# BN-NDICT IM02: Non-Domestic Imaging Government Standards Evidence Base 2009: Reference 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 Reference Scenario is a projection of what is likely to happen to energy consumption of each product if no new policies are implemented. All agreed and formally signed-off policies are included in the Reference Scenario.

- [Note that in this round of Government Standards, any ErP measures which were passed at Regulatory Committee in March 2009 are included in the Reference Scenario, although at the time of writing not all of these measures had been published in the Official Journal of the European Union].

- For cross-cutting policies such as CERT and Building Regulations, which are agreed but where the likely impact for specific products is unknown, assumptions are made about the impact per product, and detailed in the following sections. Where possible, separate projections of the reference scenario are made with and without such policies.

- This Government Standard Briefing Note (GSBN) covers non-domestic imaging equipment. The following definitions of imaging equipment types are adapted from the ErP Preparatory study on imaging equipment[1].

- **Office Imaging Equipment** is a commercially available product which was designed for the main purpose of producing a printed image (paper document or photo) from a digital image (provided by a network/card interface) through a marking process.

[1] European Commission DG TREN ErP Preparatory Studies "Imaging Equipment" (LOT 4) Draft Final Report on Task 1

Office Imaging Equipment is also a commercially available product which was designed for the main purpose of producing a digital image from a hard copy through a scanning/copying process. The definition covers products which are marketed as printers, photocopiers and multifunction devices (MFDs). For the purposes of this GSBN, "Office Imaging Equipment" is also used to cover imaging products used in a domestic environment.

- **Printer** is a commercially available imaging product that serves as a hard copy output device, and is capable of receiving information from single-user or networked computers, or other input devices (e.g. digital cameras). The unit must be capable of being powered from a wall outlet or from a data or network connection. The following products covered in this GSBN fall under this category; Laser printers, inkjet printers and dot-matrix printers.

- **Multifunction Devices (MFD)** is a commercially available imaging product which is a physically integrated device or a combination of functionally-integrated components combining two or more of the core functions of copying, printing, scanning, or faxing. The copy functionality as addressed in this definition is considered to be distinct from single sheet convenience copying offered by fax machines. The unit must be capable of being powered from a wall outlet or from a data or network connection. The following products covered in this GSBN fall under this category; Laser MFDs and Inkjet MFDs.

- Each type of imaging product detailed above can employ one or more of the following marketing technologies:

- **Electro Photographic (EP):** EP is a marking technology characterized by illumination of a charged organic photoconductor drum in a pattern representing the desired hard copy image via a light source (typically a Laser or LED). The image is created with particles of (dry) toner using the latent image on the photoconductor to define the presence or absence of toner at a given location. The toner is transferred to the final hard copy medium (typically paper or foil) and cured in a thermal fusing process while applying pressure to cause the desired hard copy to become durable. The process allows a very fast throughput and creation of hardcopy images. EP marking technology is normally applied in medium to high speed printers and copies. Products using EP marking technologies are defined as "thermal" imaging products due to the use of heat in the process. The following products covered in this GSBN fall under this category; Laser printer, laser MFDs and photocopiers.

- **Ink Jet (IJ):** Inkjet (IJ) is a marking technology where images are formed by depositing (jet) colorant (liquid ink) in small drops directly to the print media in a matrix manner. The print head of the inkjet printer scans the page in horizontal strips, using a motor to move it back and forth, as another motor rolls the paper in vertical steps. Products using inkjet marking technologies are normally defined as "non-thermal" imaging products as no heating is required to set the ink on the paper.

- The following products covered in this GSBN utilise inkjet marking technologies; inkjet printers and MFD inkjets.

- **Impact:** A marking technology characterized by the formation of the desired hard copy image by transferring colorant from a "ribbon" to the media via an impact process. Two types of impact technology are Dot Formed Impact and Fully-formed Impact. Products using impact marking technologies are normally defined as "non-thermal" imaging products as no heating is required to set the ink on the paper. The following products covered in this GSBN utilise impact marking technologies; dot-matrix printers.

- Products using EP marking technologies are defined as "thermal" imaging products due to the use of heat in the process. Conversely, products using inkjet or impact marking technologies are normally defined as "non-thermal" imaging products as no heating is required.

| Non-thermal | | | Thermal | | |
|---|---|---|---|---|---|
| Dot-matrix Printer | Inkjet Printer | MFD Inkjet | Laser Printer | MFD Laser | Photo-copier |

# 2 Scenario outputs

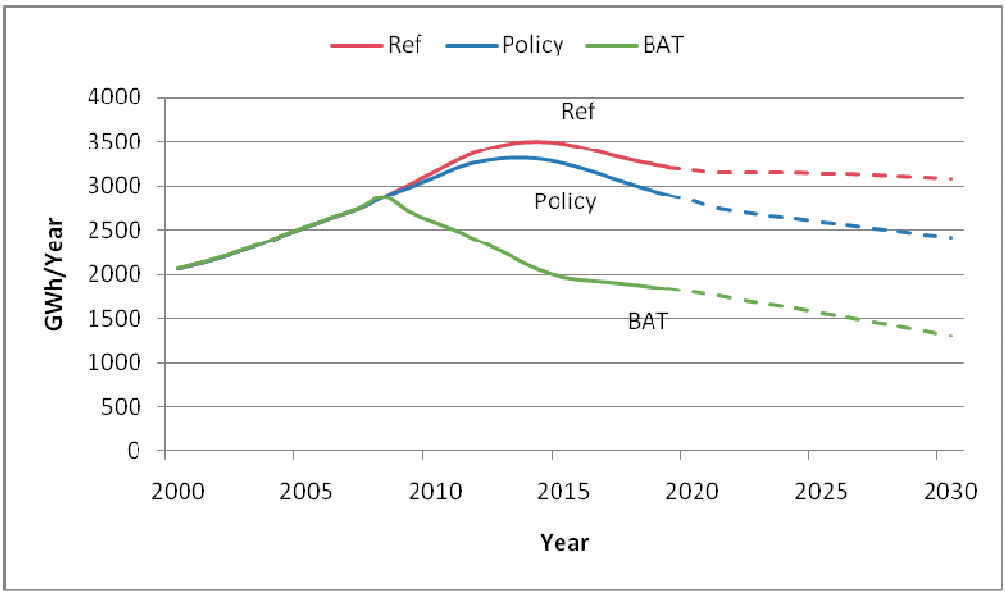


**Figure 1 Total Non-Domestic Imaging Product Energy Consumption**

- Overall energy consumption from non-domestic imaging products in the Reference Scenario is expected to increase until approximately 2013 after which time it will begin to decrease. This decrease is due to both efficiency gains and falling stock.

- Total energy consumption from non-domestic thermal printers in the Reference Scenario is expected to increase in the future until 2014 as a result of increasing stock. Energy consumption after 2014 is expected to decrease as a result of improved product efficiency and slight falls in product stock.

### Table 1 Non-Domestic Imaging Products Energy Consumption[2] and $CO_2$ emissions[3]

| Energy Consumption (GWh) | 2009 | 2020 | 2030 |
|---|---|---|---|
| **Photocopiers** | 160 | 0 | 0 |
| **InkJet MFD** | 170 | 320 | 330 |
| **Laser MFD** | 750 | 1310 | 1510 |
| **Dot Matrix** | 10 | 10 | 0 |
| **InkJet printer** | 180 | 90 | 40 |
| **Laser printer** | 1740 | 1450 | 1200 |
| **TOTAL** | 3020 | 3180 | 3080 |
| **$CO_2$ Emissions ($MtCO_2$)** | | | |
| **Photocopiers** | 0.06 | 0.00 | 0.00 |
| **InkJet MFD** | 0.06 | 0.12 | 0.12 |
| **Laser MFD** | 0.26 | 0.47 | 0.54 |
| **Dot Matrix** | 0.01 | 0.00 | 0.00 |
| **InkJet printer** | 0.07 | 0.03 | 0.01 |
| **Laser printer** | 0.61 | 0.52 | 0.43 |
| **TOTAL** | 1.06 | 1.14 | 1.10 |

[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.

