSTS		Description and scale of **key monetised costs** by 'main affected groups'
One-off (Transition)	**Yrs**	Cost of increased carbon emissions from the heat replacement effect: £ 4,470,000 – 4,510,000
£		Estimated costs to manufacturers of making products compliant: £ 46,220,000 - £ 62,160,000,(based on -10% and +20% of expert estimated marginal costs of making products compliant)
		Testing costs: £440,000 - £600,000
Average Annual Cost (excluding one-off)		TOTAL: £51,130,000 – £67,270,000
£ 5.9m - £ 7.7m	13	**Total Cost** (PV) **£ 51m – £ 67m**

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

Manufacturers will be required to make changes to product documentation in order to accommodate information requirements included in the EU Implementing Measure. These costs, however, are likely to be negligible.

BENEFITS

ANNUAL BENEFITS		Description and scale of **key monetised benefits** by 'main affected groups'
One-off	**Yrs**	
£ n/a		Total Value Energy Savings: £ 69,920,000
		Total Value EU ETS allowance savings (from CO2 emissions savings in the UK): £ 16,236,000
		Total Value Air Quality Damages Avoided: £ 1,880,000
		TOTAL: £ 88,040,000
£ 10.1m	13	**Total Benefit** (PV) **£ 88m**

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

Benefits to end-users from information on the product due to information requirements for manufacturers.

The option will also produce potentially significant wider benefits on a global scale, in particular in areas where there are no "caps" on carbon emissions. Power Supply Units produced in the UK (and EU as a whole) and sold in these areas as well as those produced locally to EU standards for the EU and also consumed locally will use less energy and produce lower carbon emissions than would have otherwise been the case.

Adopting the IM will also assist in enabling a longer-run agenda shift towards tighter emission caps in the future.

Key Assumptions/Sensitivities/Risks

The estimate for benefits above covers the period 2008 – 2020. However, it is likely that some products sold during this time will be used after that period and consequently additional benefits will continue to arise from the policy beyond 2020. Rough estimates on future benefits are included in the details of the IA but many uncertainties over the future use of such products exist (e.g. in the number of products being sold, the product mix on the market, availability of substitutes etc) and it is therefore difficult to predict the level of benefits directly attributable to the policy so far into the future. However, it should still be noted that the benefits of £88m indicated above are likely to be an underestimate.

The figures included in these summary sheets are net of both ENERGY STAR and CRC policies. Simplified assumptions have been used in estimating the likely overlaps with the IM of in the absence of detailed data. These have involved, in particular, assumptions about the level of compliance with ENERGY STAR and directly proportional relationships between costs and benefits for both CRC and ENERGY STAR. Details are provided in Section 5.

Note that there is also a Code of Conduct for External Power Supplies, a European Commission led initiative which also has potential overlaps with the IM. However, the effect is likely to be minimal given the limited time remaining until the IM comes into force and the fact that compliance with the code may be partially led by the threat of the impending EuP legislation.

Price Base Year 2008	Time Period Years: 13	**Net Benefit Range** (NPV) **£ 21m – £37m**	**NET BENEFIT** (NPV Best estimate) **£ 21m (conservative)**

What is the geographic coverage of the policy/option?			UK (but same in EU)	
On what date will the policy be implemented?			1 year after publication in Official Journal – circa 2010	
Which organisation(s) will enforce the policy?			Under review but currently UK Trading Standards	
What is the total annual cost of enforcement for these organisations?			Enforcement mechanisms are being developed; current estimates of indicative costs to UK enforcement authorities are around £50K for each product category under Implementing Measures for the EuP Directive	
Does enforcement comply with Hampton principles?			Yes	
Will implementation go beyond minimum EU requirements?			No	
What is the value of the proposed offsetting measure per year?			£ N/A	
What is the value of changes in greenhouse gas emissions?			£ 4.5m net increase in emissions through HRE. £ 16.2m in EUA savings through realisation of traded sector emission reductions.	
Will the proposal have a significant impact on competition?			No	
Annual cost (£-£) per organisation (excluding one-off)	Micro **Unknown**	Small **Unknown**	Medium **Unknown**	Large Unknown
Are any of these organisations exempt?	No	No	N/A	N/A

Impact on Admin Burdens Baseline (2005 Prices) (Increase - Decrease)

Increase of £ Unknown Decrease of £ Unknown **Net Impact** £ Unknown

Key: **Annual costs and benefits:** **(Net) Present**

Evidence Base (for summary sheets)

1. Introduction/Purpose

The Framework Directive for the Eco-design of Energy Using Products (EuP) was adopted in July 2005 and implemented in the UK and other Member States (MS) in August 2007. EuP establishes a framework by which the Commission and MS can bring forward measures to establish minimum standards relating to the environmental impacts of products (e.g. their energy consumption). The legal basis is Article 95 – Single Market.

The ability to establish minimum standards in this way is a key foundation of our approach to reducing the carbon impacts of products in the UK. As a member of the EU, the UK is bound to implement the Framework Directive and any implementing measures adopted under it. Therefore, it can be argued that the UK has effectively ceded its legislative competence in this policy area and so cannot take unilateral regulatory/legislative action in this area.

This particular measure relates to external power supplies. The IM defines an external power supply as a device meeting all of the following:

- is designed to convert alternating current (AC) power input from the mains power source input into lower voltage direct current (DC) or AC output;
- is able to convert to only one DC or AC output voltage at a time;
- is intended to be used with a separate device that constitutes the primary load;
- is contained in a physical enclosure separate from the device that constitutes the primary load;
- is connected to the device that constitutes the primary load via a removable or hard-wired male/female electrical connection, cable, cord or other wiring; and
- has nameplate output power not exceeding 250 Watts.

This Impact Assessment will enable the UK to assess the costs and benefits to the UK of the measure as proposed by the European Commission and help inform our negotiating and voting position during the forthcoming Regulatory Committee meeting and at any subsequent meetings.

The UK has fully participated in all EU discussions on this measure to date, using evidence developed by the UK Market Transformation Programme (MTP) to inform discussions and to influence the development of the proposal.

The Commission proposal has now been formally tabled for a vote of the relevant EU regulatory committee on 17 October 2008 where the UK will need to be in a position to either support or oppose the measure.

Voting at the Committee is under the Qualified Majority Voting Procedure. If approved the measure will go to the European Parliament for Scrutiny; if it is not, then it will be passed to the Council to resolve. If approved, this measure will be subject to review no later than 5 years after entry into force (around 2010).

2. Rationale for Intervention

Market failures occur, for instance, where negative externalities (carbon emissions, air quality damages) affecting the wider general public are not compensated for in market transactions in terms of the price paid for electrical goods and how they are used. As a result, the level of pollution via carbon emissions is higher than might be the case if the cost of pollution were fully incorporated into product prices. To respond to this, policy tools exist to correct for negative externalities. Across the EU, the EU Emissions Trading Scheme internalises the carbon externality back into market transactions and its coverage includes large electricity producers. In total it captures approximately 50% of all EU CO_2 emissions.

However, sales of less energy efficient power supply units are still significant. The continued use and sales of inefficient and high energy using power supply units represents a market failure in the sense that whilst negative externalities such as carbon emissions are compensated for in market transactions, via the EU ETS, this mechanism does not correct for all market failures e.g. where barriers to behaviour change still persist (due to another form of market failure - lack of, or inequality in the information available to consumers on the impacts of their behavioural choices). For instance, consumers are not always aware of the availability of the most efficient products, or of the difference in costs of running them versus other less efficient equipment. Other barriers include:

- some groups have do not have a good understanding of their energy costs;
- some people do not look at energy consumption data but at the price, brand or other recommendations when they buy a product; and
- most people tend to assume that newer products are more efficient.

Even where consumers do have access to all information required to make informed decisions on the purchase of energy efficient products, the fact that there are such a wide range of factors to consider (price, colour, maintenance facility, easy access, brand name etc.) can often mean that energy efficiency is not considered as a major determining factor in the decision to buy one product over another. In addition, frequently consumers do not want to go through the hassle of changing to more efficient products due to the perceived significant time/inconvenience cost involved.

This analysis is consistent with the "third leg" of the Stern Report (the need to develop policies to remove barriers to behaviour change such as a lack of reliable information, transaction costs, and organisational and individual inertia) and provides the rationale for the Implementing Measure which complements the EU ETS as described above.

Moreover, the new Energy White Paper (issued on the 23 May 2007) announced a renewed commitment from the Government to improve the performance of energy using products over the next 10–20 years, with this including proposals for product standards and targets to phase out the least efficient products.

Power supply units contribute significantly to the electricity consumption of households in Europe. The study of Miscellaneous Standby Power Consumption of Households Equipment (Molinder, 1997; in EC, 2004[1]) calculated an increase in standby losses, including no-load losses for wall packs and charges from about 8 TWh in 1996 to about 14 TWh in 2006. Since then, efficiency has improved through the implementation of different initiatives such as the European Code of Conduct; yet more efficiency gains are expected in the years to come through wider implementation of the code and reinforcement of its standards by means of the eco-design requirements imposed by the EuP Directive.

3. Content of the proposed Implementing Measure and options

The proposed Implementing Measure sets out its different requirements in Annex I according to time of implementation. These are presented in Box 1 below.

[1] EC (2004): Code of Conduct on Energy Efficiency of External Power Supplies, Version 2, DG JRC, Renewables Energy Unit, Ispra.

BOX 1

No-load condition power consumption and average active efficiency

a) ***One year*** after this Regulation has come into force:

The no-load condition power consumption shall not exceed 0.50 Watt.

The average active efficiency shall be not less than:

0.50 · PO, for PO < 1.0 Watt;

0.09 · ln(PO) + 0.50, for 1.0 Watt ~ PO ~ 51.0 Watts;

0.85, for PO > 51.0 Watts.

b) ***Two years*** after this implementing measure has come into force: The no-load

condition power consumption shall not exceed the following limits:

	AC-AC external power supplies, except low voltage external power supplies	AC-DC external power supplies except low voltage external power supplies	Low voltage external power supplies
P_O < 50.0W	0.50W	0.30W	0.30W
P_O ~ 50.0W	0.50W	0.50W	n/a

The average active efficiency shall be not less than the following limits:

	AC-AC and AC-DC external power supplies, except low voltage external power supplies	Low voltage external power supplies
P_O ~ 1.0W	0.480 · P_O + 0.140	0.497 · P_O + 0.067
1.0W < P_O ~ 49.0W	0.0626 · Ln($P_{O)}$ + 0.622	0.0750 · Ln($P_{O)}$ + 0.561
P_O > 49.0W	0.870	n/a

The no load power consumption and the active efficiencies shall be measured according to the Test method in Annex II of the implementing measure.

The working document however also notes the potential to include in the future an eco-design requirement and/or mandate to standardised interfaces. This will depend on the results of different initiatives (regulatory action and voluntary action by manufacturers) in terms of environmental impacts. *This IA has not taken this potential measure into consideration but if it* *was to be adopted both significant environmental and economic benefits to consumers, and probably manufacturers, could be envisaged.*

4. Identification of Potential Impacts

There is a current trend to switch from linear to switched-mode power supplies, due to the recent increases in the cost of raw materials required for linear supplies. A linear power supply uses a relatively large transformer to convert the voltage from mains 240V to the required level. The transformer is most commonly made of wire wound round a metal core which is a significant proportion of the cost. A higher power PSU requires a larger transformer and additional components convert the 50Hz AC to DC if required. The higher the output power that a linear-mode ePSU has to have, the more materials are needed for transformer coils (ferrite core and copper for windings) but also for the housing (due to larger transformers). These raw materials costs are a significant part of the overall product costs. With the raw material costs of linear supplies rising (particularly copper) the costs of switched mode supplies has come down in relative terms (MTP, 2008).

