BN-NDICT MON03: Non-Domestic Monitors Government Standards Evidence Base 2009: Policy Scenario

Version 1.1

This Briefing Note and referenced information is a public consultation document and will be used to inform Government decisions. The information and analysis forms part of the Evidence Base created by Defra's Market Transformation Programme.

1 Introduction

- The Policy Scenario is a projection of what would happen if a defined set of new product-specific and related cross-cutting policies were implemented. The policies in the Policy Scenario have not yet been agreed or funded but represent those policies which are expected to be introduced as well as likely future revisions to existing policies and, in some cases, novel policy options. These policies aim to improve the average efficiency of products in the stock through a variety of mechanisms (e.g. minimum standards, product information and labelling, procurement, incentives) and thus reduce energy consumption and carbon emissions resulting from to these products.

- As product policy is considered within the context of climate change policy, the UK government considers policies with a net UK costs of up to around £20 per tonne of CO2 saved (compared to the reference scenario). The ambition level, at a minimum, matches the Least Life Cycle Cost (LLCC) level to society of increased energy efficiency of products.

- The costs for each policy, where known, are also included, separated out for government, consumer and industry.

- This Government Standard Briefing Note (GSBN) covers non-domestic monitors. The following definition of monitors is adapted from the ErP Preparatory study on PCs and monitors[1]:

- A commercially-available, electronic product with a display screen and its associated electronics encased in a single housing that is capable of displaying output information from a computer via one or more inputs, such as VGA, DVI, and/or IEEE 1394. The monitor usually relies upon a liquid crystal display (LCD) or less frequently cathode-ray tube (CRT) or other display devices such as plasma. This definition is intended primarily to cover standard monitors designed for use with personal computers.

- The computer monitors included in this definition must have a viewable diagonal screen size greater than 9 inches and must be capable of being powered by a separate AC wall outlet or a battery unit that is sold with an AC adapter.

- Computer monitors with a tuner/receiver may be covered by this study as long as they are marketed and sold to consumers as computer monitors (i.e. focusing on computer monitor as the primary function) or as dual-function computer monitors and televisions. However, products with a tuner/receiver and computer capability that are marketed and sold as televisions are not included in the scope of this definition.

[1] European Commission DG TREN Preparatory studies for Eco-design Requirements of ErPs (Contract TREN/D1/40-2005/LOT3/S07.56313) Lot 3 Personal Computers (desktops and laptops) and Computer Monitors Final Report (Task 1-8)

2 Scenario outputs

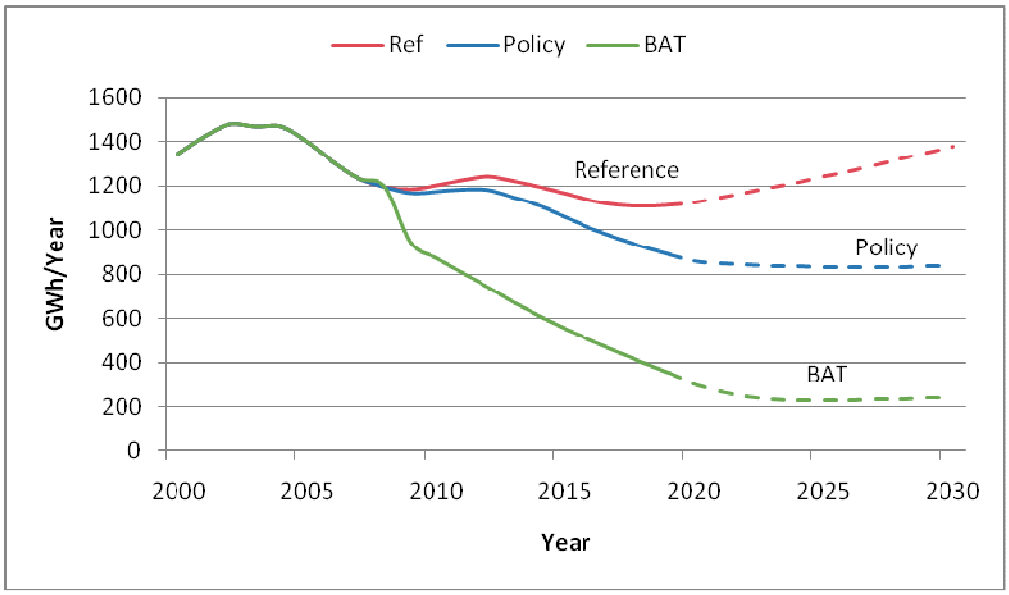

Figure 1 Total Non-Domestic Monitor Energy Consumption

- Total energy consumption from non-domestic monitors under the Policy scenario is expected to decrease until into the future due to improvements in energy efficiency offsetting the increased energy from growing stock levels.

- Total energy consumption from CRT monitors is expected to fall in the Policy scenario as stock levels diminish. All three scenarios follow the same line as CRT products are becoming obsolete.

- Total energy consumption from non-domestic LCD monitors is expected to increase in the Policy scenario until 2014 as a result of stock increases offsetting improvements in energy efficiency. Total energy consumption is expected to fall from 2014 until 2021 due to increases in efficiency. After 2021 total energy consumption is expected to increase as stock levels grow.

- Total energy consumption from plasma monitors is expected to fall as stock levels diminish.