- Total energy consumption from non-domestic inkjet printers is expected to decrease in the future. This decrease is largely as a result of non-domestic purchasers moving away from single function inkjet printers to MFD injkets and MFD Lasers.

- Total energy consumption from non-domestic dot-matrix printers and photocopiers is expected to decrease in the future as a result of falling stock. Dot-matrix printers are expected to be replaced by more common imaging technologies such as laser or inkjet. Photocopiers are expected to be replaced by MFD laser products.

- Total energy consumption from non-domestic laser printers is expected to decrease in the future as a result of falling stock. Stock levels are assumed to fall as domestic purchasers favour MFD laser products over single function laser printers.

- Total energy consumption from domestic MFD lasers is expected to first increase, then decrease and then increase again. The changeable patterns in energy consumption are attributable to increasing stock, increasing efficiency and market shift towards faster products which on average use more energy.

# 3 Current policy & measures

- ENERGY STAR is the dominant energy efficiency policy covering ICT products. The ENERGY STAR label is led by the US Environmental Protection Agency (EPA) but the European Commission has an agreement with the US Government to coordinate the energy labelling of office equipment through an EU ENERGY STAR programme. ENERGY STAR aims to qualify around the top performing 25 per cent of products at the time of specification (usually around nine months to one year prior to a specification coming into effect). Due to the complexity of the programme it is not possible to revise the criteria as frequently as perhaps needed for the fast moving ICT products. This means that compliance rates to ENERGY STAR can be high at the end of a specification cycle.
- The ENERGY STAR V1.0 imaging equipment specification (covering all imaging products included in this briefing note) was finalised in May 2006 and implemented in April 2007. Version 1.1 of the ENERGY STAR imaging equipment specification will be implemented in July 2009. Both specifications are included in the Reference Scenario.

- The Energy Using Products (ErP) Standby Implementing Measures are due to come into force January 2010 at a minimum efficiency performance standard of 1W, with a second tier of requirements due to be enforced January 2013 at 0.5W. The Standby Implementing measures are expected to apply to the off-mode of domestic imaging products. However, many non-domestic products are also marketed as domestic products. For this reason, MTP has assumed that the Standby Implementing Measures will apply to all imaging products.

- Government procurement in the UK currently requires that any imaging products procured 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.

**Table 2 Current policies & measures, Reference Scenario**

| Policy name | Period in force | Description | Impact |
|---|---|---|---|
| ENERGY STAR V1.0 | 2007 | Provides energy efficiency specifications for all imaging products covered in this GSBN. | ENERGY STAR label is set at levels which represent approximately the top 25% of products on the market (averaged across all categories). The large amount of influence associated with ENERGY STAR can, in part, be attributed to the fact that its specifications are mandatory criteria within |

| Policy name | Period in force | Description | Impact |
|---|---|---|---|
| | | | public procurement contracts of some governments. Coverage levels of ENERGY STAR are highly dependent on the type and functionality of products. |
| ENERGY STAR V1.1 | July 2009 – 2013 (estimated) | Provides energy efficiency specifications for all imaging products covered in this GSBN. | See above |
| ErP Standby Implementing Measures | 2010 (Stage 1) and 2013 (Stage 2) | Applies maximum off mode power consumption figures for domestic imaging equipment. | ErP levels of 1W off-mode by 2010 moving to 0.5W off-mode by 2013. Will remove worst performing products in off-mode from the EU market. |
| Government Procurement | 2009 | Applies ENERGY STAR criteria to all central Government procurement | Expected to have a relatively small impact due to use of ENERGY STAR specifications |

### Table 3 Test Standards

| Test Standard name | Date in force | Description | Comments |
|---|---|---|---|
| ENERGY STAR® Qualified Imaging Equipment Typical Electricity Consumption (TEC) Test Procedure (thermal products only) | 2007-2013 (Estimated) | Provides a means for manufacturers to test the Typical Electricity Consumption (TEC) of their equipment, arriving at a kWh/week figure. The methodology includes power testing in each power mode during a standardised use profile which is based on imaging speed and expected daily imaging output. | The use profile included in the ENERGY STAR TEC test procedure is widely understood to over represent actual usage. |
| ENERGY STAR® Qualified Imaging Equipment Operational Mode (OM) Test Procedure (non thermal prodcts only) | 2007-2013 (Estimated) | Provides a standardised method of measuring the sleep and off mode power consumption of Operational Mode (OM) imaging products (as defined under ENERGY STAR). | No usage assumptions are included in this test approach. This test standard does not address active imaging or ready mode. |
| IEC 62301 | 2005 | Provides a measurement method for standby/off-mode power (W) | In the process of being revised. |

## 3.1 Policy timeline

- The following policy timeline identifies when policies come into effect, including future revisions that are formally signed off:

| Policy name | Current spec in force | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016-2020 |
|---|---|---|---|---|---|---|---|---|---|
| ENERGY STAR | July 2007 | Agreed July 2009 | | | | | | | |
| ErP Standby Implementing Measures | 2008 (Agreed) | | Jan (1W) | | | Jan (0.5W) | | | |
| Government Procurement | 2009 | | | | | | | | |

# 4 Efficiency

## 4.1 Summary

- The main energy efficiency metrics for imaging products are those found within the ENERGY STAR label.
- Efficiency metrics for **thermal products are given in average TEC (kWh/week) values** for each speed category (based on images per minute (ipm) rather than as a formula (as provided by ENERGY STAR). MTP has taken this approach as it allows easier comparisons of total energy consumption between the different speed categories.
- Power consumption for **non-thermal products are communicated in Operational Mode (OM) power (W) values** for sleep and off mode as under ENERGY STAR. ENERGY STAR does not currently address the on-ready mode of non-thermal products.

**Table 4 ENERGY STAR TEC Requirements for Standard Sized Laser Printers**

| | Tier I Requirements (ENERGY STAR v1.0) | | Tier II Requirements (ENERGY STAR v1.1) | |
|---|---|---|---|---|
| **Laser Printer Type** | **Speed (ipm)** | **Maximum TEC (kWh/week)** | **Speed (ipm)** | **Maximum TEC (kWh/week)** |
| Mono | ≤ 12 | 1.5 kWh | ≤ 15 | 1.0 kWh |
| | 12 < ipm ≤ 50 | 0.20 kWh/ipm)x – 1 kWh | 15 < x ≤ 40 | (0.10 kWh/ipm)x – 0.5 kWh |
| | > 50 ipm | (0.80 kWh/ipm)x – 31 kWh | 40 < x ≤ 82 | (0.35 kWh/ipm)x – 10.3 kWh |
| | | | > 82 | (0.70 kWh/ipm)x – 39.0 kWh |
| Colour | ≤ 50 | (0.20 kWh/ipm)x + 2 kWh | ≤ 32 | (0.10 kWh/ipm)x + 2.8 kWh |
| | > 50 | (0.80 kWh/ipm)x – 28 kWh | 32 < x ≤ 58 | (0.35 kWh/ipm)x – 5.2 kWh |
| | | | > 58 | (0.70 kWh/ipm)x – 26.0 kWh |