Switched-mode power supplies use an electronic switch to convert input power to a high frequency signal (kHz-Mhz range) which allows a much smaller transformer to be used. Using electronic components, the power supply matches the input power draw to meet output power requirements. Higher efficiency power supplies use higher efficiency components and more sophisticated designs to optimise the input power to the output. The switch mode is smaller and lighter and, because the cost of metal is high, there is negligible or no cost in moving to switch mode, particularly for the larger power supplies. According to one supplier, the breakeven point has passed (meaning switched mode supplies are a zero cost solution) in some cases, if the whole life costs are taken into account (including shipping, weight, size and reliability).

The impacts from the eco-design requirements are only expected from active modes. Changes will need to be made to products that are currently not in compliance with the proposed measure and consequently it is necessary to consider the impacts of those changes on all relevant stakeholders at each stage of the products’ life cycle. Table 1 below sets out the potential environmental, economic and social impacts at each of the like-cycle phases that will be examined (including their costs and benefits) in subsequent sections. As noted earlier however, there is already a trend from linear to switch mode based on the decrease in raw materials needed. Thus, economic impacts of the Tier 1 requirements in the Implementing Measure are not expected to be significant, whereas the Tier 2 requirements, which impose stricter requirements, will result in a number of costs and benefits as detailed in the following sections.

Table 1: Areas of potential impacts			
Life cycle stage	Impact category		
	Environmental	Economic	Social
Component/Product Manufacture	Material and energy use requirements during manufacturing process	Costs of making products compliant Availability of technology and need for R&D. Other compliance issues e.g. labelling, supply chain management, competitive position. Market surveillance and compliance systems and processes.	Possibility of firms leaving the market and any effects on employment expected
Usage	Changes in electricity consumption across UK due to less power consumed. Changes in CO_2 emissions across UK. Changes in air quality as result of less electricity being generated.	Changes in energy costs for consumers resulting from any changes in electricity consumption.	None foreseen
End of life	Ease of recycling and any requirements to deal with different materials used in order to ensure compliance	Changes in recycling and waste management costs	None foreseen

4.1 Component/Product Manufacture

4.1.1 Component/Product Manufacture – Environmental

As indicated above, there are some changes in the material composition of PSUs that will result from moving to switch mode from linear mode, involving the use of less metal (copper in particular). However, since the move to switch mode PSUs is largely completed anyway, with most PSUs predicted to meet the Implementing Measure requirements in advance of any regulation coming into force, the effect on the demand for primary raw materials will be negligible.

4.1.2 Component/Product Manufacture – Economic

4.1.2.1 Making Products Compliant

Moving from linear to switch-mode is like going from analogue (LPs) to digital (CDs). A linear PSU uses an (pulsating) electromagnet made of wire wound around a metal core with some minor electronic components. The higher the power output, the more metal is needed. A switch mode uses a few microchips instead. Higher power tends to need bigger/more chips.

The switch mode is smaller and lighter and because the cost of metal is high, there is negligible or no cost of moving to switch mode, particularly for the big power supplies. A high efficiency switch-mode uses more complex/higher precision electronics which have a higher cost initially; these higher initial costs are will be offset by economies of scale when the standards are in place. Therefore, the extra cost is only in producing the first compliant batch. The MTP has provided detailed information as to the changes required for different types of PSU and the associated cost implications. These are presented in Table A24 in the Annex.

The vast majority of PSUs in all categories are currently already compliant with the requirements that will apply one year after the Implementing Measure comes into force (Tier 1) and consequently any costs associated with meeting these requirements are expected to be negligible. Table 2 below indicates current and projected compliance rates over time against both the Tier 1 and Tier 2 requirements and suggests that any costs of making products compliant will be associated with meeting the Tier 2 requirements.

Table 2: Compliance time series for costs estimation								
	1-8W		8 to 36W		36 to 49W		Above 49W	
	Tier 1	Tier 2	Tier 1	Tier 2	Tier 1	Tier 2	Tier 1	Tier 2
2008	99%	23%	98.6%	40%	97.6%	42%	91.7%	28%
2009	99%	23%	99%	40%	99%	42%	95%	28%
2010	100%	30%	100%	50%	100%	50%	98%	40%
2011	100%	50%	100%	70%	100%	70%	100%	60%
2012	100%	100%	100%	100%	100%	100%	100%	100%
2013-2020	100%	100%	100%	100%	100%	100%	100%	100%

It is assumed for this IA, therefore, that any costs associated with the measure will be related only to meeting the Tier 2 requirements. The estimated costs of making products compliant with Tier 2 requirements are set out in Table 3.

Table 3: Cost of making products compliant			
	Tier 2/Euro	Tier 2/£	Minus VAT
1-8W	0.18	£0.14	£0.12
8 to 36W	0.33	£0.26	£0.22
36 to 49W	0.63	£0.50	£0.43
Above 49W	1.50	£1.19	£1.01

Table 4 sets out the predicted sales levels of the different PSU types up to 2020 and these figures are used in conjunction with the above compliance estimates to predict the costs that will be incurred in making products compliant with the Tier 2 requirements. These costs are presented in Table 5, and are calculated on the basis of applying costs in Table 2 to products that will need to be made compliant, i.e. they are net of products that are already compliant with the requirements in each year. Tables A17 – 20 in the Annex show the percentages of sales in each year that will need to be made compliant and which are used to calculate the costs.

It is assumed that the extra cost is only incurred in producing the first compliant batch of products; costs will then be minimised by changes to the design process and offset by economies of scale once the standards and necessary adaptation is in place. It has been assumed that costs will be incurred during one production cycle of approximately 4 years. However, this is likely to produce an overestimate of the costs involved as some products are typically re-designed in shorter cycles, which would mean that the costs would also apply for a shorter period. It has not been possible, however, to obtain sufficient detail on the length of production cycles for all products in the short time available for this impact assessment to account for this.

Table 4: Projected Sales of PSUs 2008 - 2020					
Year	**Small**	**Medium**	**Medium/large**	**Large**	**ALL**
2008	38,030,000	11,480,000	9,080,000	14,540,000	73,130,000
2009	40,650,000	11,660,000	9,300,000	15,680,000	77,290,000
2010	41,130,000	12,520,000	9,820,000	16,680,000	80,150,000
2011	41,470,000	12,960,000	10,200,000	17,560,000	82,190,000
2012	41,940,000	12,850,000	10,340,000	18,340,000	83,460,000
2013	42,230,000	13,030,000	10,170,000	19,040,000	84,460,000
2014	42,430,000	13,180,000	10,400,000	19,680,000	85,690,000
2015	42,690,000	13,220,000	10,710,000	20,270,000	86,890,000
2016	43,030,000	13,170,000	9,060,000	20,800,000	86,060,000
2017	43,370,000	13,620,000	9,360,000	21,250,000	87,600,000
2018	43,740,000	13,610,000	9,570,000	21,710,000	88,630,000
2019	44,140,000	13,550,000	9,550,000	22,120,000	89,360,000
2020	44,560,000	13,530,000	9,220,000	22,510,000	89,820,000
TOTAL	**549,410,000**	**168,380,000**	**126,780,000**	**250,180,000**	**1,094,730,000**

Table 5: Costs incurred in making sales compliant/£						
	1-8W	**8 to 36W**	**36 to 49W**	**Above 49W**	**Total Cost Undiscounted**	**Total Cost Discounted**
	Cost/£	**Cost/£**	**Cost/£**	**Cost/£**		
2008	0	0	0	0	0	0
2009	0	0	0	0	0	0
2010	350,000	280,000	340,000	2,030,000	3,000,000	2,800,000
2011	1,360,000	870,000	1,220,000	5,690,000	9,140,000	8,240,000
2012	3,930,000	1,720,000	2,550,000	13,370,000	21,570,000	18,800,000
2013	3,950,000	1,740,000	2,510,000	13,890,000	22,090,000	18,600,000
2014	3,610,000	1,470,000	2,210,000	11,960,000	19,250,000	15,660,000
2015	2,590,000	880,000	1,370,000	8,220,000	13,060,000	10,270,000
2016	0	0	0	0	0	0
2017	0	0	0	0	0	0
2018	0	0	0	0	0	0
2019	0	0	0	0	0	0
2020	0	0	0	0	0	0
TOTAL					**88,110,000**	**74,370,000**

In order to take account of potential variations in the per product price of making PSUs compliant, three other scenarios are presented in Table 6 below, taking the base price presented above and making comparable estimates of overall costs at -10%, +10% and +20% for the per product compliance cost.

Table 6: Cost scenarios (@ 10% lower, 10% higher and 20% higher per unit cost				
	Base costs (as Table 4 above)	**Base costs – 10%**	**Base costs + 10%**	**Base costs + 20%**
2008	0	0	0	0
2009	0	0	0	0
2010	2,800,000	2,510,000	3,080,000	3,340,000
2011	8,240,000	7,420,000	9,060,000	9,890,000
2012	18,800,000	16,920,000	20,680,000	22,550,000
2013	18,600,000	16,750,000	20,470,000	22,320,000
2014	15,660,000	14,100,000	17,230,000	18,800,000
2015	10,270,000	9,240,000	11,290,000	12,320,000
2016	0	0	0	0
2017	0	0	0	0
2018	0	0	0	0
2019	0	0	0	0
2020	0	0	0	0
TOTAL	**74,370,000**	**66,940,000**	**81,810,000**	**89,220,000**

4.1.2.2 Information Requirements

The information requirements set down in the Implementing Measure are given in Table A21 in the Annex. Compliance with this part of the Implementing measure will require a simple amendment of product documentation which will involve a small one-off cost for each model on the market (approximately 2,000 models are currently available on the market in the UK). However, given the volume of sales of PSUs, the cost per product will be negligible for this component.

4.1.2.3 Supply Chain Management and Competitive Position

The EMEA (European and Middle East Africa) power supply market continued to see strong growth in 2007, with year-on-year growth at 9.7%. Certain key markets are noted to be driving this growth, including industrial, medical and aerospace applications as well as strong growth in the MEA region for both wireline and wireless telecom equipment. For 2008, growth is expected to continue.

Power supplies for most applications have become a commodity, differentiated primarily by price rather than performance, features or quality. Although the structure of the supply chain can vary according to the product under consideration, power supply companies generally can be divided into three groups. First, the ones that design and manufacture their own products; second, the ones that design their own products but hire another company to manufacture the products for them, and the ones that use OEM products, i.e. another company designs and manufactures their products but uses the label, box and manual from the contracting company. Most of the companies in the telecommunications sector, and PC and laptop producers fall into this last category. Sometimes, there are exclusive agreements between the companies. In other cases, the same manufacturer will be supplying the same unit to two different brands.

It is expected that costs from adapting the products will be passed on to the companies producing branded products, but not to the final consumer. As the measure will apply to all companies, it will affect them equally thus without any significant implications for their competitive position. The general shift towards one technology (switched-mode power supplies) due to increasing prices for some inputs reduces the likelihood of asymmetric cost impacts on suppliers in the market, and the IM is unlikely to limit the ability of suppliers to compete as compliance costs are relatively low (with the vast majority of PSUs already complying with the Tier 1 standard). However, there may be an asymmetric impact on firms differing by size, with larger firms being able to spread the compliance costs over a larger number of units of production relative to SMEs; this could raise the threshold for entry to the market through higher fixed costs. There also may be some competitive advantage for those PSU manufacturers that adapt more rapidly; but this is not certain. Moreover, lengthy contract negotiation periods in some cases (because of exclusivity agreements) can deter branded product manufacturers from switching suppliers to the right speed as to gain a lasting competitive advantage.