Table 1 – Non-Domestic Monitor Summary energy consumption[2] and savings and CO2 emissions[3] and savings outputs

Energy Consumption (GWh)	2009	2020	2030
Plasma	10	0	0
CRT	80	0	0
LCD	1080	860	840
TOTAL	1170	860	840
Energy Savings (GWh)			
Plasma	0	0	0
CRT	0	0	0
LCD	0	270	540
TOTAL	0	270	540
CO_2 Emissions ($MtCO_2$)			
Plasma	0.00	0.00	0.00
CRT	0.03	0.00	0.00
LCD	0.38	0.31	0.30
TOTAL	0.41	0.31	0.30
CO_2 Emissions Savings ($MtCO_2$)			
Plasma	0.00	0.00	0.00
CRT	0.00	0.00	0.00
LCD	0.01	0.10	0.19
TOTAL	0.01	0.10	0.19

[2] Energy consumption figures for the non-domestic sector in the 2009/2010 Product policy analysis and projections document 'Saving energy through better products and appliances' were scaled down to match DECC projections for overall energy demand (www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx).

MTP data represents the best currently available information based on a bottom-up modelling approach. MTP's data is the basis for detailed energy calculations in the 2009/2010 Product policy analysis and projections document. However, DECC projections indicate that overall energy demand in the non-domestic sector is lower than projected by MTP's detailed models. MTP has assumed that the differences between the DECC overall projections and its detailed bottom-up projections are due to incomplete data on the following inputs for some of its non-domestic products:

- existing product stock;
- existing product efficiency;
- product usage.

The energy consumption figures in these GSBNs have **not** been scaled down, in order to enable constructive stakeholder comment on the MTP input data, and therefore differ from the ones presented in the 2009/2010 Product policy analysis and projections document.

[3] Refer to BNXS01 Carbon Dioxide Emission Factors for UK Energy Use for details on factors used.

Table 2 Summary costs and benefits[4]

	Average annual energy savings (£m)	Average annual product & policy cost increases (£m)	Net Benefit (£m)	Cost Effectiveness (traded) (£/tCO_2)
Non-Domestic Monitors	21	7	207	-60.2

3 Future potential policy & measures

- All policies and measures are discussed in detail within the Reference Scenario GSBN for monitors. This section of the document focuses on future measures included within each of the policies.

- Future ENERGY STAR revisions are expected every four years (occurring in 2013, 2017, 2021, 2025, 2029)
- Future ErP measures addressing the on, on-idle and sleep modes of monitors are assumed to be implemented in 2012, 2016, 2020, 2024, 2028 with specifications levels assumed to based on the preceding ENERGY STAR specifications. ENERGY STAR on-mode specifications levels into the future are based on a percentage reduction from preceding year's specification level (until 2013) and then an assumed percentage decrease for each proceeding specification.
- Future EU Eco-label energy efficiency criteria included in the label are expected to refer to ENERGY STAR. Few ICT products currently hold the EU Eco-label. A modest increase in EU Eco-label coverage is expected into the future.
- Government procurement is expected to continue mandating that all monitors procured by central Government should meet ENERGY STAR specifications. This follows the 2007 revised ENERGY STAR agreement which requires central government procurement to ENERGY STAR efficiency levels or equivalent (without prejudice to Community and national law and economic criteria). Government procurement specifications are assumed to be implemented through the "Quick Wins" programme.
- Policy Scenario assumes improvement to 67% power management enabling rate by 2014, and a further improvement to 96% by 2020, resulting in a significant reduction in total product energy consumption. Increases in power management enabling are assumed to stem from new ENERGY STAR and ErP requirements.

[4] Refer to BNXS26 Rationale for Policy Cost Estimates used in MTP Policy Briefs for details on factors used.

Table 3 Future potential policies & measures, Policy Scenario

Policy name	Period in force	Description	Impact	Cost	Justification
ENERGY STAR	Years policy in force (2009 – 2030)	Current ENERGY STAR specifications include maximum power (W) levels based on a formulae approach. MTP has translated the ENERGY STAR formulae into power (W) figures.	ENERGY STAR is assumed to have a large impact on the energy efficiency of desktop and laptop PCs in their on-idle and sleep modes. ENERGY STAR will have less of an influence on off-mode power as this will be heavily impacted by the ErP Standby Implementing Measures.	No cost is assumed for ENERGY STAR compliance as it is a voluntary programme. ENERGY STAR compliance is heavily driven by the US market in particular its mandatory nature in US public procurement	ENERGY STAR is the main energy efficiency policy impacting ICT products.
ErP monitor Implementing Measures for on-active and sleep mode.	2012-2030	Expected to be based on previous ENERGY STAR specifications.	Expected to remove remaining products from the market which have not reached the 4 year old ENERGY STAR specification.	The cost of changing products to meet the future ErP measures varies across the different types of imaging devices. Please refer to section 5 in this GSBN for further information about costs.	ErP Implementing Measures for on-active and sleep mode power consumption were highlighted in the ErP Computer preparatory study. Within the preparatory study it was suggested that future ErP IM's could be based on past ENERGY STAR specifications.
Government Procurement	2009-2030	Expected to be based on ENERGY STAR specifications.	Relatively small impact expected as does not go beyond ENERYG STAR	No cost assumed as based on ENERGY STAR	Important consideration as central Government is largest single procurer of monitors

Policy name	Period in force	Description	Impact	Cost	Justification
					in the UK
EU Eco-label	2011 - 2030	EU Eco-label is the European Commission eco-label. Covers wider lifecycle impacts as well as energy in use. Energy efficiency specifications expected to refer to ENERGY STAR.	Impact on market deemed to be minimal due to low coverage rates.	No costs assigned to the due to low coverage rates and the programme's voluntary nature.	EU Eco-label is the European Commission's own label. Whilst coverage rates are low they could increase if extra resources are put into the label programme.
Power Management programme	2014-2030	Increased power management enabling requirements within ErP and ENERGY STAR specifications	Potential significant impacts on total energy consumption from monitors.	No cost assumed as technology already exists on most CRT and LCD monitors.	Could have significant impacts on total energy consumption without the need to change any product components.