**Table 5 ENERGY STAR TEC Requirements for Standard Sized MFD Laser**

| | Tier I Requirements (ENERGY STAR v1.0) | | Tier II Requirements (ENERGY STAR v1.1) | |
|---|---|---|---|---|
| **MFD Laser Type** | **Speed (ipm)** | **Maximum TEC (kWh/week)** | **Speed (ipm)** | **Maximum TEC (kWh/week)** |
| Mono | ≤20 | (0.20 kWh/ipm)x + 2 kWh | ≤10 | 1.5kWh |
| | 20 < ipm ≤69 | (0.44 kWh/ipm)x -2.8 kWh | 10 < ipm ≤26 | (0.10 kWh/ipm)x +0.5 kWh |
| | >69 | (0.80 kWh/ipm)x -28 kWh | 26< ipm ≤68 | (0.35 kWh/ipm)x -6.0 kWh |
| | | | >68 | (0.70 kWh/ipm)x -30 kWh |
| Colour | ≤32 | (0.20 kWh/ipm)x + 5 kWh | ≤26 | (0.10 kWh/ipm)x + 3.5 kWh |
| | 32 < ipm ≤61 | (0.44 kWh/ipm)x -2.8 kWh | 26 < ipm ≤62 | (0.35 kWh/ipm)x -3.0 kWh |
| | >61 | (0.80 kWh/ipm)x -25 kWh | >62 | (0.70 kWh/ipm)x -25 kWh |

- The ENERGY STAR requirements for non-thermal (OM) products are communicated in power (W) values. The ENERGY STAR sleep mode requirements include additional power allowances for extra functionality such as increased memory or network connectivity options.

**Table 6 ENERGY STAR Sleep Power Requirements for Standard and Small Sized Inkjet Printers and Inkjet MFDs**

| | Tier I Requirements (ENERGY STAR v1.0) | Tier II Requirements (ENERGY STAR v1.1) |
|---|---|---|
| **Product Type & Size Format** | **Sleep (W)** | **Sleep (W)** |
| Standard-size inkjet printers and inkjet MFDs | 3 | 1.4 |
| Small format Inkjet printers | 3 | 9 |

### Table 7 ENERGY STAR Standby Power Requirements for Standard and Small Sized Inkjet Printers and Inkjet MFDs

| | Tier I Requirements (ENERGY STAR v1.0) | Tier II Requirements (ENERGY STAR v1.1) |
|---|---|---|
| **Product Type & Size Format** | **Standby (W)** | **Standby (W)** |
| All small format and standard-size OM products without fax capability | 1 | 1 |
| All small format and standard-size OM products with fax capability | 2 | 1 |
| All large format OM products and mailing machines | N/A | 1 |

### Table 8 Non-Domestic Non-thermal Imaging Product Sleep Mode Power Consumption

| Year | Dot Matrix Printer | Inkjet Printer | MFD Inkjet |
|---|---|---|---|
| | Sleep (W) | Sleep (W) | Sleep (W) |
| 2009 | 13.1 | 11.4 | 4.7 |
| 2010 | 12.8 | 10.5 | 4.2 |
| 2011 | 12.5 | 9.5 | 3.8 |
| 2012 | 12.2 | 8.6 | 3.4 |
| 2013 | 12.2 | 8.6 | 3.4 |
| 2014 | 12.2 | 8.6 | 3.4 |
| 2015 | 12.2 | 8.6 | 3.4 |
| 2016 | 12.2 | 8.6 | 3.4 |
| 2017 | 12.2 | 8.6 | 3.4 |
| 2018 | 12.2 | 8.6 | 3.4 |
| 2019 | 12.2 | 8.6 | 3.4 |
| 2020 | 12.2 | 8.6 | 3.4 |
| 2021 | 12.2 | 8.6 | 3.4 |
| 2022 | 12.2 | 8.6 | 3.4 |
| 2023 | 12.2 | 8.6 | 3.4 |
| 2024 | 12.2 | 8.6 | 3.4 |
| 2025 | 12.2 | 8.6 | 3.4 |
| 2026 | 12.2 | 8.6 | 3.4 |
| 2027 | 12.2 | 8.6 | 3.4 |
| 2028 | 12.2 | 8.6 | 3.4 |
| 2029 | 12.2 | 8.6 | 3.4 |

| Year | Dot Matrix Printer | Inkjet Printer | MFD Inkjet |
|---|---|---|---|
| | Sleep (W) | Sleep (W) | Sleep (W) |
| 2030 | 12.2 | 8.6 | 3.4 |

- The average sleep-mode of inkjet printers, inkjet MFDs and dot-matrix printers has fallen in recent years. It is expected that the sleep-mode power consumption of these devices will not decrease any further into the future past 2012 due to no policy having an influence.

- The average off-mode of inkjet printers and inkjet MFDs has fallen in recent years. Off-mode power requirements will continue to fall in relation to the ErP Standby Implementing Measures in 2010 and 2013. Further decreases in off-mode power consumption are not expected post 2013.

- The average off-mode of dot-matrix printers has increased in recent years. No further changes are expected as off-mode power is already below limits found in the ErP Standby Implementing Measures.

## Table 9 Non-Domestic Laser Printer TEC Requirements

| Year | Laser Printer | | | | | |
|---|---|---|---|---|---|---|
| | ≤ 15ipm Mono | >15 ipm ≤ 40 Mono | >40 ipm ≤ 82 Mono | > 82ipm Mono | ≤ 32ipm Colour | >32 ipm ≤ 58 Colour |
| | TEC (kWh/week) | TEC (kWh/week) | TEC (kWh/week) | TEC (kWh/week) | TEC (kWh/week) | TEC (kWh/week) |
| 2009 | 0.6 | 3.4 | 7.7 | 62.3 | 5.2 | 9.6 |
| 2010 | 0.6 | 3.2 | 7.3 | 62.6 | 4.9 | 9.2 |
| 2011 | 0.6 | 3.0 | 6.9 | 62.9 | 4.6 | 8.9 |
| 2012 | 0.6 | 2.9 | 6.5 | 63.2 | 4.3 | 8.6 |
| 2013 | 0.6 | 2.7 | 6.1 | 63.4 | 4.1 | 8.3 |
| 2014 | 0.6 | 2.5 | 5.8 | 63.6 | 4.0 | 8.0 |
| 2015 | 0.6 | 2.4 | 5.4 | 63.9 | 3.8 | 7.8 |
| 2016 | 0.6 | 2.2 | 5.1 | 64.1 | 3.6 | 7.5 |
| 2017 | 0.6 | 2.2 | 5.1 | 65.3 | 3.5 | 7.6 |
| 2018 | 0.6 | 2.2 | 5.1 | 66.6 | 3.5 | 7.6 |
| 2019 | 0.6 | 2.1 | 5.1 | 67.8 | 3.5 | 7.7 |
| 2020 | 0.6 | 2.1 | 5.1 | 69.0 | 3.4 | 7.8 |
| 2021 | 0.6 | 2.1 | 5.1 | 70.2 | 3.4 | 7.8 |
| 2022 | 0.6 | 2.1 | 5.1 | 71.4 | 3.3 | 7.9 |
| 2023 | 0.6 | 2.1 | 5.1 | 72.6 | 3.3 | 8.0 |
| 2024 | 0.6 | 2.0 | 5.1 | 73.8 | 3.2 | 8.0 |
| 2025 | 0.6 | 2.0 | 5.1 | 75.1 | 3.2 | 8.1 |
| 2026 | 0.6 | 2.0 | 5.1 | 76.3 | 3.1 | 8.1 |
| 2027 | 0.6 | 2.0 | 5.1 | 77.5 | 3.1 | 8.2 |
| 2028 | 0.6 | 2.0 | 5.1 | 78.7 | 3.0 | 8.3 |
| 2029 | 0.6 | 1.9 | 5.1 | 79.9 | 3.0 | 8.3 |
| 2030 | 0.6 | 1.9 | 5.1 | 81.1 | 2.9 | 8.4 |

- The average TEC values of mono laser printers (in the speed category of less than 15 ipm and of more than 82ipm) are expected to increase slightly in the future. This increase is based on the average increase seen in the EU ENERGY STAR database over the period of 1 year (end of 2007 to end of 2008).