4.1.2.4 Costs to Consumers

The costs to consumers are considered negligible for the reasons outlined in the previous sections.

4.1.2.5 Market Surveillance and Compliance Systems and Processes

The draft Implementing Measure sets out a number of requirements for compliance verification procedures. These are replicated in Box 2.

BOX 2 – Compliance Verification

When performing the market surveillance checks referred to in Article 3 (2) of Directive 2005/32/EC, the authorities of the Member States shall apply the following verification procedure for the requirements set out in Annex I.

1. Authorities of the Member State shall test one single unit.

2. The model shall be considered to comply with the provisions set out in Annex I, if:

(a) the result for no-load condition does not exceed the applicable limit value set out in Annex I by more than 0.10 W, and

(b) the arithmetic average of efficiency at load conditions 1-4 as defined in Annex I does not exceed the applicable limit value for average active efficiency by more than 5%.

3. If the results referred to in points 2(a) and (b) are not achieved, three additional units of the same model shall be tested.

4. After three additional units of the same model have been tested, the model shall be considered to comply with the requirements if:

(a) the average of the results for no-load condition does not exceed the applicable limit value set out in Annex I by more than 0.10 W, and

(b) the average of the arithmetic averages of efficiency at load conditions 1-4 as defined in Annex I does not exceed the applicable limit value for average active efficiency by more than 5%.

5. If the results referred to in points 4(a) and (b) are not achieved, the model shall be considered not to comply with the requirements.

Expert opinion suggests that there are approximately 2,000 PSU models currently available on the UK market and that an appropriate compliance test would cost in the region of £700 per test (although it is noted that if this were to be contracted out to somewhere like China, the costs might be significantly less). This information has been used to calculate the testing costs as reported in the Table A22 in the Annex, including assumptions. A summary Table is presented below.

Table 7: Testing costs (2010 – 2020)/£		
	Undiscounted	**Discounted**
Lower bound	501,200	**440,000**
Upper bound	675,967	**600,000**

Note that there are several caveats associated with these estimates, e.g. the number of units undergoing testing may be an overestimate; equally companies may undertake their own compliance test in-house at a lower cost. It is noted that the UK has not yet determined the regime for testing EuP appliances for conformity and it is uncertain at this time whether or not testing will be carried out independently with the costs falling to the authorities or whether some form of self-certification system based on verification of design will be put in place. An amount in the region of £250,000 may be set aside by the authorities for establishing compliance systems for all products subject to EuP requirements and it is to be noted that this is separate from the compliance testing costs indicated above.

4.1.3 Component/Product Manufacture – Social

It seems unlikely that manufacturers in the UK will opt to leave the market rather than incur the extra costs associated with making their products compliant or will be forced to leave the market as a result of competition from other manufacturers. Thus impacts on employment are expected to be negligible.

4.2 Product Usage

4.2.1 Product Usage – Environmental

Three areas of environmental impact associated with reduced power consumption from the implementation of the proposed Implementing Measure. These are:

- Reductions in electricity consumption across UK due to less power being consumed;
- Reductions in CO2 emissions across UK due to less power being consumed;
- Improvements in air quality as a result of less electricity being generated at power stations due to less power being required;

4.2.1.1 Reduced damages from climate change as a result of reduced CO2 emissions

In accordance with government guidance, the valuation of the decrease in emissions that will result from products using less power is calculated using the projected EU Allowance price under the EU Emissions Trading Scheme, i.e. the revenue gained from selling permits for emissions.

The values for the EU Allowance used for the period 2008 to 2020 are as follows:

Table 8: EU allowance under emission trading													
£/tCO_2	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
2008 Prices	16.0	16.4	16.8	17.3	18.0	28.5							

Assumptions: All prices expressed in £2008, Exchange rate of €1 = £0.7, 2010 -2012 uses prices from the forward market (averaged across August 2007-May 2008), and 2013-2020 is based upon the European Commission's price forecast of €39 (2005 prices) from their Impact Assessment for measures to meet the Climate and Energy Package, adjusted to 2008 prices.

Applying these allowance prices to the CO_2 savings identified (discounted at 3.5% and in 2008 prices) provides the estimated value of the benefits from reducing CO_2 emissions which would result; see Table 9 below

Table 9: ETS CO2 emission savings from PSUs			
Year	**Carbon reduction (Ktonnes CO2)**	**Value CO2 reduction (£), UNDISCOUNTED**	**Value CO2 reduction (£), DISCOUNTED**
2008	0	0	0
2009	0	0	0
2010	0	0	0
2011	5	90,000	80,000
2012	72	1,300,000	1,140,000
2013	107	3,040,000	2,550,000
2014	140	3,990,000	3,250,000
2015	167	4,770,000	3,750,000
2016	184	5,240,000	3,980,000
2017	191	5,450,000	4,000,000
2018	194	5,530,000	3,920,000
2019	195	5,570,000	3,810,000
2020	197	5,610,000	3,710,000
TOTAL	**1,452**	**40,590,000**	**30,190,000**

The CO_2 emissions reductions set out in Table 9 above do not account for the fact that reduced energy consumption by PSUs will lead to a loss in heat emanating from the equipment and consequently, there is likely to be a “heat replacement effect” (HRE) as people use more heating in order to compensate for the loss of heat. This extra heating will result in a corresponding increase in CO_2 emissions, representing an environmental cost of the policy.

The HRE is by definition proportional to the electricity demand reduction. It's rationale is that the inefficiency of an appliance by definition results in heat creation (first law of thermodynamics), and reducing these inefficiencies results in a similar amount of heat not generated. This implies that, to maintain the same indoor temperature, the same amount of heat has to be added to a house as was saved, as far as the appliance generating the heat was located in heated areas of the house and only during the heating season. These factors are taken into account in the HRE, resulting in approximately half of the electricity demand reduction being replaced with other heating. This heat is typically generated by a gas or oil-fired heating system, with a smaller CO_2 emission per kWh of heat generated than associated with electricity-operated appliances. This is also factored in, resulting in an HRE correction on CO_2 emission reduction of approximately one quarter. Not all factors influencing the HRE are sufficiently taken into account however; for example the exact locations of PSUs (within or outside of heated areas) is not well understood, neither is the question whether all waste heat previously generated by inefficient products during the heating season constitutes useful heat.

MTP intends to carry out further analysis to better understand these and similar issues. The principle that heat generated by appliances contributes significantly to the heating up of buildings is well-established though, demonstrated, for example, by the inclusion of internal heat load factors in virtually all building energy codes in the world (including Part L of the UK building regulations).

User responses to such changes are notoriously hard to predict, and it cannot be ruled out that users might choose to heat their house to a lower temperature in response to the purchase of a more efficient PSU. This is unlikely, however, as heating systems are almost always operated by means of a thermostat, which will automatically compensate for the 'lost' heat by producing more heat from a heating system, to maintain the set temperature. The other situation, of users controlling their heating without a thermostat, appears to be rare. Even in those cases, however, it cannot simply be assumed that users will ignore the small loss of heating per unit: the HRE applies to all electrical products, and many of these are subject to similar measures. Together, this would create a notable impact, even if it cannot be attributed to a single PSU, and - in the absence of further evidence- it appears reasonable to assume that users will compensate for this.

Table 10 below sets out the levels of CO2 emissions that would result from the increase in energy use as a result of HRE and calculates their economic value. It has been assumed that the HRE only applies to domestic use of PSUs. In commercial settings, there may be some "heat replacement effect" with respect to electricity use, due to the fact that more efficient PSUs will generate less heat. In office buildings, however, there is also a cooling replacement effect - from the waste heat generated by inefficient PSUs that needs to be "cooled away" during hotter weather.

Detailed research findings on this "cooling replacement effect" are not available currently and, whilst research data is available and robust enough on HRE in domestic situations to be able to factor in adjustments to benefits, insufficient research has been conducted into the real HRE for office buildings. Consequently, it is impossible to properly assess the combined impact. Expert opinion would suggest that the combined impact is closer to zero and that it could even be the case that the net effect is a benefit rather than a cost. Therefore, this IA has not made any adjustments for HRE with respect to PSUs being used in commercial settings.

The cost applied to the CO2 emissions is not the same as in Table 9 above (the EU ETS allowance rates set out in Table 8) since heat energy is not in the capped ETS sector. Therefore, in accordance with Defra guidance, these emissions are valued at the shadow price of carbon in 2008 prices.

Table 10: Value of increase in CO2 emissions as a result of the heat replacement effect – All PSUs

Year	CO2 Emissions Saved from lower power consumption of PSUs /kt CO2	HRE Factor[1]	Domestic CO2 Emissions from extra heating /kt CO2	Shadow price of carbon/£ per tonne	Value of emissions/£ (undiscounted)	Value of emissions/£ (discounted)
2008	0	0.3378	0	26.5	0	0
2009	0	0.3333	0	27.0	0	0
2010	0	0.3293	0	27.6	0	0
2011	5	0.3257	1	28.1	20,000	20,000
2012	72	0.3224	14	28.7	410,000	360,000
2013	107	0.3195	21	29.2	610,000	510,000
2014	140	0.3168	27	29.8	810,000	660,000
2015	167	0.3144	32	30.4	980,000	770,000
2016	184	0.3123	35	31.0	1,090,000	830,000
2017	191	0.3105	36	31.6	1,150,000	840,000
2018	194	0.3089	37	32.3	1,180,000	840,000
2019	195	0.3076	37	32.9	1,210,000	830,000
2020	197	0.3066	37	33.6	1,240,000	820,000
Total	**1,452**		**277**		**8,700,000**	**6,480,000**

[1] These HRE factors are calculated from the carbon HRE beneficial factors provided by MTP for the % of carbon savings that would be realised from the reductions in power consumption of PSUs. The value is calculated as "1 minus the HRE factor". HRE factors are only applied to PSUs for domestic use for the reasons outlined in the text above and based on the % split between domestic and commercial use set out in Table 13.

These carbon emissions represent a cost of the policy and are recorded in the cost section of the summary sheet above.

4.2.1.2 Value of reduced damage costs due to air quality improvements

The reduction in energy usage that will result from the restrictions imposed by the Implementing Measure will have additional benefits in terms of air quality since less pollution will be generated from power stations. The value of air quality impacts can be assessed by measuring the marginal external costs caused by each tonne of pollutant emitted. In this case, in the absence of detailed data on air pollution from power stations, damage costs approximating the value of air quality changes by applying average values for the benefit of reducing a pollutant emitted by one tonne have been used (as provided by Defra).

Applying these costs to the gross amount of energy savings resulting from the reduction in power consumption provides the following benefits in terms of damages avoided for the period from 2008 – 2020 (discounted at 3.5% at 2008 prices). Detailed calculations by each type of PSU are provided in Tables A5 to A8 in the Annex.

Table 11: Air Quality Savings

Year	Energy savings (GWh)	Value Air quality Improvements (£), UNDISCOUNTED	Value Air quality Improvements (£), DISCOUNTED
2008	0	0	0
2009	0	0	0
2010	0	0	0
2011	11	10,000	10,000
2012	169	260,000	220,000
2013	248	380,000	320,000
2014	325	510,000	420,000
2015	389	620,000	500,000
2016	428	700,000	540,000
2017	444	740,000	540,000
2018	450	770,000	540,000
2019	454	780,000	520,000
2020	458	800,000	530,000
TOTALS	**3,376**	**5,570,000**	**4,140,000**

4.2.2 Product Usage – Economic

The major economic impact as a result of placing restrictions on power consumption is a benefit to consumers in terms of savings from lower electricity bills due to reduced power consumption of electrical equipment.