Table 4 - Test Standards

Test Standard name	Date in force	Description	Comments
ENERGY STAR Program Requirements for Computer Monitors (Version 5.0)	July 2009	Identifies methodology for measuring the on-mode, sleep mode and off modes of monitors.	Includes reference to other test methodologies
IEC 62301	2005	Provides a measurement method for standby/off-mode power (W)	In the process of being revised.
IEC 62301 Ed.2	TBD	Will provide a revised methodology for measuring standby/off-mode power (W). The revisions in the standard are likely to focus on nomenclature of power modes.)	

3.1 Policy timeline

- The following policy timeline identifies when policies come into effect, including future revisions

Table 5 - Future policies & measures, Policy Scenario

Policy name	Current specification in force	2009	2010	2011	2012	2013	2014	2015	2016-2020	2021-2025	2026-2030
ENERGY STAR						2013 Estimate			2017 Estimate	2021 and 2025 Estimate	2029 Estimate
ErP monitor Implementing Measures for on-active and sleep mode					2012 Estimate				2016 and 2020 Estimate	2024 Estimate	2028 Estimate
EU Eco-label	2010	Future specifications estimated to remain based on ENERGY STAR									
Government Procurement	2007	Estimated refresh each year and future specifications estimated to remain based on ENERGY STAR									
Power Management Programme	n/a						Est. (67% PM Rate)		2020 Est 96% PM Rate)		

4 Efficiency

4.1 Summary

- This section provides details of the efficiency inputs assumed (for new sales i.e. not stock average)
- ENERGY STAR on-active specifications include a maximum power consumption value in watts expressed as formulae. The ENERGY STAR V4.0/4.1 on-active specifications are based on monitor resolution whereas the ENERGY STAR V5.0 on-active specifications are based on both resolution and screen size. ENERGY STAR V4.1 and V5.0 also include power (W) consumption specifications for the sleep and off modes of monitors.
- The ErP Standby Implementing Measures also expressed in units of power (W).

- The table below illustrates the expected ENERGY STAR coverage rate for LCD monitors. The expected ENERGY STAR coverage rate (the number of products which meet the ENERGY STAR specification) increases each year until the new specification is implemented. It is assumed that ErP Implementing Measures will be based on the previous ENERGY STAR specification (therefore within 8 years 100% of products will be compliant to the previous ENERGY STAR specification).

Table 6 - Expected Domestic LCD monitor ENERGY STAR® Coverage Rates

	Specification Years						
Year	2007 Spec (Agreed)	2009 Spec (Agreed)	2013 Spec (Forecast)	2017 Spec (Forecast)	2021 Spec (Forecast)	2025 Spec (Forecast)	2029 Spec (Forecast)
2010	47%	27%	11%	7%	4%	3%	1%
2015	33%	30%	17%	7%	5%	4%	3%
2020	0%	0%	45%	28%	11%	9%	7%
2025	0%	0%	0%	44%	32%	15%	9%
2030	0%	0%	0%	0%	45%	36%	19%

- The Reference scenario GSBN provides a full description of the ENERGY STAR specification process and how MTP have interpreted the values.
- The on-active mode power figures, developed from the ENERGY STAR specifications, are used as the main metric of monitor power consumption as this mode dominates the overall energy consumption of these products.

Table 7 Domestic LCD monitor Power Consumption – Policy Scenario

	LCD monitor	
	MTP Policy scenario	Estimated ENERGY STAR Specifications
Year	On-mode (W)	On-mode (W)
2009	31.55	26.4
2010	30.74	
2011	29.94	
2012	29.13	
2013	28.03	23.8
2014	26.94	
2015	25.84	
2016	24.75	
2017	24.14	21.3
2018	23.53	
2019	22.92	
2020	22.31	
2021	21.91	20.3
2022	21.50	
2023	21.10	
2024	20.69	
2025	20.43	19.3
2026	20.17	
2027	19.92	
2028	19.66	
2029	19.41	18.3
2030	19.17	

- Table 7 shows the MTP power consumption requirements under the Policy scenario for LCD monitors in on-active mode. The table also lists the estimated ENERGY STAR specifications in each year that they are expected to be refreshed. The ENERGY STAR specifications are slightly lower than the Policy scenario to account for the fact that not all products on the market will be expected to meet the current ENERGY STAR specifications.