- The average TEC values of mono laser printers (speed categories of 15 to 40 ipm and 40 to 82 ipm) and of colour laser printers (speed categories of less than 32 ipm and 32 to 58ipm) are expected to decrease in the future. This decrease is based on the average decrease seen in the EU ENERGY STAR database over the period of 1 year (end of 2007 to end of 2008).

**Table 10 Non-Domestic Laser MFD TEC Requirements**

| | Laser MFD | | | | | |
|---|---|---|---|---|---|---|
| | >10 ipm ≤ 26 Mono | >26 ipm ≤ 68 Mono | > 68 ipm Mono | ≤26 ipm Colour | >26 ipm ≤62 Colour | >62ipm Colour |
| Year | TEC (kWh/week) | TEC (kWh/week) | TEC (kWh/week) | TEC (kWh/week) | TEC (kWh/week) | TEC (kWh/week) |
| 2009 | 3.0 | 12.2 | 28.8 | 9.8 | 13.4 | 18.2 |
| 2010 | 2.8 | 11.0 | 27.2 | 8.6 | 12.3 | 17.3 |
| 2011 | 2.5 | 9.8 | 25.5 | 7.3 | 11.2 | 16.3 |
| 2012 | 2.3 | 8.7 | 23.9 | 6.1 | 10.1 | 15.4 |
| 2013 | 2.1 | 8.0 | 23.6 | 5.5 | 9.3 | 15.1 |
| 2014 | 1.9 | 7.4 | 23.2 | 4.9 | 8.6 | 14.9 |
| 2015 | 1.7 | 6.8 | 22.8 | 4.4 | 7.8 | 14.6 |
| 2016 | 1.6 | 6.2 | 22.5 | 3.8 | 7.1 | 14.3 |
| 2017 | 1.6 | 6.1 | 22.4 | 3.8 | 7.0 | 14.3 |
| 2018 | 1.6 | 6.1 | 22.2 | 3.7 | 6.9 | 14.3 |
| 2019 | 1.6 | 6.1 | 22.1 | 3.7 | 6.9 | 14.4 |
| 2020 | 1.6 | 6.1 | 22.0 | 3.7 | 6.8 | 14.4 |
| 2021 | 1.6 | 6.1 | 21.8 | 3.7 | 6.7 | 14.4 |

| Year | Laser MFD | | | | | |
|---|---|---|---|---|---|---|
| | >10 ipm ≤ 26 Mono | >26 ipm ≤ 68 Mono | > 68 ipm Mono | ≤26 ipm Colour | >26 ipm ≤62 Colour | >62ipm Colour |
| | TEC (kWh/week) | TEC (kWh/week) | TEC (kWh/week) | TEC (kWh/week) | TEC (kWh/week) | TEC (kWh/week) |
| 2022 | 1.6 | 6.1 | 21.7 | 3.6 | 6.7 | 14.4 |
| 2023 | 1.7 | 6.1 | 21.6 | 3.6 | 6.6 | 14.4 |
| 2024 | 1.7 | 6.1 | 21.4 | 3.6 | 6.5 | 14.5 |
| 2025 | 1.7 | 6.0 | 21.3 | 3.5 | 6.5 | 14.5 |
| 2026 | 1.7 | 6.0 | 21.1 | 3.5 | 6.4 | 14.5 |
| 2027 | 1.7 | 6.0 | 21.0 | 3.5 | 6.4 | 14.5 |
| 2028 | 1.7 | 6.0 | 20.9 | 3.5 | 6.3 | 14.6 |
| 2029 | 1.8 | 6.0 | 20.7 | 3.4 | 6.2 | 14.6 |
| 2030 | 1.8 | 6.0 | 20.6 | 3.4 | 6.2 | 14.6 |

- The average TEC values of MFD Lasers (for speed categories >26 ipm ≤ 68 mono, > 68 ipm mono, ≤26 ipm colour and >26 ipm ≤62 colour*)* are expected to decrease into the future. This decrease in based on the average increase seen in the EU ENERGY STAR database over the period of 1 year (end of 2007 to end of 2008).

- The average TEC values of MFD Lasers (for speed category >10 ipm ≤ 26 mono) are expected to decrease into the future until 2019 and then start to increase up to 2030. This increase in based on the average change seen in the EU ENERGY STAR database over the period of 1 year (end of 2007 to end of 2008).

- The average TEC values of MFD Lasers (for speed category >62ipm colour) are expected to decrease into the future until 2018 and then start to increase up to 2030. This increase in based on the average change seen in the EU ENERGY STAR database over the period of 1 year (end of 2007 to end of 2008).

## Table 11 Non-Domestic Photocopier TEC Requirements

| Year | Photocopier | | | | | | |
|---|---|---|---|---|---|---|---|
| | ≤ 15ipm Mono | >15 ipm ≤ 40 Mono | >40 ipm ≤ 82 Mono | > 82ipm Mono | ≤ 32ipm Colour | >32 ipm ≤ 58 Colour | ≤ 58 Colour |
| | TEC (kWh/week) | TEC (kWh/week) | TEC (kWh/week) | TEC (kWh/week) | TEC (kWh/week) | TEC (kWh/week) | TEC (kWh/week) |
| 2009 | 1.0 | 4.8 | 14.7 | 27.7 | 12.9 | 11.9 | 20.7 |
| 2010 | 1.0 | 4.2 | 13.7 | 27.7 | 10.7 | 11.3 | 20.3 |
| 2011 | 1.0 | 3.7 | 12.7 | 27.7 | 8.5 | 10.7 | 19.9 |
| 2012 | 1.0 | 3.1 | 11.7 | 27.7 | 6.2 | 10.1 | 19.5 |
| 2013 | 0.9 | 2.6 | 10.6 | 27.7 | 5.8 | 9.3 | 19.0 |
| 2014 | 0.9 | 2.2 | 9.5 | 27.7 | 5.3 | 8.4 | 18.5 |
| 2015 | 0.9 | 1.7 | 8.4 | 27.7 | 4.8 | 7.6 | 18.1 |
| 2016 | 0.9 | 1.2 | 7.2 | 27.7 | 4.3 | 6.7 | 17.6 |
| 2017 | 0.9 | 1.3 | 7.2 | 29.1 | 4.6 | 7.2 | 17.6 |
| 2018 | 0.9 | 1.5 | 7.2 | 30.6 | 4.9 | 7.8 | 17.6 |
| 2019 | 0.9 | 1.6 | 7.2 | 32.1 | 5.2 | 8.3 | 17.6 |
| 2020 | 0.9 | 1.7 | 7.2 | 33.6 | 5.5 | 8.8 | 17.6 |
| 2021 | 0.9 | 1.8 | 7.2 | 35.1 | 5.8 | 9.4 | 17.6 |
| 2022 | 0.9 | 1.9 | 7.2 | 36.5 | 6.1 | 9.9 | 17.6 |
| 2023 | 0.9 | 2.0 | 7.2 | 38.0 | 6.4 | 10.5 | 17.6 |
| 2024 | 0.9 | 2.1 | 7.2 | 39.5 | 6.7 | 11.0 | 17.6 |
| 2025 | 0.9 | 2.2 | 7.2 | 41.0 | 7.0 | 11.0 | 17.6 |
| 2026 | 0.9 | 2.3 | 7.2 | 42.5 | 7.3 | 11.0 | 17.6 |
| 2027 | 0.9 | 2.4 | 7.2 | 43.9 | 7.6 | 11.0 | 17.6 |
| 2028 | 0.9 | 2.5 | 7.2 | 45.4 | 7.9 | 11.0 | 17.6 |
| 2029 | 0.9 | 2.6 | 7.2 | 46.9 | 8.2 | 11.0 | 17.6 |
| 2030 | 0.9 | 2.6 | 7.2 | 48.4 | 8.5 | 11.0 | 17.6 |