Benefits to consumers from reduced energy consumption have been calculated by taking the savings in energy use (in GWh) identified above and multiplying these by average long run marginal (resource) costs (as advised by BERR and used in a recent impact assessment on Smart Metering) for electricity for both domestic and commercial use in each of the respective years from 2008 to 2020. The electricity prices (per kWh) applied to the energy savings are given in Table 12.

Table 12: Electricity prices per kWh

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Domestic	5.29	5.30	5.31	5.32	5.33	5.34	5.35	5.36	5.36	5.37	5.38
Commercial	4.65	4.67	4.69	4.72	4.74	4.73	4.75	4.77	4.78	4.80	4.82

Recognising that PSUs are used in both domestic and commercial settings, different electricity prices have been applied to the respective proportions of PSUs used in each setting. PSU usage has been estimated by technical experts as follows:

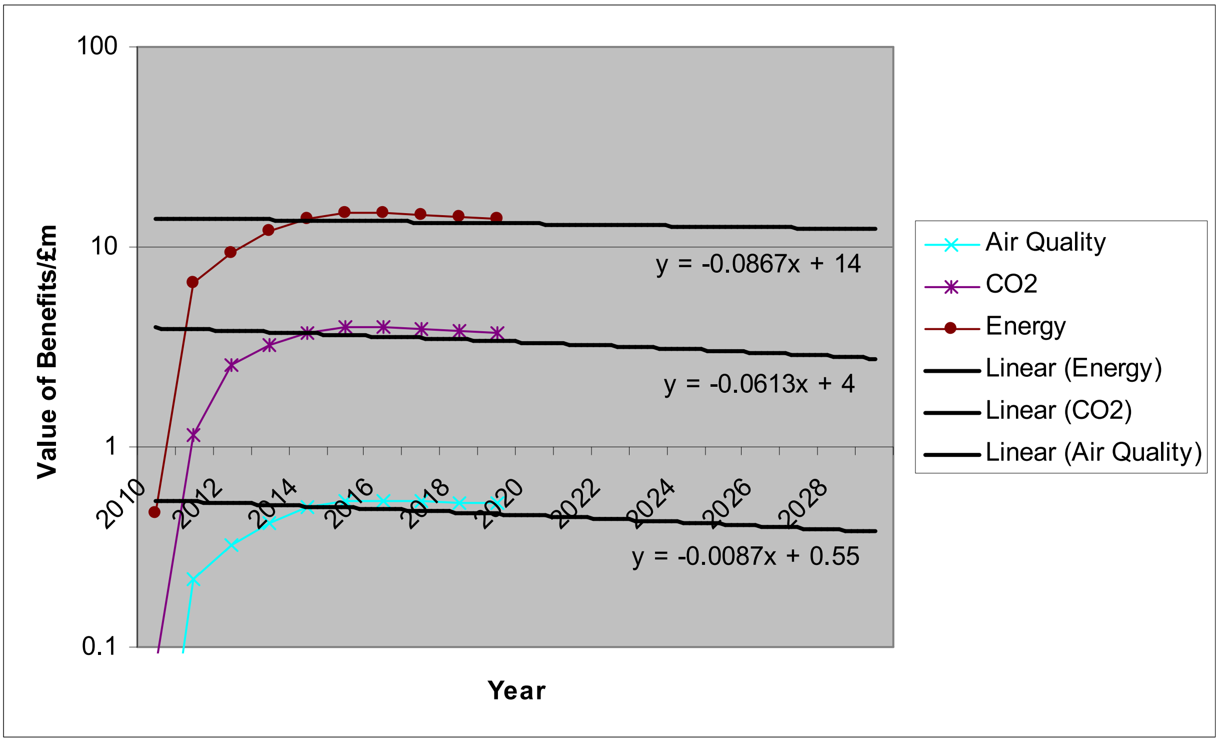
Table 13: Estimated share of PSU usage in domestic and commercial sectors		
PSU Type	**Estimated Domestic Use**	**Estimated Commercial Use**
1-8W	85%	15%
8-36W	80%	20%
36-49	60%	40%
49+	50%	50%

The resulting savings to consumers and businesses have then been adapted for the fact that lower power consumption will result in less beneficial heat being generated from electrical products. Heat replacement factors have been used to scale down the savings from the proposed Implementing Measure under the assumption that additional energy will be required to generate the "lost" heat. Different HRE factors have been used between 2008 and 2020 and detailed calculations for the different PSU types are provided in Tables A13 to A16 in the Annex. As explained above in Section 4.2.1.1, any HRE in the commercial sector is less well researched than in the domestic sector and the overall effect is uncertain. Therefore, the valuations presented in Table 14 only include reductions in energy savings due to the HRE in the domestic sector (based on the % split between domestic and commercial use identified in Table 13).

Table14: Value of Energy savings from All PSUs/£				
	Energy Savings GWh	**Value Energy Savings (£)**	**Value Energy savings HRE Adjusted (£), UNDISCOUNTED**	**Value Energy savings HRE Adjusted (£), DISCOUNTED**
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	11	580,000	520,000	470,000
2012	169	8,540,000	7,520,000	6,560,000
2013	248	12,620,000	11,160,000	9,380,000
2014	325	16,550,000	14,690,000	11,960,000
2015	389	19,860,000	17,670,000	13,890,000
2016	428	21,890,000	19,480,000	14,790,000
2017	444	22,760,000	20,260,000	14,880,000
2018	450	23,160,000	20,620,000	14,610,000
2019	454	23,420,000	20,860,000	14,280,000
2020	458	23,650,000	21,060,000	13,930,000
TOTAL	**3,376**	**173,030,000**	**153,840,000**	**114,750,000**

The above analysis has considered benefits across an implementation period between 2008 and 2020. It is most likely the case that the energy savings, reductions in carbon emissions and air quality improvements resulting from the proposed legislation will continue beyond 2020, with future sales of compliant products meaning that energy consumption, carbon emissions and air pollutants will all continue to be reduced with respect to the current baseline position.

Figure 1 below is based on a linear projection of the benefits identified from the MTP models (which go up to 2020) for a further period to 2030.



Extrapolating the benefits into the future based on the trendlines for the benefits accruing from 2008 to 2020 would yield approximately an extra £124 million in energy savings, £29m carbon emission and £3.9m air quality savings for the period 2021 – 2030. Table A23 in the Annex provides more detail on the calculation of these figures.

However, it must be noted that this level of benefits is highly uncertain, given the fact that a simple linear trend line has been used for the calculations. Little information is available on the level of replacement during this extra period and it does not take into consideration any improvements in energy consumption that may have happened in the absence of the implementing measure. Care must be taken in comparing these extra benefits with the overall costs identified in this impact assessment since costs to manufacturers as a result of the legislation have been assumed to be negligible after only one production cycle and consequently taper off after 2015.

4.2.3 Summary of Monetised Benefits

Table 15 summarises the benefits predicted in terms of the benefits to consumers of energy savings, the value of reduced damages from climate change due to lower emissions and the value of air quality damages avoided.

Table 15: Total monetised benefits (£, discounted at 3.5% over period from 2008 to 2020 (2008 prices)	
Total Value Energy Savings	114,750,000
Total Value CO2 savings	30,190,000
Total Value Air Quality Damages Avoided	4,140,000
Total	**149,080,000**

4.2.4 Product Usage – Social

In a general sense, the issue of functionality is not likely to be a major issue in most cases. However, there are instances where a reduced power usage may hinder the speed with which a product operates or returns to a state where it can perform its main function. Again, this may not be an issue in many cases and manufacturers will be able to introduce product changes without any fear of losing their market share and any associated costs will reduce over time.

4.3 End of Life Phase

Where consumers elect to replace their existing PSUs with more efficient ones in advance of the product becoming obsolete, there will be impacts from disposal of existing stocks. However, the extent to which this might happen is unknown and as a result it has not been possible to estimate any associated costs in this impact assessment.

Since the move to switch mode PSUs from linear ones is almost complete, there are unlikely to be any impacts from the Implementing Measure in terms of reduced availability of secondary raw materials (metals and in particular copper) from linear PSUs once they enter the waste stream.

5. Adjustments for Other Policies

5.1 ENERGY STAR

The ENERGY STAR label in Europe covers office equipment such as printers, computers and monitors, whereas the external power supplies of qualifying products are required to comply with the US ENERGY STAR specifications for external power supplies.

This external power supply specification holds considerable weight in the US, such that products rapidly shift to become compliant with it. As these products are manufactured by a focused group of manufacturers for global supply chains, the US specification results in a global influence on power supply efficiency. ENERGY STAR requirements will be upgraded in November 2008 and will be equivalent to the Tier 2 requirements of the EuP Implementing Measure. It is assumed that many manufacturers (approximately 50%) will comply with these standards from November 2008.

If it is assumed that 50% of products are compliant with ENERGY STAR from 2008, costs attributable to the Implementing Measure will only arise once overall compliance levels with the requirements of the Implementing Measure go above 50% (i.e. when manufacturers that are not signed up with ENERGY STAR begin to make their products compliant with the Implementing Measure). Using compliance estimates from MTP for the different PSU types (set out in Tables A17 to A20 in the Annex) and estimates (in Tables A25 to A27 in the Annex) which project costs attributable to the Implementing Measure for low, base and high cost scenarios, Table 16 below sets out discounted costs across all PSU types which would be attributable to the Implementing Measure.

Table 16: Estimated net costs to manufacturers of making products compliant with Implementing Measure (after allowing for costs attributable to ENERGY STAR compliance)

	Cost of IM, Net of ES (Base Cost) Discounted/£	Low Cost Scenario, Net of ES (Base cost – 10%) Discounted	High Cost Scenario (Net of ES) (Base cost + 20%) Discounted
2008	0	0	0
2009	0	0	0
2010	0	0	0
2011	2,910,000	2,620,000	3,490,000
2012	13,480,000	12,130,000	16,180,000
2013	13,320,000	12,000,000	15,980,000
2014	13,200,000	11,880,000	15,840,000

Table 16: Estimated net costs to manufacturers of making products compliant with Implementing Measure (after allowing for costs attributable to ENERGY STAR compliance)			
	Cost of IM, Net of ES (Base Cost) Discounted/£	**Low Cost Scenario, Net of ES (Base cost – 10%) Discounted**	**High Cost Scenario (Net of ES) (Base cost + 20%) Discounted**
2015	10,270,000	9,240,000	12,320,000
2016	0	0	0
2017	0	0	0
2018	0	0	0
2019	0	0	0
2020	0	0	0
TOTAL	**53,180,000**	**47,870,000**	**63,810,000**
Note that the above costs are based on making products compliant only and do not include other costs of the Implementing Measure related to HRE and product testing			

Table 17 below then presents the potential costs attributable to the Implementing Measure after taking into account compliance with ENERGY STAR.

Table 17: Costs attributable to Implementing Measure (Net of costs of complying with ENERGY STAR)				
	Low Cost Scenario (Implementing Measure +ES, Discounted)	**Low Cost Scenario (Net of ES) Base cost - 10% Discounted**	**High cost Scenario (Implementing Measure + ES, Discounted)**	**High Cost Scenario (Net of ES) Base Cost + 20% Discounted**
Costs to Manufacturers	66,940,000	47,870,000	89,220,000	63,810,000
Costs of increased carbon emissions	6,480,000	4,630,000	6,480,000	4,630,000
Testing costs	440,000	440,000	600,000	600,000
TOTAL	**73,860,000**	52,940,000	**96,300,000**	69,040,000
Note: It is assumed that the cost of increased carbon emissions due to the HRE effect is adjusted in the same % as the cost to manufacturers (i.e. 48m/67m and 64m/89m) to calculate the "net of ES" values. Testing costs are assumed to remain the same i.e. are unadjusted since products will need to be proven to comply with the IM irrespective of whether or not compliance is due to ES or the IM and it is the IM which imposes these costs				

Table 17 suggests that under both the low cost and high cost scenarios, approximately 28% (£21m of the £74m in the low cost, and £27m of the £96m in the high cost scenario) of the costs originally identified could be attributable to the ENERGY STAR programme (i.e. as a result of manufacturers making their products compliant with ENERGY STAR as opposed to being a result of the introduction of requirements under the Implementing Measure.)