4.2 Data sources – efficiency

Table 8 Monitor Efficiency data sources

Year	Reference	Reference date	Author	Justification	Confidence in sources (High/Low)
2009, 2012, 2016, 2017, 2020, 2021, 2024, 2025, 2028, 2029, 2032, 2033	Expert Assumptions	2009	MTP Technical Expert	Required expert assumptions to collate power (CRT monitors)	Medium
2009, 2012, 2016, 2017, 2020, 2021, 2024, 2025, 2028, 2029, 2032, 2033	Expert Assumptions	2009	MTP Technical Expert	Required expert assumptions to collate power (LCD monitors)	Medium
2009	MTP Television policy briefing note BNCE TV03 (plasma TV details)	2009	MTP	Best Data Available (plasma monitors)	High
2009	Expert Assumption	2009	MTP Technical Expert	Required expert assumptions to reduce TV tuner allowance (plasma monitors)	Medium

Note: Historic data sources are included in BN-NDICT MON02 – Reference Scenario

4.3 Methodology & key assumptions – efficiency

- This section describes what has been done with the data listed in Table 8 along with a rationale for any key assumptions (in particular any expert judgements listed in Table 8) and detail of any background calculations behind the data points.

- Table 9 describes the process taken when developing the MTP Policy scenario.
  - Stage 1 identifies how the specification levels for each policy were calculated.
  - Stage 2 describes how the individual specifications were combined to develop the MTP Policy scenario.
  - Stage 3 details how the ENERGY STAR coverage rates were calculated.
- Plasma monitor efficiency figures are sourced from the MTP plasma television model, and therefore are not discussed here. Details can be found in BNCE TV03. All comments in the table below refer to both CRT and LCD unless otherwise stated.
- Methodology & key assumptions for historic data are included in BN-NDICT MON02 – Reference Scenario

4.3.1 Future data

Table 9 Extrapolation & background calculations –Monitor efficiency

Year	Methodology & assumptions
Stage 1: Policy Specification Value Calculations	
2009	ENERGY STAR specification (on-active mode): Specification level is based on a model weighted distribution of ENERGY STAR specifications for each size of CRT and LCD monitor category. Model weighting is based on the distribution of products found in the EU ENERGY STAR database during 2008 and assumed increases in screen size during 2009.
2010-2029	ENERGY STAR specification (on-active mode): straight line Interpolation between 2009 and 2030 sales distributions of monitor sizes.
2030	ENERGY STAR specification (on-active mode): assumed distribution of monitor sizes toward larger screen size based on expert assumption in light of no further information being available.
2009	ENERGY STAR specification (sleep mode): uses the ENERGY STAR 2009 specification (2W) for monitors under 30 inches.
2012	ENERGY STAR specification (sleep mode): uses the ENERGY STAR 2011 specification (1W) for monitors.
2017, 2021, 2025, 2029, 2033	ENERGY STAR specification value (on-active mode power): It is assumed that the ENERGY STAR specifications will be refreshed in these years. These values for LCD monitors are based on an assumed increase in efficiency over the preceding ENERGY STAR specification value (which was developed four years in the past). The level of assumed efficiency gain ranges between 5% and 10%. The 10% value is used in the first refresh and the 5% values for each subsequent refresh period to reflect diminishing gains. The percentage decreases are based on expert assumption. It is also assumed that there will be no further improvement in CRT monitors due to low sales volumes of this mature technology and so no further ENERGY STAR specifications are devised for these products.
2017, 2021, 2025, 2029, 2033	ENERGY STAR specification (sleep mode): uses the ENERGY STAR 2011 specification (1W) for monitors as it is assumed that no further improvements will be made.
2010–2012, 2014–2016, 2018–2020, 2022-2024, 2026–2028, 2030-2032	ENERGY STAR specification value (on-active and sleep mode power): The values for each year are based on a straight line interpolation between the preceding year's and future year's ENERGY STAR specification value.
2013	ENERGY STAR specification value (off-mode (W)) is assumed to be at 0.5W to match ErP.
2010-2012	ENERGY STAR specification value (off-mode (W)): The values for each year are based on a straight line interpolation between the preceding year's and future

Year	Methodology & assumptions
	year's ENERGY STAR specification value.
2014 - 2030	ENERGY STAR specification value (off-mode (W)): It is assumed that ENERGY STAR will use the 2013 ErP Implementing measure of 0.5W as a specification to ensure that ENERGY STAR qualified products are legally compliant in the EU.
2009	Government procurement specifications based on ENERGY STAR specifications.
2010-2030	Government procurement specifications assumed to be based on ENERGY STAR specifications in place in same year.
2012, 2016, 2020, 2024, 2028, 2032	ErP specification value (on-active and sleep mode power): The ErP specification value in these years matches the previously implemented ENERGY STAR specification value.
2013–2015, 2017–2019, 2021–2023, 2025-2027, 2029–2031	ErP specification value (on-active and sleep mode power): The values for each year are based on a straight line interpolation between the preceding year's and future year's ErP specification value.
2014 to 2030	ErP specification value (off-mode power (W)): The ErP 2013 standby implementing measure of 0.5 W is applied linearly in each subsequent year as no further improvement is considered possible without further policy intervention.
2011 - 2030	EU Eco-label values (on-active and sleep mode) are assumed to equal the ENERGY STAR specifications in the same year.
Stage 2: Policy scenario Calculation	
2009 - 2030	Overall Policy scenario: this overall Policy scenario brings together the results of all the individual Policy scenario calculations. The scenario is based on the minimum value that occurs in either the Reference scenario or in any of the individual Policy scenario s. If the minimum value occurs in the Reference scenario it shows that the package of policies is having no impact.
2012, 2016, 2020, 2024, 2028, 2032	ENERGY STAR Policy scenario : Values (on-active and sleep mode) are based on a weighted percentage of products which meet the ENERGY STAR specification with the remaining percentage of products meeting the average Reference scenario value.
2009-2011, 2013–2015, 2017–2019, 2021–2023, 2025-2027, 2029–2031	ENERGY STAR Policy scenario : Values for (on-active and sleep mode): The values for each year are based on a straight line interpolation between the preceding year's and future year's calculated ENERGY STAR Policy scenario value.
2012, 2016, 2020, 2024, 2028, 2032	EU Eco-label Policy scenario : Values (on-active and sleep mode) are based on a weighted percentage of products which are assumed to meet the EU Eco-label specification with the remaining percentage of products meeting the ENERGY STAR Policy scenario figures.
2009-2011, 2013–2015, 2017–2019, 2021–2023, 2025-2027, 2029–2031	EU Eco-label Policy scenario : Values for (on-active and sleep mode): The values for each year are based on a straight line interpolation between the preceding year's and future year's EU Eco-label Policy scenario value.
2009 - 2011	ErP Policy scenario (on-active and sleep mode): includes an assumed improvement in product performance ahead of ErP implementation in 2012. This reflects the thinking that manufacturers would improve product energy efficiency ahead of the ErP implementation date. The figures for these years are calculated on an assumed % reduction from the Reference scenario figures. The percentage reductions are based on expert opinion and are tailored to ensure that the ErP Policy scenario in these years does not fall below the 2012 implementing measure.