- The average TEC values of photocopiers (for speed categories >10 ipm Mono, >40 ipm ≤ 82 Mono and ≤ 58 Colour) are expected to decrease into the future. This decrease in based on the average increase seen in the EU ENERGY STAR database over the period of 1 year (end of 2007 to end of 2008). All other photocopier categories are expected to have increased TEC values into the future. All changes are based on the average differences seen in the EU ENERGY STAR database over the period of 1 year (end of 2007 to end of 2008).

## 4.2 Data sources – efficiency

**Table 12 Efficiency data sources – Inkjet Printer**

| Year | Reference | Reference date | Author | Justification | Confidence in sources (High/Low) |
|---|---|---|---|---|---|
| 2008 | Printer Manufacturer Data - Downloaded 01/07 | 2007 | Various manufacturers | Best Data Available | Medium |
| 2008 | MFD Manufacturers Data - Downloaded 01/07 | 2007 | Various manufacturers | Best Data Available | Medium |
| 2008 | Manufacturers' Data 07-02-08 | 2008 | Various manufacturers | Best Data Available | Medium |
| 2008 | US OM Data Set Oct 08 | 2008 | ENERGY STAR | Best Data Available | Medium |
| 2008 | Manufacturer Data Downloaded July 2008 | 2008 | Various manufacturers | Best Data Available | Medium |
| 2008 | US Energy Star database FTP Download 20.07.06 | 2006 | ENERGY STAR | Best Data Available | Medium |
| 2008 | EU Energy Star database website download 07/12/06 | 2006 | ENERGY STAR | Best Data Available | Medium |
| 2008 | EPA Energy Star Current Data 27-10-06 | 2006 | ENERGY STAR | Best Data Available | Medium |
| 2008 | EU ENERGY STAR database download 29-10-08 | 2008 | ENERGY STAR | Best Data Available | High |
| 2008 | STD FORMAT EU Energy Star Database 14-01-08 | 2008 | ENERGY STAR | Best Data Available | High |
| 2008 | LARGE FORMAT EU Energy Star Database 14-01-08 | 2008 | ENERGY STAR | Best Data Available | High |
| 2008 | EU ENERGY STAR DB download 29-10-08 (Standard Size) | 2008 | ENERGY STAR | Best Data Available | High |
| 2008 | EU ENERGY STAR DB download 29-10-08 (Large Format) | 2008 | ENERGY STAR | Best Data Available | High |
| 2008 | US OM Data Set Oct 08 (Standard Size) | 2008 | ENERGY STAR | Best Data Available | High |
| 2008 | US OM Data Set Oct 08 (Large Format) | 2008 | ENERGY STAR | Best Data Available | High |
| 2008 | US ENERGY STAR Download | 2008 | ENERGY | Best Data | High |

| Year | Reference | Reference date | Author | Justification | Confidence in sources (High/Low) |
|---|---|---|---|---|---|
| | EU&UK Oct-08 (Standard Size) | | STAR | Available | |
| 2008 | US ENERGY STAR Download EU&UK Oct-08 (Large Format) | 2008 | ENERGY STAR | Best Data Available | High |
| 2008 | EU Energy Star Database 14-01-08 | 2008 | ENERGY STAR | Best Data Available | High |
| 1999, 2007, 2012, 2013, 2016, 2020 | Expert assumptions | 2009 | MTP Technical Expert | Expert assumptions required to collate power figures in Reference, Policy and BAT scenarios. | Medium |

**Table 13 Efficiency data sources – MFD Inkjet**

| Year | Reference | Reference date | Author | Justification | Confidence in sources (High/Low) |
|---|---|---|---|---|---|
| 2008 | US OM Data Set Oct 08 | 2008 | ENERGY STAR | Best Data Available | High |
| 2006 | Energy Star FTP Download 13-10-06 | 2006 | ENERGY STAR | Best Data Available | High |
| 2008 | EU Energy Star Database Download 14-01-08 | 2008 | ENERGY STAR | Best Data Available | High |
| 2008 | Manufacturers' Data March 2008 | 2008 | ENERGY STAR | Best Data Available | Medium |
| 2008 | EU ENERGY STAR DB download 29-10-08 | 2008 | ENERGY STAR | Best Data Available | High |
| 2008 | US ESTAR Download EU&UK Oct-08 | 2008 | ENERGY STAR | Best Data Available | High |
| 2008 | Manufacturer Data Downloaded July 2008 | 2008 | Various manufacturers | Best Data Available | High |
| 2008 | Manufacturers' Downloaded Data March 2008 | 2008 | Various manufacturers | Best Data Available | Medium |
| 1999, 2000, 2007, 2012, 2016, 2020 | Expert assumptions | 2009 | MTP Technical Expert | Expert assumptions required to collate power figures in Reference, Policy and BAT scenarios. | Medium |

### Table 14 Efficiency data sources – Dot-matrix Printer

| Year | Reference | Reference date | Author | Justification | Confidence in sources (High/Low) |
|---|---|---|---|---|---|
| 2008 | Energy Star OM Data Corresponding to the Final Version 1.0 Specification - May 3, 2006 | 2006 | Various manufacturers | Best Data Available | Medium |
| 2008 | EU Energy Star Database 14-01-08 | 2008 | See Inkjet model | Best Data Available | High |
| 2008 | EU ENERGY STAR DB download 29-10-08 | 2008 | Various manufacturers | Best Data Available | Medium |
| 2008 | US OM Data Set Oct 08 | 2008 | ENERGY STAR | Best Data Available | High |
| 2008 | US ESTAR Download EU&UK Oct-08 | 2008 | ENERGY STAR | Best Data Available | High |
| 1993, 2000, 2006, 2007, 2013, 2012, 2016 | Expert assumptions | 2009 | MTP Technical Expert | Expert assumptions required to collate power figures in Reference, Policy and BAT scenarios. | Medium |