In order to estimate the scale of benefits that might be attributable to ENERGY STAR instead of the Implementing Measure, it has been assumed that costs associated with both the Implementing Measure and ENERGY STAR are in direct proportion to the benefits, i.e:

$$\frac{\text{Costs attributable to ENERGY STAR}}{\text{Total costs ENERGY STAR + IM}} = 28\%$$

AND

$$\frac{\text{Benefits attributable to ENERGY STAR}}{\text{Total benefits of ENERGY STAR + IM}} = 28\%$$

Table 18 below sets out the net benefits from the Implementing Measure after accounting for benefits that would be attributable to ENERGY STAR, as a result of manufacturers making products compliant with those standards.

Table 18: Benefits attributable to Implementing Measure (Net of benefits of complying with ENERGY STAR)			
	Benefits attributable to IM + ES	**Benefits attributable to ES**	**Benefits attributable to IM**
Total Value Energy Savings	114,750,000	32,130,000	82,620,000
Total Value CO2 savings	30,190,000	8,453,200	21,736,800
Total Value Air Quality Damages Avoided	4,140,000	1,159,200	2,980,800
TOTAL	**149,080,000**	**41,740,000**	**107,340,000**

5.2 Carbon Reduction Commitments

The government's Carbon Reduction Commitment policy will apply mandatory emissions trading to energy use emissions from large business and public sector organisations with at least one meter settled on the half-hourly market - and where its total half-hourly metered electricity use is greater than 6,000 megawatts per hour (MWh) between January 2008 and 31 December 2008 (which is equivalent to around £500,000 a year spent on electricity).

It is expected that the scheme will affect around 4,810 organisations, of which 168 are public sector and the rest fall under different sector categories, such as chemicals (69), education (74), estate and business (308), mechanical engineering (1,066), plastics (259) and retail (109). It is estimated that the scheme will lead to around 0.5 MtC savings per year and around 1.1 MtC by 2020.

The Partial Regulatory Impact Assessment for the CRC estimates the present value of benefits in terms of savings on energy bills would be around £2,545 million for a 3.5% social discount rate. It also considers the overlaps with other government policies such as the Energy Performance of Buildings Directive (EPBD), Business Smart Metering, Climate Change Levy and EU ETS cap, and estimates the PV benefits in terms of carbon saved (discounted at 3.5%) at around £1,102m and £183m to £264m in terms of air quality benefits also, at 3.5% discount rate (Nera/Enviros, 2007).

Given the limited time available to conduct this impact assessment, it has not been possible to conduct a full analysis of the CRC policy and data was not available to estimate costs and benefits on an annual basis. Consequently, only very simplified estimates of the potential overlaps with the IM have been possible and only a simplified estimate of reductions in the benefits and costs from the IM at an aggregated level are calculated below.

Since approximately 50% of the savings due to the CRC identified above is estimated to result from emissions from gas power, the range of benefits from savings in reduced electricity consumption is taken as approximately half these figures (£550m for carbon saved and £90m to £130m for air quality improvements. However, these savings will be accrued from a number of measures relating to ALL electricity consumption and not just that from power supply units. It is therefore unknown to what extent the organisations and enterprises subject to CRC will target use of PSUs in meeting their commitments under CRC targets. Whilst expert opinion suggests that approximately 5% of commercial electricity use is from power supply units, this figure applies to all commercial organisations, including those where use of such products is significantly higher. Given the nature of the business of the larger organisations which are subject to meeting CRC targets, it is unlikely that PSU usage will reach such a high percentage of their electricity consumption and therefore PSU use will probably not be targeted for reductions in electricity consumption as much as other areas of their business. Any reduction of power consumption by PSUs due to CRC in the absence of the EuP implementing measure necessarily assumes that large electricity users will be aware of the benefits of using more efficient power supply units and make the decision to replace inefficient ones with more efficient ones – a practice that currently is not taking place to the extent that might be desirable (as described in the commentary on market failure in Section 2 above). Taking this factor into account, the estimates presented below are likely to represent an overestimate of the CRC benefits and costs associated with PSUs.

Due to the limited time available to conduct this impact assessment, in order to estimate the effect of CRC on abatement measures relating to PSU efficiency it is necessary to adopt very simplified assumptions on the potential contribution of changes in PSU electricity usage to CRC targets. Given the likely lower (than 5%) percentage contribution of PSU power consumption to the benefits and costs identified in the CRC Partial RIA, it is therefore estimated that these products contribute a maximum of 1% to electricity usage of the affected organisations.

Table 19 below sets out the potential costs of abatement measures that might then be attributable to power supply units.

Table 19: Potential reduction in costs to manufacturers of IM accounting for costs attributed to CRC/£

	***Cost of CRC (electricity)**	****CRC cost due to PSU**	**Net cost IM**
	165,000,000	1,650,000	
	Total cost of IM***		
Low	66,940,000	1,650,000	65,290,000
High	89,220,000	1,650,000	87,570,000

* This figure is based on the CRC Partial RIA which estimates total costs of abatement measures at £329m, with half of these being attributable to electricity measures.

**Based on an estimated contribution of PSUs of 1% to commercial electricity usage by organisations and enterprises affected by CRC

*** These are costs of the IM in absence of any other policies

Note that the above costs are based on making products compliant only and do not include other costs of the Implementing Measure related to the HRE and product testing

Table 20 combines the calculations for estimating the net costs from the IM to manufacturers in making products compliant with earlier calculations on the costs of testing products for compliance and the increases in emission costs as a result of HRE to calculate the overall net costs of the measure.

Table 20: Costs attributable to Implementing Measure (Net of costs of complying with CRC)

	Low Cost Scenario (Implementing Measure, Discounted)	**Low Cost Scenario (Net of CRC) Base cost - 10% Discounted**	**High cost Scenario (Implementing Measure, Discounted)**	**High Cost Scenario (Net of CRC) Base Cost + 20% Discounted**
Costs to Manufacturers	66,940,000	65,290,000	89,220,000	87,570,000
Costs of increased carbon emissions	6,480,000	6,320,000	6,480,000	6,360,000
Testing costs	440,000	440,000	600,000	600,000
TOTAL	**73,860,000**	72,050,000	**96,300,000**	94,530,000

The same assumptions regarding the contribution of PSU electricity consumption to the overall electricity consumption of organisations and enterprises affected by CRC and the proportion of CRC benefits attributed to electricity consumption have been used to estimate the scale of benefits to be deducted from the implementing measure in Table 21. For example, total CRC benefits = £2,454m, half of these (£1270m) are attributable to electricity savings and 1% of these electricity savings are assumed to be attributable to PSUs (i.e. £12.7m)

Table 21: Estimated net benefits from Implementing Measure (after allowing for CRC benefits)			
	Total benefits calculated in Table 15/£	Saving from CRC/£	Net IM/£
Electricity cost savings	114,750,000	12,700,000	102,050,000
Carbon savings	30,190,000	5,500,000	24,690,000
Air quality cost savings	4,140,000	1,100,000	3,040,000
Totals	**149,080,000**	**19,300,000**	**129,780,000**

5.3 Code of Conduct for External Power Supplies

An EU initiative on the efficiency of external power supplies has been in place following the European Commission Communication COM(1999)120 to the Council and the European Parliament on Policy Instruments to Reduce Stand-by Losses of Consumer Electronic Equipment in 1999. A Code of Conduct for External Power Supplies has been developed and its scope includes external power supplies for electronic appliances including AC adapters, battery chargers, domestic appliances, power tools and IT equipment, in the input range of 0.3 to 75 W. Under the Code, manufacturers of power supply units commit themselves to comply with energy efficiency guidelines and manufacturers producing appliances commit themselves to supply these more efficient PSUs with their products.

The Commission notes that the Code is a voluntary measure, involves industry in the development of standards and includes some of the largest electronics manufacturers in Europe. It has not been possible in the time available for this impact assessment to obtain any detailed information on the degree of compliance with the code. Whilst it has been estimated that the Code of Conduct will lead to savings of 5 TWh per year from 2010, it has not been possible to estimate overlaps with the IM; consequently no adjustments have been made to the costs and benefits associated with the measure. It is noted, however, that it is likely that some products being made compliant with this Code will already be compliant with the requirements of the Implementing measure and this has been considered in the modelling of benefits by MTP. Given that there is only a short period until the time when the implementing measure comes into force and combined with the likelihood that the threat of EuP legislation may have driven some manufacturers to sign up to the Code of Conduct anyway, the overall impact on the total costs and benefits is likely to be minimal and consequently no further adjustment is required.

5.4 Net benefits of the Implementing Measure after accounting for other policies

The following table 22 provides a summary of potential reductions in costs and benefits (outlined above) attributable to the Implementing Measure after accounting for costs and benefits associated with both ENERGY STAR and CRC. Tables 23-25 which follow provide a more detailed breakdown of costs and benefits attributable to ENERGY STAR and CRC as well as the net benefits from the Implementing Measure.

Table 22: Potential net costs and benefits from the Implementing Measure/£m				
	Gross benefits/costs from IM + ES + CRC	Attributable to ENERGY STAR	Attributable to CRC	Net benefits/costs from Implementing Measure
Costs				
Low Scenario	73,860,000	20,920,000	1,810,000	51,130,000
High Scenario	96,300,000	27,260,000	1,770,000	67,270,000
Benefits	149,080,000	41,742,400	19,300,000	88,040,000
Notes: Costs include compliance costs for making products compliant as well as those associated with HRE and testing costs. The % of benefits from the IM attributable to CRC is significantly higher than that for the costs. This is due to the simplified assumptions made in order to calculate the costs and benefits associated with CRC.				

Table 23: Benefits from the Implementing Measure net of benefits from ENERGY STAR and CRC				
	Benefits attributable to IM + ES + CRC	**Benefits attributable to ES**	**Benefits attributable to CRC**	**Net IM**
Total Value Energy Savings	114,750,000	32,130,000	12,700,000	69,920,000
Total Value CO2 savings	30,190,000	8,453,200	5,500,000	16,236,800
Total Value Air Quality Damages Avoided	4,140,000	1,159,200	1,100,000	1,880,800
TOTAL	**149,080,000**	**41,740,000**	**19,300,000**	**88,040,000**

Table 24: Costs attributable to Implementing Measure (Net of costs of complying with ES and CRC – Low Cost Scenario)				
	Low Cost Scenario (Implementing Measure + ES + CRC, Discounted)	**Low Cost Scenario ES Base cost - 10% Discounted**	**Low cost Scenario CRC Discounted**	**Low Cost Scenario (Net of CRC) Discounted**
Costs to Manufacturers	66,940,000	19,070,000	1,650,000	46,220,000
Costs of increased carbon emissions	6,480,000	1,850,000	160,000	4,470,000
Testing costs	440,000	0	0	440,000
TOTAL	**73,860,000**	20,920,000	1,810,000	**51,130,000**

Table 25: Costs attributable to Implementing Measure (Net of costs of complying with ES and CRC – High Cost Scenario)				
	High Cost Scenario (Implementing Measure + ES + CRC, Discounted)	**High Cost Scenario ES Base cost +20% Discounted**	**High cost Scenario CRC Discounted**	**High Cost Scenario (Net of CRC) Discounted**
Costs to Manufacturers	89,220,000	25,410,000	1,650,000	62,160,000
Costs of increased carbon emissions	6,480,000	1,850,000	120,000	4,510,000
Testing costs	600,000	0	0	600,000
TOTAL	**96,300,000**	27,260,000	1,770,000	**67,270,000**

6. Climate Change Policy Cost-Effectiveness Indicator

All Impact Assessments that estimate changes in CO2 emissions in excess of either (i) 0.1MtCO2e average per year for an appraisal of less than 20 years, or (ii) 2.0MtCO2e over the lifetime of an appraisal of more than 20 years, are required by PSA Delivery Agreement 27, Indicator 6 to undergo a Climate Change Policy Cost-Effectiveness analysis. This involves measuring the proportion of tonnes of CO2 abated, for which the cost falls below the Shadow Price of Carbon (or EU ETS Allowance Price) once weighted and discounted. This Impact Assessment falls into that category with average per year CO2 emissions reduced in excess of 0.1MtCO2.