Year	Methodology & assumptions
2012, 2016, 2020, 2024, 2028, 2032	ErP Policy scenario : Values (on-active and sleep mode) are based on a weighted percentage of products which are assumed to meet the ErP specification with the remaining percentage of products meeting the EU Eco-label Policy scenario figures (EU Eco-label Policy scenario includes the combined effects of the ENERGY STAR, EU Eco-label as well as the ESR specifications).
2013–2015, 2017–2019, 2021–2023, 2025-2027, 2029–2031	ErP Policy scenario : Values for (all power modes): The values for each year are based on a straight line interpolation between the preceding year's and future years' ErP Policy scenario value.
2010 and 2013	ErP Policy scenario (off-mode (W)): Includes the ErP Implementing Measures as maximum power consumption values in 2010 and 2013.
2009 - 2012	ErP Policy scenario (off mode): includes an assumed improvement in product performance ahead of ErP implementation in 2013. This reflects the thinking that manufacturers would improve product energy efficiency ahead of the ErP implementation date. The figures for these years are calculated on an assumed % reduction from the Reference scenario figures. The percentage reductions are based on expert opinion. The off-mode and are tailored to ensure that the ErP Policy scenario in these years does not fall below the 2013 implementing measure (as the 2013 implementing measure is assumed to be the lowest power requirement in the policy scenario).
2012	ENERGY STAR Policy scenario (off-mode (W)): based on a weighted percentage of products which meet the ENERGY STAR specification with the remaining percentage of products meeting the average Reference scenario value.
2009 - 2011	ENERGY STAR Policy scenario (off-mode (W)): The values for each year are based on a straight line interpolation between the preceding year's and future year's ESR Policy scenario value.
2012	EU Eco-label Policy scenario : Values (off-mode (W)): Values are based on a weighted percentage of products which are assumed to meet the EU Eco-label specification with the remaining percentage of products meeting the ENERGY STAR Policy scenario figures. Market coverage of EU Eco-label is expected to be1% until 2030.
2009 - 2011	EU Eco-label Policy scenario : Values for (off-mode (W)): The values for each year are based on a straight line interpolation between the preceding year's and future years' EU Eco-label Policy scenario value.
2014 -2030	All Policy scenario s (off-mode (W)): All values based on the 2013 ErP Implementing Measure of 0.5W (maximum level). .
2009-2030	Government public procurement Policy scenario is not calculated separately as it is based on ENERGY STAR specifications. Assumed that the Government procurement influence is included within the ENERGY STAR Policy scenario .
2009-2030	Plasma monitor – Policy scenario is taken from the MTP plasma television model with 50% of the TV tuner power removed in each year.
Stage 3: Efficiency Sales Weighting	
2009-2030	LCD monitor - sales weighting for ENERGY STAR coverage graphs: The ENERGY STAR coverage graphs illustrate an assumed mix of coverage levels in the market place against ENERGY STAR specifications set in 2007, 2009, 2013, 2107, 2021, 2025 and 2029.
2009	LCD monitor - sales weighting for ENERGY STAR coverage graphs: Current coverage of products in EU ENERGY STAR database to the 2009 ENERGY STAR specification value. This calculation provides a percentage compliance rate for those products already in the EU ENERGY STAR database. Where necessary, a correction factor is then added (value assumed by the technical expert) to account for the fact that the products in the EU ENERGY STAR database do not account for the whole market. The correction factor therefore