### Table 15 Efficiency data sources – Laser Printer

| Year | Reference | Reference date | Author | Justification | Confidence in sources (High/Low) |
|---|---|---|---|---|---|
| 2008 | EU DL Mono Laser Jan-08 | 2008 | ENERGY STAR | Best Data Available | High |
| 2008 | US ES dl Mono Laser EU Oct-08 | 2008 | ENERGY STAR | Best Data Available | High |
| 2008 | US ES Mono download Laser UK Oct-08 | 2008 | ENERGY STAR | Best Data Available | High |
| 2008 | EU NOV 08 Mono | 2008 | ENERGY STAR | Best Data Available | High |
| 2006 | US TEC Laser Mono Dataset 2006 | 2006 | ENERGY STAR | Best Data Available | High |
| 2008 | US Mono Laser 230-Oct-08 | 2008 | ENERGY STAR | Best Data Available | High |
| 2009 | EU NOV 09 Mono | 2009 | ENERGY STAR | Best Data Available | High |
| 2008 | US TEC Laser Colour Dataset 2006 | 2006 | ENERGY STAR | Best Data Available | High |
| 2008 | EU DL Col Laser Jan-08 | 2008 | ENERGY STAR | Best Data Available | High |
| 2008 | US Col Laser 230-Oct-08 | 2008 | ENERGY STAR | Best Data Available | High |
| 2008 | US ES dl Col Laser EU Oct-08 | 2008 | ENERGY | Best Data | High |

| Year | Reference | Reference date | Author | Justification | Confidence in sources (High/Low) |
|---|---|---|---|---|---|
| | | | STAR | Available | |
| 2008 | US ES Col dl Laser UK Oct-08 | 2008 | ENERGY STAR | Best Data Available | High |
| 2008 | EU NOV 09 Col | 2009 | ENERGY STAR | Best Data Available | High |
| 2007, 2012, 2016, 2020, 2024, 2028, 2032 | Expert assumptions | 2009 | MTP Technical Expert | Expert assumptions required to collate power figures in Reference, Policy and BAT scenarios. | Medium |

**Table 16 Efficiency data sources – MFD Laser**

| Year | Reference | Reference date | Author | Justification | Confidence in sources (High/Low) |
|---|---|---|---|---|---|
| 2008 | EU ENERGY STAR DB download 29-10-08 | 2008 | ENERGY STAR | Best Data Available | High |
| 2008 | US ENERGY STAR Dataset October 2008 | 2008 | ENERGY STAR | Best Data Available | High |
| 2008 | US ESTAR Download EU Oct-08 | 2008 | ENERGY STAR | Best Data Available | High |
| 2008 | US ESTAR Download UK Oct-08 | 2008 | ENERGY STAR | Best Data Available | High |
| 2006 | ES TEC Dataset 2006 | 2006 | ENERGY STAR | Best Data Available | High |
| 2007, 2012, 2016, 2020, 2024, 2028, 2032 | Expert assumptions | 2009 | MTP Technical Expert | Expert assumptions required to collate power figures in Reference, Policy and EBP lines. | Medium |

**Table 17 Efficiency data sources – Photocopiers**

| Year | Reference | Reference date | Author | Justification | Confidence in sources (High/Low) |
|---|---|---|---|---|---|
| 2008 | US ES dl Mono Copier EU Oct-08 | 2008 | ENERGY STAR | Best Data Available | High |
| 2008 | US ES Mono dl Copier UK Oct-08 | 2008 | ENERGY STAR | Best Data Available | High |
| 2008 | EU NOV 08 Mono | 2008 | ENERGY STAR | Best Data Available | High |

| Year | Reference | Reference date | Author | Justification | Confidence in sources (High/Low) |
|---|---|---|---|---|---|
| 2008 | US TEC Copier Mono Dataset 2006 | 2006 | ENERGY STAR | Best Data Available | High |
| 2006 | EU DL Mono Copier Jan-08 | 2008 | ENERGY STAR | Best Data Available | High |
| 2008 | US Mono Copier 230-Oct-08 | 2008 | ENERGY STAR | Best Data Available | High |
| 2009 | EU NOV 09 Mono | 2009 | ENERGY STAR | Best Data Available | High |
| 2008 | US ES Col dl Copier UK Oct-08 | 2008 | ENERGY STAR | Best Data Available | High |
| 2008 | EU DL Col Copier Jan-08 | 2008 | ENERGY STAR | Best Data Available | High |
| 2008 | US ES dl Col Copier EU Oct-08 | 2008 | ENERGY STAR | Best Data Available | High |
| 2008 | EU NOV 09 Col | 2009 | ENERGY STAR | Best Data Available | High |
| 2008 | US TEC Copier Col Dataset 2006 | 2006 | ENERGY STAR | Best Data Available | High |
| 2008 | US Col Copier 230-Oct-08 | 2008 | ENERGY STAR | Best Data Available | High |
| 2009 | Expert Assumptions | 2009 | MTP Technical Expert | Expert assumptions required to collate power figures. | Medium |

## 4.3 Methodology & key assumptions – efficiency

### 4.3.1 Historic data

**Table 18 Interpolation & background calculations – efficiency**

| Year | Methodology & assumptions |
|---|---|
| 2007 | All non-thermal imaging products (all power modes): Reference scenario power figures for all imaging products are based on a weighted average of all datasets listed in section 4.2. Datasets are added to an Excel toolkit where they are assessed. Datasets are weighted to take account of confidence in data source (which organisation published the data), data year, size of dataset, country of origin and relevance to domestic or non-domestic sector. The individual model weighted average figures from each of the datasets are then combined to arrive at an overall domestic and non-domestic average figure. These 2007 figures are then used as a benchmark from which future products performance values are derived. |
| 2008 | All imaging products - Reference scenario power figures for all imaging products are based on a weighted average of all datasets listed in section 4.2. Datasets are added to an Excel toolkit where they are assessed. Datasets are weighted to take account of confidence in data source (which organisation published the data), data year, size of dataset, country of origin and relevance to domestic or non-domestic sector. The individual model weighted average figures from each of the datasets are then combined to arrive at an overall domestic and non-domestic average figure. These 2008 figures are then used as a benchmark from which |

| Year | Methodology & assumptions |
|---|---|
| | future products performance values are derived. |
| 2007 | Thermal products - due to the lack of historic data on TEC values it has been necessary to interpolate the 2008 figures for each year prior. |
| 1960-2006 | Thermal products – use the 2007 figures as described above |
| 1993 | Inkjet printer (on-ready mode) – power consumption assumed to be 10W. This is based on an expert assumption in light of not further information being available. |
| 1960 – 1993 | Inkjet printer (on-ready mode) – these years are deemed to be the same as the 1993 value. This is based on an expert assumption as no further data was available. |
| 1994 -2006 | Inkjet printer (on-ready mode) – based on a straight line interpolation between the 1993 and 2007 values. |
| 1985 | Inkjet printer (sleep mode) – power level assumed to be 5W. This is based on an expert assumption due to lack of any other data. |
| 1960 – 1984 | Inkjet printer (sleep mode) – these years are deemed to be the same as the 1993 value. This is based on an expert assumption as no further data was available. |
| 1986 - 2006 | Inkjet printer (sleep mode) – based on a straight line interpolation between the 1993 and 2007 values. |
| 1999 | Inkjet printer (off mode) – assumed to be at 2W. This figure is based on an expert assumption in light of no further data being available. |
| 1960 - 1998 | Inkjet printer (off mode) – these years are deemed to be the same as the 1993 value. This is based on an expert assumption as no further data was available |
| 2000 – 2006 | Inkjet printer (off mode) - based on a straight line interpolation between the 1993 and 2007 values. |
| 2000 | MFD inkjet (on-ready mode) – assumed to be 25.5W. This value is based on an expert assumption as no further data was available. |
| 1960 - 1999 | MFD inkjet (on-ready mode) – these years are deemed to be the same as the 2000 value. This is based on an expert assumption as no further data was available. |
| 2001 - 2006 | MFD inkjet (on-ready mode) – based on a straight line interpolation between the 2000 and 2007 values. |
| 1999 | MFD inkjet (sleep mode) – assumed to be 22.5W. This value is an expert assumption which was made as no further information was available. |
| 1960 - 1998 | MFD inkjet (sleep mode) – these years are deemed to be the same as the 1999 value. This is based on an expert assumption as no further data was available. |
| 2000 – 2006 | MFD inkjet (sleep mode) based on a straight line interpolation between the 2000 and 2007 values. |
| 2000 | MFD inkjet (off mode) – this value (2.9W) is based on an expert assumption as no further data was available. |
| 1960 - 1999 | MFD inkjet (off mode) – these years are deemed to be the same as the 2000 value. This is based on an expert assumption as no further data was available. |
| 2001-2006 | MFD inkjet (off mode) – based on a straight line interpolation between the 2000 and 2007 values |
| 1993 | Dot-matrix (on-ready and sleep mode) – these values (40W on-ready and 20W sleep mode) are based on an expert assumption as no further data was available. |
| 1960-1992 | Dot-matrix (on-ready and sleep mode) - these years are deemed to be the same as the 1993 value. This is based on an expert assumption as no further data was available |
| 1994-2006 | Dot-matrix (on-ready and sleep mode) - based on a straight line interpolation between the 1993 and 2007 values |
| 2000 | Dot-matrix (off mode) - assumed to be 0W. This value is an expert assumption which was made as no further information was available. |