The current weighted average discounted EU ETS Allowance price for the traded sector is - £20.78 and the current weighted average discounted shadow price of CO2 is £23.37. Cost effectiveness is calculated according to the following formula and the results are presented in Table 23 below:

Cost effectiveness = NPV minus PV of CO2 / CO2 costs or savings

Table 26: Cost Effectiveness Indicators (CEI) – No other policies considered			
		Low Cost Scenario	**High Cost Scenario**
Traded Sector	NPV/£	75	53
	PV traded/£	30	30
	Traded Co2/ktonnes	1,452	1,452
	CEI	-30.99	-15.84
Non-traded sector	NPV/£	75	53
	PV non-traded/£	6.5	6.5
	Non-traded Co2/ktonnes	277	277
	CEI	247.29	167.87

The CEI figures for the traded sector represent savings of approximately £31 and £16 per tonne of CO2 saved and, since it is a benefit (i.e. a negative cost), is clearly well below the weighted average discounted EU ETS Allowance price for the traded sector.

Although there is an increase in carbon emissions in the non-traded sector, the non-traded sector CEI indicates that for each extra tonne emitted there is an overall benefit of approximately £168 to £247 per tonne of CO2 through the value of reduced energy use and reduced costs of air quality damages. As this is clearly greater than the WAD Shadow Price of Carbon (£23.37), the increase in non-traded carbon emissions is therefore considered cost-effective as part of this policy.

If the same cost effectiveness indicators are calculated using costs and benefits net of those attributable to ENERGY STAR and CRC, the savings are estimated at between £26.63 and - £6.15 per tonne of CO2 in the traded sector, as indicated in Table 24. Both of these are below the weighted average discounted EU ETS Allowance price for the traded sector of £20.79. Similarly, the non-traded CEIs indicate there would be an overall benefit of between £91.09 and £170.31 per tonne of CO2 as these are also indicating benefits which are below the WAD Shadow Price of Carbon (£23.37).

Table 27: Cost Effectiveness Indicators (CEI) – For IM net of ENERGY STAR and CRC			
		Low Cost Scenario	**High Cost Scenario**
Traded Sector	NPV/£	37,000,000	21,000,000
	PV traded/£	16,200,000	16,200,000
	Traded Co2/ktonnes	781	781
	CEI	-26.63	-6.15
Non-traded sector	NPV/£	37,000,000	22,000,000
	PV non-traded/£	4,470,000	4,510,000
	Non-traded Co2/ktonnes	191	192
	CEI	170.31	91.09
The figures for Traded and non-traded CO2/tonnes have been adjusted to allow for reductions due to ENERGY STAR and CRC impacts. It has been assumed that a reduction in traded and non-traded CO2 Emissions will be in the same proportions as the value of the costs (for the non-traded sector) and benefits for the traded sector in Tables 23 and 24/25.			

Therefore 100% of the CO2 emissions that the Implementing Measure is aiming to reduce in both the high and low cost scenarios are deemed to be cost-effective reductions.

Specific Impact Tests: Checklist

Use the table below to demonstrate how broadly you have considered the potential impacts of your policy options.

Ensure that the results of any tests that impact on the cost-benefit analysis are contained within the main evidence base; other results may be annexed.

Type of testing undertaken	***Results in Evidence Base?***	***Results annexed?***
Competition Assessment	Yes	No
Small Firms Impact Test	No	No
Legal Aid	No	No
Sustainable Development	No	No
Carbon Assessment	Yes	No
Other Environment	Yes	No
Health Impact Assessment	No	No
Race Equality	No	No
Disability Equality	No	No
Gender Equality	No	No
Human Rights	No	No
Rural Proofing	No	No

Annexes

Table A1: Energy Savings from small PSUs (HRE adjustments only made for domestic sector)			
	Value Energy Savings (£)	Value Energy savings HRE Adjusted (£), UNDISCOUNTED	Value Energy savings HRE Adjusted (£), DISCOUNTED
2008	0	0	0
2009	0	0	0
2010	0	0	0
2011	0	0	0
2012	230,000	190,000	170,000
2013	430,000	360,000	300,000
2014	560,000	480,000	400,000
2015	610,000	520,000	410,000
2016	620,000	530,000	400,000
2017	630,000	540,000	400,000
2018	640,000	550,000	390,000
2019	640,000	550,000	380,000
2020	650,000	550,000	360,000
TOTAL	**5,010,000**	**4,270,000**	**3,210,000**

Table A2: Energy Savings from medium PSUs (HRE adjustments only made for domestic sector)			
	Value Energy Savings (£)	Value Energy savings HRE Adjusted (£), UNDISCOUNTED	Value Energy savings HRE Adjusted (£), DISCOUNTED
2008	0	0	0
2009	0	0	0
2010	0	0	0
2011	60,000	50,000	50,000
2012	2,010,000	1,700,000	1,480,000
2013	3,460,000	2,950,000	2,480,000
2014	4,880,000	4,180,000	3,400,000
2015	6,110,000	5,250,000	4,120,000
2016	6,880,000	5,910,000	4,490,000
2017	7,210,000	6,200,000	4,550,000
2018	7,350,000	6,320,000	4,480,000
2019	7,440,000	6,400,000	4,380,000
2020	7,510,000	6,460,000	4,280,000
TOTAL	**52,910,000**	**45,420,000**	**33,710,000**

Table A3: Energy Savings from medium/large PSUs (HRE adjustments only made for domestic sector)			
	Value Energy Savings (£)	Value Energy savings HRE Adjusted (£), UNDISCOUNTED	Value Energy savings HRE Adjusted (£), DISCOUNTED
2008	0	0	0
2009	0	0	0
2010	0	0	0
2011	110,000	100,000	90,000
2012	2,290,000	2,020,000	1,760,000

2013	2,320,000	2,060,000	1,730,000
2014	2,340,000	2,080,000	1,690,000
2015	2,370,000	2,110,000	1,660,000
2016	2,370,000	2,110,000	1,600,000
2017	2,370,000	2,110,000	1,550,000
2018	2,380,000	2,120,000	1,500,000
2019	2,380,000	2,120,000	1,450,000
2020	2,360,000	2,110,000	1,390,000
TOTAL	**21,290,000**	**18,940,000**	**14,420,000**

Table A4: Energy Savings from large PSUs (HRE adjustments only made for domestic sector)			
	Value Energy Savings (£)	**Value Energy savings HRE Adjusted (£), UNDISCOUNTED**	**Value Energy savings HRE Adjusted (£), DISCOUNTED**
2008	0	0	0
2009	0	0	0
2010	0	0	0
2011	410,000	370,000	330,000
2012	4,010,000	3,610,000	3,150,000
2013	6,410,000	5,790,000	4,870,000
2014	8,770,000	7,950,000	6,470,000
2015	10,770,000	9,790,000	7,700,000
2016	12,020,000	10,930,000	8,300,000
2017	12,550,000	11,410,000	8,380,000
2018	12,790,000	11,630,000	8,240,000
2019	12,960,000	11,790,000	8,070,000
2020	13,130,000	11,940,000	7,900,000
TOTAL	**93,820,000**	**85,210,000**	**63,410,000**

Table A5: Air Quality Savings from Small PSUs			
Year	**Energy savings (GWh)**	**Value Air quality Improvements (£), UNDISCOUNTED**	**Value Air quality Improvements (£), DISCOUNTED**
2008	0	0	0
2009	0	0	0
2010	0	0	0
2011	0	0	0
2012	4	10,000	10,000
2013	8	10,000	10,000
2014	11	20,000	20,000
2015	12	20,000	20,000
2016	12	20,000	20,000
2017	12	20,000	10,000
2018	12	20,000	10,000
2019	12	20,000	10,000
2020	12	20,000	10,000
TOTAL	**95**	**160,000**	**120,000**

Table A6: Air Quality Savings from Medium PSUs			
Year	**Energy savings (GWh)**	**Value Air quality Improvements (£), UNDISCOUNTED**	**Value Air quality Improvements (£), DISCOUNTED**
2008	0	0	0
2009	0	0	0
2010	0	0	0
2011	1	0	0
2012	39	60,000	50,000
2013	66	100,000	80,000
2014	94	150,000	120,000
2015	117	190,000	150,000
2016	132	210,000	160,000
2017	138	230,000	170,000
2018	140	240,000	170,000
2019	141	240,000	160,000
2020	143	250,000	170,000
TOTAL	**1,010**	**1,670,000**	**1,230,000**

Table A7: Air Quality Savings from Medium/Large PSUs			
Year	**Energy savings (GWh)**	**Value Air quality Improvements (£), UNDISCOUNTED**	**Value Air quality Improvements (£), DISCOUNTED**
2008	0	0	0
2009	0	0	0
2010	0	0	0
2011	2	0	0
2012	45	70,000	60,000
2013	46	70,000	60,000
2014	46	70,000	60,000
2015	47	70,000	60,000
2016	46	80,000	60,000
2017	46	80,000	60,000
2018	46	80,000	60,000
2019	46	80,000	50,000
2020	46	80,000	50,000
TOTAL	**417**	**680,000**	**520,000**

Table A8: Air Quality Savings from Large PSUs			
Year	**Energy savings (GWh)**	**Value Air quality Improvements (£), UNDISCOUNTED**	**Value Air quality Improvements (£), DISCOUNTED**
2008	0	0	0
2009	0	0	0
2010	0	0	0
2011	8	10,000	10,000
2012	80	120,000	100,000

2013	128	200,000	170,000
2014	174	270,000	220,000
2015	214	340,000	270,000
2016	238	390,000	300,000
2017	248	410,000	300,000
2018	252	430,000	300,000
2019	255	440,000	300,000
2020	257	450,000	300,000
TOTAL	**1,854**	**3,060,000**	**2,270,000**

Table A9: CO2 Savings from Small PSUs

Year	Carbon reduction (Ktonnes CO2)	Value CO2 reduction (£), UNDISCOUNTED	Value CO2 reduction (£), DISCOUNTED
2008	0	0	0
2009	0	0	0
2010	0	0	0
2011	0	0	0
2012	2	30,000	30,000
2013	3	100,000	80,000
2014	5	130,000	110,000
2015	5	140,000	110,000
2016	5	140,000	110,000
2017	5	150,000	110,000
2018	5	150,000	110,000
2019	5	150,000	100,000
2020	5	150,000	100,000
TOTAL	**41**	**1,140,000**	**860,000**