Year	Methodology & assumptions
	provides an estimate of how many products on the whole market are likely to be meeting the ENERGY STAR specification value.
2009	LCD monitor - sales weighting for ENERGY STAR coverage graphs: Coverage rates for 2009 against assumed 2013, 2017, 2021, 2025 and 2029 ENERGY STAR specification values are assumed.
2012, 2016, 2020, 2024, 2028	LCD monitor - sales weighting for ENERGY STAR coverage graphs: It is assumed 1 year prior to the implementation of new ENERGY STAR specifications the specifications are developed to cover approximately 25% of the most energy efficient products on the market.
2012, 2016, 2020, 2024 and 2028	LCD monitor - sales weighting for ENERGY STAR coverage graphs: It is assumed that 100% of products meet revised ENERGY STAR specifications 7 years after implementation. This is based on the assumption that ErP will require that all products sold in the EU market meet the previous ENERGY STAR specifications.
2010–2015, 2013-2019, 2017-2023, 2021-2027, 2025-2030	LCD monitor - sales weighting for ENERGY STAR coverage graphs: The values for each year are based on a straight line interpolation between the preceding year's and future year's ENERGY STAR coverage rates.
2010, 2015, 2020, 2025 and 2030	LCD monitor - sales weighting for ENERGY STAR coverage graphs: Coverage rates for the 2007, 2009, 2013, 2021, 2025 and 2029 ENERGY STAR specifications are normalised to 100% for graphing purposes.
2009-2030	CRT monitors – no sales weighting developed as it is assumed that future sales volumes will be very low.

4.4 Data issues – efficiency

- This section flags any areas of uncertainty, both in general and for specific data points, along with a description of how this has been dealt with in the model

Table 10 Data issues – efficiency

Issue/risk	Approach taken/rationale
Much of the power data sourced for LCD monitors comes from products compliant to ENERGY STAR. There is a risk that the Policy scenario figures could be too low which results in future values also being too ambitious.	MTP have commissioned their own testing and power figures are included in the datasets. Inclusion of these figures helps to develop realistic Policy scenario values. MTP will review on an annual basis.
Product development in the ICT industry is rapid. The Policy scenario assumptions could change with a sudden uptake of an extremely efficient or inefficient product.	MTP review the Policy scenario figures on an annual basis. This annual review will ensure that the MTP Policy scenario figures are set at an appropriate efficiency level.
On-active power of monitors is heavily dependent on the size of monitor screen. Should average screen size increase more than has been expected then the MTP figures could become too stringent.	MTP will continually review changes in screen sizes of monitors and if necessary adapt figures.
There is currently little data available for CRT monitors. This is largely due to the small number of CRT monitors available on the market (having been largely	This assumption is considered representative of current stock, and therefore no changes to the models are suggested. Assumptions can be reassessed for validity in future revisions.

Issue/risk	Approach taken/rationale
replaced by LCDs). MTP figures are based on screen size. The remaining CRT monitors on the market are mostly small screen devices used for specialist purposes. The small screen size of remaining products has meant that MTP figures for CRT monitors are lower than those for LCD monitors. This could be seen as confusing.	

4.5 Confidence level – efficiency

- This section provides an indication of overall confidence in the data set (i.e. data points, calculations, interpolation and projections)
- MTP has gathered a significant amount of historical power data for the monitor types covered in this GSBN. Estimates of average power requirements are therefore likely to be relatively accurate into the very near future. Given the fast moving nature of the ICT industry it is necessary to note that confidence in MTP assumptions decreases with time into the future.

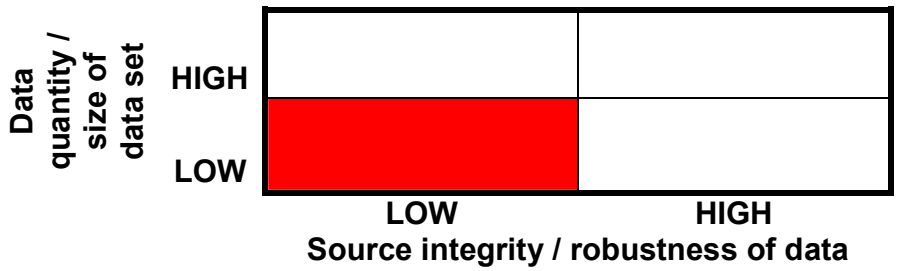

Figure 2 Confidence indicator for efficiency data

5 Usage

5.1 Summary

- Two sets of use profiles are developed for CRT and LCD monitors. The first use profile is based on a situation where no power management is enabled and the second where power management is enabled (see Key Inputs GSBN for profiles). An “enabling rate” is used as a weighting factor between these two use profiles to arrive at overall use profile for each product. No enabling rates are developed for

plasma monitors as it is assumed that these types of monitors do not have a sleep mode.

- The table below shows average usage profiles, derived from the Policy scenario enabling rate and the power managed and non power managed profiles discussed in the Key Inputs briefing note.

Table 11 Average Usage – CRT and LCD monitors

	CRT and LCD Monitor				
	Policy (Use Hours/Year)				Power Management Enabling Rates
Year	On-Active	Sleep	Off	Off-Unplugged	%
2010	1603	437	6431	289	64
2020	1383	657	6431	289	96
2030	1383	657	6431	289	96

Table 12 Average Usage – plasma monitors

	Plasma monitor				
	Policy (Use Hours/Year)				Power Management Enabling Rates
Year	On-Active	Sleep	Off	Off-Unplugged	%
2010	1,920	-	6,840	0	-
2020	1,920	-	6,840	0	-
2030	1,920	-	6,840	0	-

- Average non-domestic CRT and LCD monitor on-active use time is expected to reduce over time within the Policy scenario as power management enabling rates increase. The increasing amount of time spent in sleep mode is a result of the combination of CRT and LCD monitors being used more but with increased power management. Without the increase in power management rates the extra time spent in sleep mode would occur during in on-active mode.
- Power management enabling rates within the policy scenario are assumed to increase over time largely as a result of new ENERGY STAR and ErP requirements, increasing rates to 67% by 2014 and 96% by 2020 (by comparison the reference scenario power management rate is assumed to reach 60% by 2020).
- Average on-active time for plasma monitors is assumed to remain constant into the future under the Policy scenario as it is assumed that no power management functionality is implemented for these products.