### 4.3.2 Future analysis

**Table 19 Extrapolation & background calculations – efficiency**

| Year | Methodology & assumptions |
|---|---|
| 2009-2011<br>2013 – 2015<br>2021 – 2023<br>2025 – 2027<br>2019 – 2031 | All thermal products: These years are based on a straight line interpolation between the adjacent years' figures. |
| 2012 | All thermal products: The 2012 figures are based on an assumed distribution of products which meet the average 2008 figure and the current ENERGY STAR specification level (see Policy scenario GSBN for details about how the ENERGY STAR levels are calculated). The distribution rates are based on an assumed percentage of products on the market which meet the ENERGY STAR specifications. The percentages of products not meeting the ENERGY STAR specifications are assumed to perform at the 2008 average figure. The assumed ENERGY STAR coverage rates are shown in the Policy scenario GSBN. |
| 2016 | All thermal products: The 2016 level is assumed to match the 2009 ENERGY STAR specification i.e. all products are assumed to be performing at their respective 2009 ENERGY STAR specification level. |
| 2020<br>2024<br>2028<br>2032 | All thermal products: The TEC values for each year are based on the value four years in the past plus an average increase or decrease figure derived from the TEC values (for each speed category) in the EU ENERGY STAR database (2008 to 2009). |

**Table 20 Extrapolation & background calculations – non-thermal efficiency**

| Year | Methodology & assumptions |
|---|---|
| 2009-2011 | Inkjet printer and MFD inkjet (sleep modes) - these years are based on a straight line interpolation between the adjacent years' figures. |
| 2009-2030 | MFD inkjet and inkjet printer (on-ready mode) – all values match the 2008 level. This is an expert assumption as no further evidence was available. Based on the assumption that there are no future policies which will tackle sleep mode power. |
| 2012 | MFD inkjet and inkjet printer (sleep mode) - the 2012 figures are based on an assumed distribution of products meeting the ENERGY STAR and Reference scenario values |
| 2013-2030 | MFD inkjet (sleep mode) - values for these years assumed to match the 2012 value at 3.4 W as no further improvements assumed to be possible without further policy intervention. |
| 2013-2030 | Inkjet printer (sleep mode) - values for these years assumed to match the 2012 value at 8.6 W as no further improvements assumed to be possible without further policy intervention. |
| 2009-2012 | MFD inkjet (off mode) – these years are based on a straight line interpolation between the adjacent years' figures. |
| 2009-2012 | Inkjet printer (off mode) - values for these years assumed to match the 2008 value as no further improvements assumed to be possible without further policy intervention. |
| 2013 | MFD inkjet and inkjet printer (off-mode) - ErP Implementing Measure of 0.5W enforced. |
| 2014 - 2030 | MFD inkjet and inkjet printer (off-mode) - values for these years assumed to match the 2013 value at 0.5 W as no further improvements assumed to be possible. |
| 2009 - 2030 | Dot-matrix (on-ready mode) – all figures same as in 2008. |

| Year | Methodology & assumptions |
|---|---|
| 2009 - 2011 | Dot-matrix printer (sleep mode) – these years are based on a straight line interpolation between the adjacent years' figures. |
| 2012 | Dot-matrix printer (sleep mode) - the 2012 figures are based on an assumed distribution of products meeting the ENERGY STAR 2007 and 2009 specification levels (see Policy scenario GSBN for details about how the ENERGY STAR levels are calculated). The remaining (25%) products are assumed to meet the 2008 Reference scenario value. This is based on an expert assumption in light of no further evidence being available. |
| 2013 - 2030 | Dot-matrix printer (sleep mode) – all values match the 2012 level. This is an expert assumption as no further evidence was available. Based on the assumption that there are no future policies which will tackle sleep mode power. |
| 2009 | Dot-matrix printer (off mode) - based on a straight line interpolation between the adjacent years' figures. |
| 2010, 2013 | Dot-matrix printer (off mode) – ErP implementing measure included at 1W in 2010 and 0.5 W in 2013 |
| 2009 - 2030 | Dot-matrix printer (off mode) all values match the 2008 level. This is an expert assumption as no further evidence was available. Based on the assumption that there are no future policies which will tackle sleep mode power. |

## 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 21 Data issues – efficiency**

| Issue/risk | Approach taken/rationale |
|---|---|
| Much of the power data sourced for thermal imaging products comes from products compliant to ENERGY STAR. There is a risk that the average figures could be too low in relation to the "true" market average. | MTP has used non-compliant values for products listed in the ENERGY STAR specification development process when determining the 2008 average efficiency figure. MTP could conduct more testing in future of non-ENERGY STAR compliant products. |
| On-ready mode power consumption of non-thermal imaging products is not covered under the ENERGY STAR programme. Data for this power mode of non-thermal products is therefore primarily sourced from manufacturers' declarations. Data included in these manufacturer declarations could be less reliable than data found in government programme databases (due in part to non-standardisation of test methodologies used). | MTP has attempted to source on-ready power consumption data from various manufacturers (from websites and supplier declarations). It is assumed that collecting data from a number of manufacturers has helped to reduce any potential errors. |
| ErP Implementing Measures for off-mode of thermal products has not been considered in the MTP modelling due to a lack of data. The lack of data is due to the fact that under ENERGY STAR off-mode power consumption is included within the TEC methodology and there | MTP has not modelled the off-mode of thermal products separately due to the lack of data. Off-mode power consumption is an integrated part of the TEC test methodology and so off-mode power is considered within the MTP figures. MTP might consider further investigations surrounding off-mode power consumption of the thermal imaging devices in |

| Issue/risk | Approach taken/rationale |
|---|---|
| are no requirements to communicate off-mode power consumption figures separately. | the future. |
| The 2010 and 2013 ErP Implementing Measures for off-mode have been applied across all inkjet printers and inkjet MFDs at 1W and 0.5W respectively. There is a possibility that some of these products will not need to comply with the off-mode requirements as listed under the ErP implementing measures. | MTP has applied the ErP Implementing Measures for off-mode across all non-thermal products. MTP will reassess this assumption as the implementation of the ErP measures progresses and more information becomes available. |

## 4.5 Confidence level – efficiency

- Confidence in the thermal imaging product data is generally low. There is a possibility that heavy reliance on ENERGY STAR data could result in the Reference scenario assumptions being too low.
- Confidence levels in the on-ready mode for non-thermal (OM) products is generally low due to the reliance on manufacturer declared data that has not been independently verified or that might not have been measured according to a standard methodology. Confidence levels for other non-thermal (OM) power modes are higher but could also be subject to ENERGY STAR bias.