Table A10: ETS CO2 Savings from Medium PSUs

Year	Carbon reduction (Ktonnes CO2)	Value CO2 reduction (£), UNDISCOUNTED	Value CO2 reduction (£), DISCOUNTED
2008	0	0	0
2009	0	0	0
2010	0	0	0
2011	0	10,000	10,000
2012	17	300,000	260,000
2013	29	810,000	680,000
2014	40	1,150,000	940,000
2015	50	1,440,000	1,130,000
2016	57	1,610,000	1,220,000
2017	59	1,690,000	1,240,000
2018	60	1,720,000	1,220,000
2019	61	1,730,000	1,180,000
2020	61	1,750,000	1,160,000
TOTAL	**434**	**12,210,000**	**9,040,000**

Table A11: ETS CO2 Savings from Medium/Large PSUs			
Year	**Carbon reduction (Ktonnes CO2)**	**Value CO2 reduction (£), UNDISCOUNTED**	**Value CO2 reduction (£), DISCOUNTED**
2008	0	0	0
2009	0	0	0
2010	0	0	0
2011	1	20,000	20,000
2012	19	350,000	310,000
2013	20	560,000	470,000
2014	20	570,000	460,000
2015	20	570,000	450,000
2016	20	570,000	430,000
2017	20	570,000	420,000
2018	20	570,000	400,000
2019	20	570,000	390,000
2020	20	560,000	370,000
TOTAL	**179**	**4,910,000**	**3,720,000**

Table A12: ETS CO2 Savings from Large PSUs			
Year	**Carbon reduction (Ktonnes CO2)**	**Value CO2 reduction (£), UNDISCOUNTED**	**Value CO2 reduction (£), DISCOUNTED**
2008	0	-	-
2009	0	-	-
2010	0	-	-
2011	3	60,000	50,000
2012	34	620,000	540,000
2013	55	1,570,000	1,320,000
2014	75	2,140,000	1,740,000
2015	92	2,620,000	2,060,000
2016	102	2,920,000	2,220,000
2017	107	3,040,000	2,230,000
2018	108	3,090,000	2,190,000
2019	110	3,120,000	2,140,000
2020	111	3,150,000	2,080,000
TOTAL	**797**	**22,330,000**	**16,570,000**

Table A13: Value of increase in CO2 emissions as a result of the heat replacement effect - Small						
Year	**CO2 Emissions Saved from lower power consumption of PSUs /kt CO2**	**HRE Factor[1]**	**CO2 Emissions from extra heating /kt CO2**	**Shadow price of carbon/£ per tonne**	**Value of emissions/£ (undiscounted)**	**Value of emissions/£ (discounted)**
2008	0	0.3378	0	26.5	0	0
2009	0	0.3333	0	27.0	0	0
2010	0	0.3293	0	27.6	0	0
2011	0	0.3257	0	28.1	0	0
2012	2	0.3224	1	28.7	10,000	10,000
2013	3	0.3195	1	29.2	30,000	30,000
2014	5	0.3168	1	29.8	40,000	30,000
2015	5	0.3144	1	30.4	40,000	30,000

2016	5	0.3123	1	31.0	40,000	30,000
2017	5	0.3105	1	31.6	40,000	30,000
2018	5	0.3089	1	32.3	40,000	30,000
2019	5	0.3076	1	32.9	40,000	30,000
2020	5	0.3066	1	33.6	50,000	30,000
Total	**41**		**11**		**330,000**	**250,000**

[1] These HRE factors are calculated from the carbon HRE beneficial factors provided by MTP for the % of carbon savings that would be realised from the reductions in power consumption of PSUs. The value is calculated as "1 minus the HRE factor". HRE factors are only applied to PSUs for domestic use.

Table A14: Value of increase in CO2 emissions as a result of the heat replacement effect - Medium

Year	CO2 Emissions Saved from lower power consumption of PSUs /kt CO2	HRE Factor[1]	CO2 Emissions from extra heating /kt CO2	Shadow price of carbon/£ per tonne	Value of emissions/£ (undiscounted)	Value of emissions/£ (discounted)
2008	0	0.3378	0	26.5	0	0
2009	0	0.3333	0	27.0	0	0
2010	0	0.3293	0	27.6	0	0
2011	0	0.3257	0	28.1	0	0
2012	17	0.3224	4	28.7	120,000	100,000
2013	29	0.3195	7	29.2	210,000	180,000
2014	40	0.3168	10	29.8	300,000	240,000
2015	50	0.3144	13	30.4	390,000	310,000
2016	57	0.3123	14	31.0	440,000	330,000
2017	59	0.3105	15	31.6	460,000	340,000
2018	60	0.3089	15	32.3	480,000	340,000
2019	61	0.3076	15	32.9	490,000	340,000
2020	61	0.3066	15	33.6	510,000	340,000
Total	**434**		**108**		**3,400,000**	**2,520,000**

[1] These HRE factors are calculated from the carbon HRE beneficial factors provided by MTP for the % of carbon savings that would be realised from the reductions in power consumption of PSUs. The value is calculated as "1 minus the HRE factor". HRE factors are only applied to PSUs for domestic use.

Table A15: Value of increase in CO2 emissions as a result of the heat replacement effect – Medium/Large

Year	CO2 Emissions Saved from lower power consumption of PSUs /kt CO2	HRE Factor[1]	CO2 Emissions from extra heating /kt CO2	Shadow price of carbon/£ per tonne	Value of emissions/£ (undiscounted)	Value of emissions/£ (discounted)
2008	0	0.3378	0	26.5	0	0
2009	0	0.3333	0	27.0	0	0
2010	0	0.3293	0	27.6	0	0
2011	1	0.3257	0	28.1	0	0
2012	19	0.3224	4	28.7	110,000	100,000
2013	20	0.3195	4	29.2	110,000	90,000
2014	20	0.3168	4	29.8	110,000	90,000
2015	20	0.3144	4	30.4	110,000	90,000
2016	20	0.3123	4	31.0	120,000	90,000
2017	20	0.3105	4	31.6	120,000	90,000
2018	20	0.3089	4	32.3	120,000	90,000
2019	20	0.3076	4	32.9	120,000	80,000
2020	20	0.3066	4	33.6	120,000	80,000
Total	**179**		**34**		**1,040,000**	**800,000**

[1] These HRE factors are calculated from the carbon HRE beneficial factors provided by MTP for the % of carbon savings that would be realised from the reductions in power consumption of PSUs. The value is calculated as "1 minus the HRE factor". HRE factors are only applied to PSUs for domestic use.

Table A16: Value of increase in CO2 emissions as a result of the heat replacement effect – Large						
Year	CO2 Emissions Saved from lower power consumption of PSUs /kt CO2	HRE Factor[1]	CO2 Emissions from extra heating /kt CO2	Shadow price of carbon/£ per tonne	Value of emissions/£ (undiscounted)	Value of emissions/£ (discounted)
2008	0	0.3378	0	26.5	0	0
2009	0	0.3333	0	27.0	0	0
2010	0	0.3293	0	27.6	0	0
2011	3	0.3257	1	28.1	20,000	20,000
2012	34	0.3224	6	28.7	160,000	140,000
2013	55	0.3195	9	29.2	260,000	220,000
2014	75	0.3168	12	29.8	350,000	280,000
2015	92	0.3144	14	30.4	440,000	350,000
2016	102	0.3123	16	31.0	500,000	380,000
2017	107	0.3105	17	31.6	520,000	380,000
2018	108	0.3089	17	32.3	540,000	380,000
2019	110	0.3076	17	32.9	550,000	380,000
2020	111	0.3066	17	33.6	570,000	380,000
Total	**797**		**124**		**3,910,000**	**2,910,000**

[1] These HRE factors are calculated from the carbon HRE beneficial factors provided by MTP for the % of carbon savings that would be realised from the reductions in power consumption of PSUs. The value is calculated as "1 minus the HRE factor". HRE factors are only applied to PSUs for domestic use.

Table A17: Percentage of sales that need to be made compliant and will incur costs (Small)							
1-8W	Compliant	Extra	Extra	Extra	Extra	Extra	Total
2008	23%						0%
2009	23%	0%					0%
2010	30%	0%	7%				7%
2011	50%	0%	7%	20%			27%
2012	100%	0%	7%	20%	50%		77%
2013	100%		7%	20%	50%	0%	77%
2014	100%			20%	50%	0%	70%
2015	100%				50%	0%	50%
2016	100%					0%	0%
2017	100%						0%
2018	100%						0%
2019	100%						0%
2020	100%						0%

Table A18: Percentage of sales that need to be made compliant and will incur costs (Medium)							
8 to 36W	Compliant	Extra	Extra	Extra	Extra	Extra	Total
2008	40%						0%
2009	40%	0%					0%
2010	50%	0%	10%				10%
2011	70%	0%	10%	20%			30%
2012	100%	0%	10%	20%	30%		60%
2013	100%		10%	20%	30%	0%	60%

2014	100%			20%	30%	0%	50%
2015	100%				30%	0%	30%
2016	100%					0%	0%
2017	100%						0%
2018	100%						0%
2019	100%						0%
2020	100%						0%

Table A19: Percentage of sales that need to be made compliant and will incur costs (Med/Large)							
36 to 49W	**Compliant**	**Extra**	**Extra**	**Extra**	**Extra**	**Extra**	**Total**
2008	42%						0%
2009	42%	0%					0%
2010	50%	0%	8%				8%
2011	70%	0%	8%	20%			28%
2012	100%	0%	8%	20%	30%		58%
2013	100%		8%	20%	30%	0%	58%
2014	100%			20%	30%	0%	50%
2015	100%				30%	0%	30%
2016	100%					0%	0%
2017	100%						0%
2018	100%						0%
2019	100%						0%
2020	100%						0%

Table A20: Percentage of sales that need to be made compliant and will incur costs (Large)							
Above 49W	**Compliant**	**Extra**	**Extra**	**Extra**	**Extra**	**Extra**	**Total**
2008	28%						0%
2009	28%	0%					0%
2010	40%	0%	12%				12%
2011	60%	0%	12%	20%			32%
2012	100%	0%	12%	20%	40%		72%
2013	100%		12%	20%	40%	0%	72%
2014	100%			20%	40%	0%	60%
2015	100%				40%	0%	40%
2016	100%					0%	0%
2017	100%						0%
2018	100%						0%
2019	100%						0%
2020	100%						0%

Table A21: Information Requirements – Technical documentation	
Reported Quantity	Description
Rms Output Current (mA)	Measured at Load Conditions 1 – 4
Rms Output Voltage (V)	
Active Output Power (W)	
Rms Input Voltage (V)	Measured at Load Conditions 1 – 5
Rms Input Power (W)	
Total Harmonic Distortion (THD)	
True Power Factor	
Power Consumed (W)	Calculated at Load Condition 1 – 4, Measured at Load Condition 5
Efficiency	Calculated at Load Conditions 1 – 4
Average Efficiency	Arithmetic Average of Efficiency at Load Conditions 1 – 4
The relevant load conditions are as follows:	
Percentage of Nameplate Output Current	
Load Condition 1	100 % ± 2%
Load Condition 2	75% ± 2%
Load Condition 3	50% ± 2%
Load Condition 4	25% ± 2%

Table A22: Testing costs

Units going to testing per year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Lower bound	-	-	500	22	22	22	22	22	22	22	22	22	22	
Upper bound	-	-	667	30	30	30	30	30	30	30	30	30	30	
Costs														
UNDISCOUNTED														
Lower bound	-	-	350,000	15,120	15,120	15,120	15,120	15,120	15,120	15,120	15,120	15,120	15,120	**501,200**
Upper bound	-	-	466,667	20,930	20,930	20,930	20,930	20,930	20,930	20,930	20,930	20,930	20,930	**675,967**
DISCOUNTED														
Discount factor	*1*	*0.96618*	*0.933511*	*0.901943*	*0.871442*	*0.841973*	*0.813501*	*0.785991*	*0.759412*	*0.733731*	*0.708919*	*0.684946*	*0.661783*	
Lower bound	-	-	326,729	13,637	13,176	12,731	12,300	11,884	11,482	11,094	10,719	10,356	10,006	**440,000**
Upper	-	-	435,638	18,878	18,239	17,622	17,027	16,451	15,894	15,357	14,838	14,336	13,851	**600,000**

Notes; Assumes £700 per test. Number of units tested 2010-2020 is one per model (legislation requires one to be tested and additional units if this fails). All figures based on 2000 models on the UK market and production cycle of 4 years for the lower estimates and 3 for the upper estimates.