5.2 Data sources – usage

Table 13 – Usage data sources (enabling rates)

Year	Reference	Reference date	Author	Justification	Confidence in sources (High/Low)
2014, 2020	Expert Assumptions	2009	MTP Technical Expert	Required expert assumptions to develop power management enabling rates	Medium

5.3 Methodology & key assumptions – usage

- This section describes what has been done with the data listed in Table 13 along with a rationale for any key assumptions (in particular any expert judgements listed in Table 13) and detail of any background calculations behind the data points.

5.3.1 Future analysis

Table 14 Extrapolation & background calculations – usage data

Year	Methodology & assumptions
2009-2013 2015-2019	CRT and LCD monitor power management enabling rates based on a straight line interpolation between adjacent years' figures.
2014	CRT and LCD monitor power management enabling rates assumed to be 67% as new ENERGY STAR and ErP requirements are implemented.
2020	CRT and LCD monitor power management enabling rates assumed to be 96%. as the market builds on the 67% enabling rates in 2014 and power management becomes more engrained into future ENERGY STAR and ErP requirements.
2021-2030	CRT and LCD monitor power management enabling rates assumed to be the same as in 2020.

5.4 Data issues – usage

- This section flags any areas of uncertainty, both in general and for specific data points, along with a description of how this has been dealt with in the model

Table 15 Data issues – usage

Issue/risk	Approach taken/rationale
Power management enabling rates can have a large impact of overall use profiles. Over or under-estimation of power management enabling rates could have a consequentially large impact on overall use hours.	MTP has included a number of expert assumptions which estimate power management enabling rates. MTP will continue to evaluate new use profile data.

5.5 Confidence level – usage

- This section provides an indication of overall confidence in the data set (i.e. data points, interpolation and projections)
- Confidence levels about actual base use profiles are included in the Key Inputs GSBN's. Confidence levels of the power management enabling rates are relatively low, especially for future years, due to the large potential for users to disable functionality.

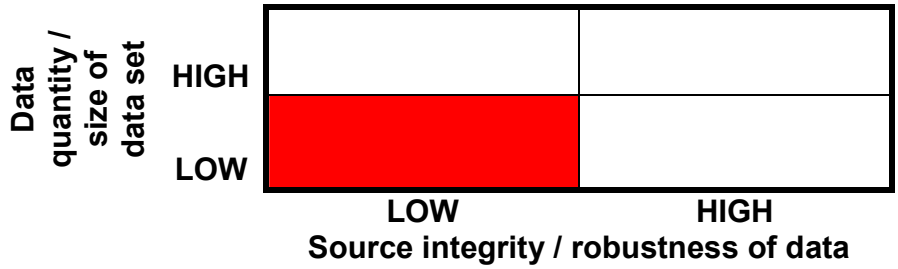

Figure 3 Confidence indicator for usage data

6 Cost

- The cost of adapting products to meet each set of future ErP specifications has been estimated below. No other policy costs are included as they are either voluntary in nature or adaptation would have fee or no costs attached.
- CRT monitors are a legacy technology and further development is not envisaged, therefore costs related to these products are not considered.
- Cost data is at the heart of commercial competition and not discussed openly within industry – for this reason, all cost data is based on expert opinion from within the MTP team
- All costs stated are marginal costs related to the introduction of a specific energy efficiency improvement in the Policy Scenario, and above the normal purchase cost implied in the Reference Scenario.

6.1 Summary

Table 16 Summary of Costs in each specification year - Undiscounted (real £2009)

	Undiscounted cost £000's			
Year	**CRT**	**LCD**	**Plasma**	**Total**
2011	0	31,618	194	31,812
2015	0	24,494	70	24,563

	Undiscounted cost £000's			
Year	CRT	LCD	Plasma	Total
2019	0	25,473	59	25,533
2023	0	26,837	36	26,873
2027	0	28,394	9	28,403

6.2 Data sources – cost

Table 17 Cost data sources

Year	Reference	Reference date	Author	Justification	Confidence in sources (High/Low)
2011, 2015, 2019, 2023, 2027	Expert assumption of cost per improvement option	2009	MTP Technical Expert	No cost data available	Low
2011, 2015, 2019, 2023, 2027	Expert assumption of percentage of products on the market requiring adaptation to meet ErP specification	2009	MTP Techincal Expert	No data available	Low

6.3 Methodology & key assumptions – cost

- This section describes what has been done with the data listed in Table 17 along with a rationale for any key assumptions (in particular any expert judgements listed in Table 17) and detail of any background calculations behind the data points
- CRT monitors are a legacy (declining) technology and further development is not envisaged.
- Plasma products form a small part of this sector – Two product developments are envisaged to meet the future policy requirements.
    - 5 lumen/watt screen efficiency is seen as an early development with all plasma screens meeting this specification by 2011.
    - It is assumed that further development will lead to 10 lumen/W screens displays being available from 2011increasing their share of the plasma market by 10% per year.
- Costs for these two developments are assumed to be £300 and £500 respectively for 5l/W and 10l/W display panels. These costs are highly dependent on the financial

treatment of the development costs in the manufacturer's balance sheet. A short amortisation period (time to recover development cost) would push the cost to the consumer up, whilst a long amortisation period would reduce or hide some of the costs.