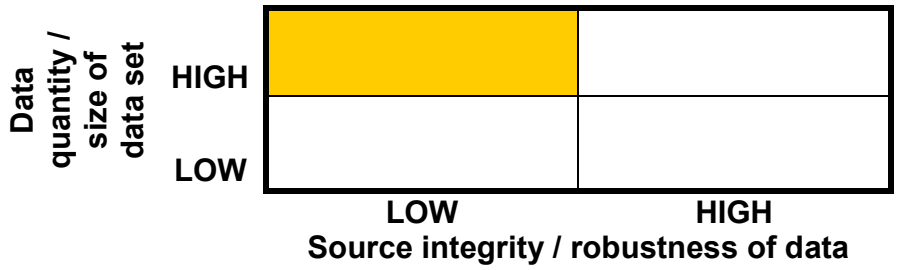


**Figure 4 Confidence indicator for efficiency data**

# 5 Usage

## 5.1 Summary

- This section of the GSBN details the usage assumptions included for the **non-thermal imaging products**.
- Thermal products are included under the TEC approach and therefore their usage is integral to the efficiency metrics section and cannot be drawn out in detail separately The TEC approach under ENERGY STAR for thermal imaging products is based on an expected use profile (based on speed and colour) for a week's use. The TEC use profile under ENERGY STAR reflects an assumed usage pattern across all power modes in a non-domestic environment. MTP has adapted the TEC use profile to better reflect assumed usage of thermal imaging products in the domestic environment.
- Two sets of use profiles are developed for non-thermal imaging products. 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.
- The table below shows average usage profiles, derived from the Reference scenario enabling rate and the power managed and non power managed profiles discussed in the Key Inputs Briefing Note.
- The TEC approach under ENERGY STAR for thermal imaging products is based on an expected use profile (based on speed and colour) for a week's use. MTP has adjusted the TEC use profile to better reflect assumed usage of thermal imaging products. Details can be found in the Key Inputs GSBN.

**Table 22 Average Usage – Inkjet Printers and MFD inkjets**

| | Inkjet Printer | | | | |
|---|---|---|---|---|---|
| | Reference (Use Hours/Year | | | | Power Management Enabling Rates |
| Year | On-Ready | Sleep | Off | Off-Unplugged | % |
| 2008 | 906 | 1134 | 6720 | 0 | 80 |
| 2010 | 906 | 1134 | 6720 | 0 | 80 |
| 2020 | 906 | 1134 | 6720 | 0 | 80 |
| 2030 | 906 | 1134 | 6720 | 0 | 80 |

**Table 23 Average Usage – Dot Matrix Printer**

| | Photo Printer | | | | |
|---|---|---|---|---|---|
| | Reference (Use Hours/Year | | | | Power Management Enabling Rates |
| Year | On-Ready | Sleep | Off | Off-Unplugged | % |
| 2008 | 289 | 1751 | 6303 | 418 | 100 |
| 2010 | 289 | 1751 | 6303 | 418 | 100 |
| 2020 | 289 | 1751 | 6303 | 418 | 100 |
| 2030 | 289 | 1751 | 6303 | 418 | 100 |

- The use hours of non-thermal imaging products are expected to remain constant into the future as power management rates stay unchanged and it is assumed that no increases in imaging (print/copy/scan) will occur. No further increases in power management enabling are considered to occur without policy intervention.

## 5.2 Data sources – usage

**Table 24 Usage data sources (enabling rates)– Non-thermal Imaging Products**

| Year | Reference | Reference date | Author | Justification | Confidence in sources (High/Low) |
|---|---|---|---|---|---|
| 1988, 2008, 2021 | Expert Assumptions | 2009 | MTP Technical Expert | Expert assumption required to develop power management rates. | Medium |

## 5.3 Methodology & key assumptions – usage

- This section describes what has been done with the data listed in Table 24 along with a rationale for any key assumptions (in particular any expert judgements listed in Table 24) and detail of any background calculations behind the data points

### 5.3.1 Historic data

**Table 25 Interpolation & background calculations – usage data**

| Year | Methodology & assumptions |
|---|---|
| 1988 | All non-thermal printers – power management enabling rates developed to be used as weighting factor between "power managed enabled" and "non-power management" enables use profiles. Enabling rate for non-thermal imaging products; 0% in 1988. |
| 2001 | All non-thermal printers – enabling rate for non-thermal imaging products; 80% in 2001. Based on expert assumptions in light of no further information being available. Enabling rate high as generally little impact on product use therefore users less inclined to disable. |
| 1960 - 1987 | All non-thermal printers - power management enabling rates equal to 1988 assumption |
| 1991 - 2000 | All non-thermal printers - power management enabling rates based on interpolation between adjacent years' figures. |
| 2002 - 2008 | All non-thermal printers - power management enabling rates equal to 2001 assumption as no further improvements are assumed to occur in these years due to the high initial enabling rate. |
| 2008 | Thermal products - the use profile including power management components for thermal imaging products is included in the TEC methodology. Details about the use profiles can be found in the Key Inputs GSBN. |

### 5.3.2 Future analysis

**Table 26 Extrapolation & background calculations – usage & lifespan data**

| Year | Methodology & assumptions |
|---|---|
| 2009 - 2030 | All non-thermal printers – power management enabling rates equal to 2008 values. |

## 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 27 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 in the power management enabling rates for non-thermal

imaging products are relatively low, especially for future years, due to the potential for users to disable functionality.

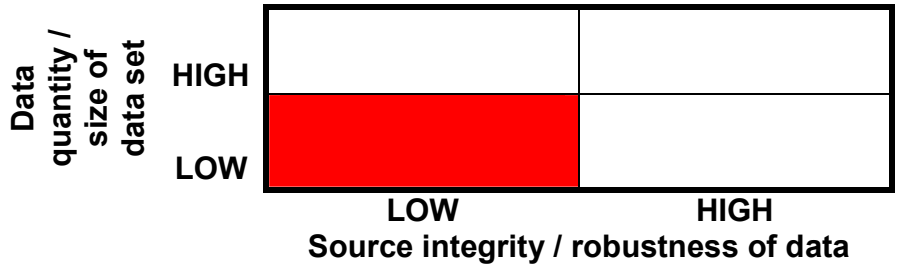


**Figure 5 Confidence indicator for usage data**

# 6 Other issues

- There are also environmental impacts associated with the use of consumables for imaging products.

## Related MTP information

- BN-NDICT IM01: Government Standards Evidence Base 2009 – Key Inputs, Non Domestic Imaging Products
- BN-NDICT IM03: Government Standards Evidence Base 2009 – Policy Scenario, Non Domestic Imaging Products
- BN-NDICT IM04: Government Standards Evidence Base 2009 – Best Available Technology (BAT) Scenario, Non Domestic Imaging Products
- BN-DICT IM01: Government Standards Evidence Base 2009 – Key Inputs, Domestic Imaging Products
- BN-DICT IM02: Government Standards Evidence Base 2009 – Reference Scenario, Domestic Imaging Products
- BN-DICT IM03: Government Standards Evidence Base 2009 – Policy Scenario, Domestic Imaging Products
- BN-DICT IM04: Government Standards Evidence Base 2009 – Best Available Technology (BAT) Scenario, Domestic Imaging Products
- 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

- Model location table updated.
- 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**