Table A23: Projections of benefits 2021 – 2030

Year	Energy Savings/ £ million	Carbon savings/ £ million	Air Quality Savings/ £ million
2021	12,790,000	3,140,000	430,000
2022	12,700,000	3,080,000	420,000
2023	12,610,000	3,020,000	410,000
2024	12,530,000	2,960,000	400,000
2025	12,440,000	2,900,000	390,000
2026	12,350,000	2,840,000	380,000
2027	12,270,000	2,770,000	380,000
2028	12,180,000	2,710,000	370,000
2029	12,090,000	2,650,000	360,000
2030	12,010,000	2,590,000	350,000
Total 2021-2030	**123,960,000**	**28,660,000**	**3,890,000**

Table A24: Cost associated with making products compliant with requirements of the Implementing Measure					
ePSU type	**Average active efficiency requirement Tier 1 2011 *(after 1 year)***	**Average active efficiency requirement Tier 2 2012 *(after 2 years)***	**Additional Cost per unit Tier 1**	**Additional Cost per unit Tier 2**	**Details - cost of switched mode power supply**
ePSU 1-8W mobile phones, cordless phones, other battery operated handheld devices	$0.09 \cdot \ln(P_o) + 0.50$ (no load power consumption <= 0.50 Watt.)	$0.0626 \cdot \ln(P_o) + 0.622$ (Low voltage: $0.0750 \cdot \ln(P_o) + 0.561$) (no load power consumption <= 0.30 Watt.)	**negligible**	**€0.18** but not passed onto consumer	It is unlikely that these costs will be passed on to the consumer as per discussions with key stakeholders Tier 1 and 2 costs based on EuP study Options 1 and 2 respectively and assumes this is cost to manufacturer. Negligible Tier 1 cost supported by high current compliance rate
8 to 36W STBs, audio, routers	$0.09 \cdot \ln(P_o) + 0.50$. (no load power consumption <= 0.50 Watt.)	$0.0626 \cdot \ln(P_o) + 0.622$ (Low voltage: $0.0750 \cdot \ln(P_o) + 0.561$) (no load power consumption <= 0.30 Watt.)	**negligible**	**€0.33** but not passed onto consumer	Tier 1 and 2 costs based on EuP study Options 1 and 2 respectively and assumes this is cost to manufacturer. Negligible Tier 1 cost supported by high current compliance rate
36 to 49W Printers, monitors	$0.09 \cdot \ln(P_o) + 0.50$ (no load power consumption <= 0.50 Watt.)	Low voltage: $0.0626 \cdot \ln(P_o) + 0.622$ (Low voltage $0.0750 \cdot \ln(P_o) + 0.561$) (no load power consumption <= 0.30 Watt.)	**negligible**	**€0.63** but not passed onto consumer	Tier 1 and 2 costs based on EuP study Options 1 and 2 respectively and assumes this is cost to manufacturer. Negligible Tier 1 cost supported by high current compliance rate
Above 49W Power tools, laptops, TVs	0.85 (no load power consumption <=0.50 Watt.)	0.87 (no load power consumption <=0.50 Watt.)	**negligible**	**€1.5** but not passed onto consumer	Tier 1 and 2 costs based on EuP study Options 1 and 2 respectively and assumes this is cost to manufacturer. Negligible Tier 1 cost supported by high current compliance rate

Table A25: Net costs to manufacturers, of making products compliant, attributable to the Implementing measure (Base Costs. Undiscounted)

	1-8W			8-36W			36-49W			49+W		
	Sales	% sales to be made compliant with IM (assuming 50% already compliant with ES)	Cost of making products compliant attributable to IM	Sales	% sales to be made compliant with IM (assuming 50% already compliant with ES)	Cost of making products compliant attributable to IM	Sales	% sales to be made compliant with IM (assuming 50% already compliant with ES)	Cost of making products compliant attributable to IM	Sales	% sales to be made compliant with IM (assuming 50% already compliant with ES)	Cost of making products compliant attributable to IM
2008	38,030,000	0%	0	11,480,000	0%	0	9,080,000	0%	0	14,540,000	0%	0
2009	40,650,000	0%	0	11,660,000	0%	0	9,300,000	0%	0	15,680,000	0%	0
2010	41,130,000	0%	0	12,520,000	0%	0	9,820,000	0%	0	16,680,000	0%	0
2011	41,470,000	0%	0	12,960,000	20%	580,000	10,200,000	20%	870,000	17,560,000	10%	1,780,000
2012	41,940,000	50%	2,550,000	12,850,000	50%	1,430,000	10,340,000	50%	2,200,000	18,340,000	50%	9,290,000
2013	42,230,000	50%	2,570,000	13,030,000	50%	1,450,000	10,170,000	50%	2,160,000	19,040,000	50%	9,640,000
2014	42,430,000	50%	2,580,000	13,180,000	50%	1,470,000	10,400,000	50%	2,210,000	19,680,000	50%	9,970,000
2015	42,690,000	50%	2,590,000	13,220,000	30%	880,000	10,710,000	30%	1,370,000	20,270,000	40%	8,220,000
2016	43,030,000	0%	0	13,170,000	0%	0	9,060,000	0%	0	20,800,000	0%	0
2017	43,370,000	0%	0	13,620,000	0%	0	9,360,000	0%	0	21,250,000	0%	0
2018	43,740,000	0%	0	13,610,000	0%	0	9,570,000	0%	0	21,710,000	0%	0
2019	44,140,000	0%	0	13,550,000	0%	0	9,550,000	0%	0	22,120,000	0%	0
2020	44,560,000	0%	0	13,530,000	0%	0	9,220,000	0%	0	22,510,000	0%	0
TOTAL	549,410,000		**10,290,000**	168,380,000		**5,810,000**	126,780,000		**8,810,000**	250,180,000		**38,900,000**

Costs based on figures included in Table 3. % sales to be made compliant based on figures in Tables A17 – A20 and subtracting 50% already compliant with ENERGY STAR

Table A26: Net costs to manufacturers, of making products compliant, attributable to the Implementing measure (Base Costs minus 10%, Undiscounted)

	1-8W			8-36W			36-49W			49+W		
	Sales	% sales to be made compliant with IM (assuming 50% already compliant with ES)	Cost of making products compliant attributable to IM	Sales	% sales to be made compliant with IM (assuming 50% already compliant with ES)	Cost of making products compliant attributable to IM	Sales	% sales to be made compliant with IM (assuming 50% already compliant with ES)	Cost of making products compliant attributable to IM	Sales	% sales to be made compliant with IM (assuming 50% already compliant with ES)	Cost of making products compliant attributable to IM
2008	38,030,000	0%	0	11,480,000	0%	0	9,080,000	0%	0	14,540,000	0%	0
2009	40,650,000	0%	0	11,660,000	0%	0	9,300,000	0%	0	15,680,000	0%	0
2010	41,130,000	0%	0	12,520,000	0%	0	9,820,000	0%	0	16,680,000	0%	0
2011	41,470,000	0%	0	12,960,000	20%	520,000	10,200,000	20%	780,000	17,560,000	10%	1,600,000
2012	41,940,000	50%	2,290,000	12,850,000	50%	1,290,000	10,340,000	50%	1,980,000	18,340,000	50%	8,360,000
2013	42,230,000	50%	2,310,000	13,030,000	50%	1,310,000	10,170,000	50%	1,950,000	19,040,000	50%	8,680,000
2014	42,430,000	50%	2,320,000	13,180,000	50%	1,320,000	10,400,000	50%	1,990,000	19,680,000	50%	8,970,000
2015	42,690,000	50%	2,330,000	13,220,000	30%	800,000	10,710,000	30%	1,230,000	20,270,000	40%	7,390,000
2016	43,030,000	0%	0	13,170,000	0%	0	9,060,000	0%	0	20,800,000	0%	0
2017	43,370,000	0%	0	13,620,000	0%	0	9,360,000	0%	0	21,250,000	0%	0
2018	43,740,000	0%	0	13,610,000	0%	0	9,570,000	0%	0	21,710,000	0%	0
2019	44,140,000	0%	0	13,550,000	0%	0	9,550,000	0%	0	22,120,000	0%	0
2020	44,560,000	0%	0	13,530,000	0%	0	9,220,000	0%	0	22,510,000	0%	0
TOTAL	549,410,000		**9,250,000**	168,380,000		**5,240,000**	126,780,000		**7,930,000**	250,180,000		**35,000,000**

Costs based on figures included in Table 3. % sales to be made compliant based on figures in Tables A17 – A20 and subtracting 50% already compliant with ENERGY STAR

Table A27: Net costs to manufacturers, of making products compliant, attributable to the Implementing measure (Base Costs + 20%, Undiscounted)

	1-8W			8-36W			36-49W			49+W		
	Sales	% sales to be made compliant with IM (assuming 50% already compliant with ES)	Cost of making products compliant attributable to IM	Sales	% sales to be made compliant with IM (assuming 50% already compliant with ES)	Cost of making products compliant attributable to IM	Sales	% sales to be made compliant with IM (assuming 50% already compliant with ES)	Cost of making products compliant attributable to IM	Sales	% sales to be made compliant with IM (assuming 50% already compliant with ES)	Cost of making products compliant attributable to IM
2008	38,030,000	0%	0	11,480,000	0%	0	9,080,000	0%	0	14,540,000	0%	0
2009	40,650,000	0%	0	11,660,000	0%	0	9,300,000	0%	0	15,680,000	0%	0
2010	41,130,000	0%	0	12,520,000	0%	0	9,820,000	0%	0	16,680,000	0%	0
2011	41,470,000	0%	0	12,960,000	20%	690,000	10,200,000	20%	1,040,000	17,560,000	10%	2,140,000
2012	41,940,000	50%	3,060,000	12,850,000	50%	1,720,000	10,340,000	50%	2,640,000	18,340,000	50%	11,150,000
2013	42,230,000	50%	3,080,000	13,030,000	50%	1,740,000	10,170,000	50%	2,590,000	19,040,000	50%	11,570,000
2014	42,430,000	50%	3,090,000	13,180,000	50%	1,760,000	10,400,000	50%	2,660,000	19,680,000	50%	11,960,000
2015	42,690,000	50%	3,110,000	13,220,000	30%	1,060,000	10,710,000	30%	1,640,000	20,270,000	40%	9,860,000
2016	43,030,000	0%	0	13,170,000	0%	0	9,060,000	0%	0	20,800,000	0%	0
2017	43,370,000	0%	0	13,620,000	0%	0	9,360,000	0%	0	21,250,000	0%	0
2018	43,740,000	0%	0	13,610,000	0%	0	9,570,000	0%	0	21,710,000	0%	0
2019	44,140,000	0%	0	13,550,000	0%	0	9,550,000	0%	0	22,120,000	0%	0
2020	44,560,000	0%	0	13,530,000	0%	0	9,220,000	0%	0	22,510,000	0%	0
TOTAL	549,410,000		12,340,000	168,380,000		6,970,000	126,780,000		10,570,000	250,180,000		46,680,000

Costs based on figures included in Table 3. % sales to be made compliant based on figures in Tables A17 – A20 and subtracting 50% already compliant with ENERGY STAR