- LCD monitor costs are based around 4 key technology improvements – more efficient power supply units, better optical films (to allow more light through the panel), dynamic dimming circuitry(to turn off or dim the backlight in dark areas of the image), and high efficiency backlights (e.g. LED).
- While estimates have been made of current and future costs, the confidence level reduces into the future as uncertainty around specification levels and cost of component changes increases. The cost in each policy implementation year is therefore assumed the same, but can be updated in any future studies
- Estimated costs shown are to the consumer

6.3.1 Future analysis

Table 18 Extrapolation & background calculations – cost

Year	Methodology & assumptions
2011, 2015, 2019, 2023, 2027	Multiple rounds of ErP specifications assigned to monitors. Measures based on previous ENERGY STAR® specification For CRT monitors – no improvement options identified For LCD monitors: • More efficient power supply – assumed £5 • More efficient optical films – assumed £10 • Dynamic dimming improvements – assumed £25 • High efficiency backlights (e.g. LEDs) – assumed £30 For Plasma monitors at the first ErP specification in 2011 • Assumed 90% market fitted with 5l/W panels @£300 • Assumed 10% market fitted with 10l/W panels @£500 For plasma monitors in subsequent years, the efficiency mix changes in 10% steps each year until 2020 when 100% of monitors are assumed to have a 10l/W panel
2011, 2015, 2019, 2023, 2027	It is assumed that each ErP specification will be the same as the voluntary specification from 3 years previous. Therefore, it is assumed that in the ErP specification year, the majority of products placed on the market will be compliant, Expert assumptions have been made of the remaining percentage of products placed on the market which require adaptation in the ErP specification year as follows For LCD and Plasma 2011 12.5% 2015 9.5% 2019 9.5% 2023 9.5% 2027 9.5%
2011, 2015, 2019, 2023, 2027	The costs are derived from multiplying the assumed cost of change by the number of products requiring adaptation in each specification year

6.4 Data issues – cost

- This section flags any areas of uncertainty, both in general and for specific data points, along with a description of how this has been dealt with in the model

Table 19 Data issues – cost

Issue/risk	Approach taken/rationale
Cost data is at the heart of commercial competition and not discussed openly within industry. Costs vary not only according to specification and with quantity of material purchased, but also with the accounting treatment applied to the amortisation of the huge development costs associated with new panel fabrication plants. While estimates have been made of current and future costs, the confidence level reduces into the future as uncertainty around specification levels and cost of component changes increases.	The approach has been to take indicative feedback provided by industry of current costs to prepare an expert opinion within the MTP. These assumptions have been extrapolated linearly into the future. MTP will review on an annual basis

6.5 Confidence level – cost

- This section provides an indication of overall confidence in the data set (i.e. data points, calculations, interpolation and projections)
- Cost data for changing certain components of monitors is difficult to source. Any assumptions are highly dependent on assumed future specification levels and potential energy savings from each component change.

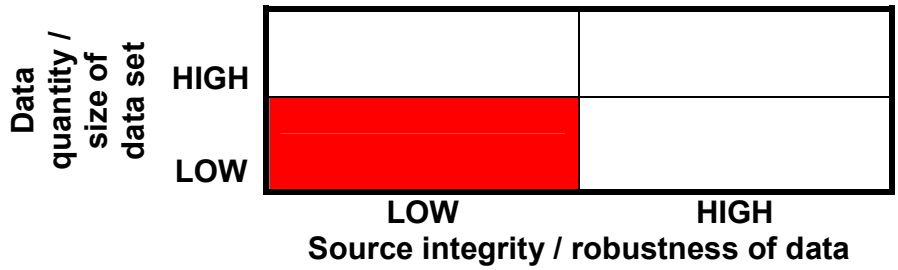

Figure 4 Confidence indicator for cost data

7 Other issues

- None addressed.

Related MTP information

- BN-NDICT MON01: Government Standards Evidence Base 2009 – Key Inputs, Non Domestic Monitors
- BN-NDICT MON02: Government Standards Evidence Base 2009 – Reference Scenario, Non Domestic Monitors
- BN-NDICT MON04: Government Standards Evidence Base 2009 – Best Available Technology (BAT) Scenario, Non Domestic Monitors
- BN-DICT MON01: Government Standards Evidence Base 2009 – Key Inputs, Domestic Monitors
- BN-DICT MON02: Government Standards Evidence Base 2009 – Reference Scenario, Domestic Monitors
- BN-DICT MON03: Government Standards Evidence Base 2009 – Policy Scenario, Domestic Monitors
- BN-DICT MON04: Government Standards Evidence Base 2009 – Best Available Technology (BAT) Scenario, Domestic Monitors
- BN-NDICT KO01: Government Standards Evidence Base 2009 – Key Outputs, Non Domestic ICT
- BN-DICT KO01: Government Standards Evidence Base 2009 – Key Outputs, Domestic ICT

Changes from Version 1.0

- Cost and benefit figures updated.
- CEI calculation updated and figure changed.
- Minor changes to the template.

Consultation and further information

Stakeholders are encouraged to review this document and provide suggestions that may improve the quality of information provided, email **info@mtprog.com** quoting the document reference, or call the MTP enquiry line on +44 (0) 845 600 8951.

For further information on related issues visit **http://efficient-products.defra.gov.uk**