Introduction

[NOTE: This analysis updates a mapping report first published in June 2011\(^1\). That report was based on a different data source covering a different sub-set of EU countries and consequently the original data is not directly comparable and not shown here. Data was supplied aggregated separately for the seven countries/Poland & Spain because it was available for a different range of years. Consequently, it could not be aggregated in a meaningful way and is presented separately.]

The first stage in the Mapping and Benchmarking process is the definition of the products, i.e. clearly setting the boundaries that define the products for use in data collection and analysis. The definition ensures that comparisons between the participating countries are performed against a specific and consistent set of products/criteria.

The summary definition for this product is:

“Lighting products that perform the vast majority of illumination applications within the domestic (household) sector\(^2\)”

Hence data was sought (where possible) for the following lighting product types (subdivided by wattage buckets):

- Mains Voltage Incandescent
- Mains Voltage Halogens (Single and Double Ended)
- Low Voltage (12V) Halogen
- Pin Based and Self Ballasted CFLs
- Linear Tubes (T12, T8 and T5)\(^3\)
- Retrofit LEDs
- Dedicated LEDs

A full product definition is provided at the annex website\(^4\).

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\(^1\) see http://mappingandbenchmarking.iea-4e.org/matrix?type=product&id=5
\(^2\) Most ‘domestic lighting’ products are also used in other areas (e.g. hotels, shops, offices, etc). However, given the functionality of these products is virtually the same in all installations, and in almost all participating countries it will be impossible to separate sales to the domestic sector from sales elsewhere, all products shown will be considered as “domestic lighting” irrespective of final installation point.
\(^3\) The subsequent analysis in the associated benchmarking report excludes linear fluorescent tubes as, for those countries submitting data, these lamps constituted a small proportion of use in the domestic sector.
\(^4\) see http://mappingandbenchmarking.iea-4e.org
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### Phase out regulations for non-directional lamps – EU

**Key notes on Graph (see notes section 1)**

National regulations of non-directional lamps based on pan EU requirement as follows:
- Each Ecodesign requirement shall apply in accordance with the following stages (with some exceptions). Implementation of stage 6 was under review at the time of publication.

| Stage | Date | Range (<12000lm) | Equivalent to lamps below EU Energy Class |
|-------|------|------------------|-----------------------------------------|
| 1     | 01. Sept. 2009 | >950lm (~80W GLS) <950lm (Energy Class F&G) | C F&G |
| 2     | 01. Sept 2010 | >725lm (~65W GLS) | C |
| 3     | 01. Sept 2011 | >450lm (~45W GLS) | C |
| 4     | 01. Sept 2012 | >60lm (~7W GLS) | C |
| 5     | 01. Sept 2013 | 2013 increased quality requirements | C |
|       |        |                  | Anticipated Review 2014 |
| 6     | 01. Sept. 2016 | >60lm | B |

#### Non clear (frosted) lamps
- 01. Sept. 2009 >60lm
- 01. Sept. 2016 >60lm

5 Table derived from Commission Regulation (EC) No 1194/2012: [http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:076:0003:0016:EN:PDF](http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:076:0003:0016:EN:PDF)

6 Incandescent lamps with S14, S15 or S19 caps are included in stage 5 & 6

7 Except for clear lamps with G9/R7s caps: EEL C

8 The curve shown is for non-clear lamps. Lamps with a second envelope, eg covered CFLs, have an efficacy requirements 5% lower than this general non-clear requirement. Section 2c of Regulation 244/2009 formally defines second envelope lamps as: "Second lamp envelope" is a second outer lamp envelope which is not required for the production of light, such as an external sleeve for preventing mercury and glass release into the environment in case of lamp breakage, for protecting from ultraviolet radiation or for serving as a light diffuser".

Issue date: September 2014
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European Union
Domestic Lighting

Phase out regulations for directional and LED lamps – EU

Key notes on Graph\(^9\) (see notes section 1)

National regulations of non-directional lamps based on pan EU requirement as follows:

- Regulations for directional lamps and LEDs are based on an Energy Efficiency Index but have been converted to an efficacy requirement for clarity\(^10\).
- Each Ecodesign requirement shall apply in accordance with the following stages (with some exceptions)\(^11\):

| Type                      | Stage | Date               | Range                                      | Equivalent to lamps below EU Energy Class |
|---------------------------|-------|--------------------|--------------------------------------------|-----------------------------------------|
| Mains-voltage filament lamps | 1     | 01. Sept. 2013     | If Φ use > 450 lm: EEI: 1.75               | D                                       |
|                           | 2     | 01. Sept 2014      | Lamps of all Φ use: EEI: 1.75             | D                                       |
|                           | 3     | 01. Sept 2016      | Lamps of all Φ use: EEI: 0.95             | B                                       |
|                           |       | Anticipated Review 2014 (mains voltage only) |                                    |                                         |
| Other filament lamps      | 1     | 01. Sept. 2013     | If Φ use ≤ 450 lm: EEI: 1.20              | C                                       |
|                           | 2     | 01. Sept 2014      | If Φ use > 450 lm: EEI: 0.95              | B                                       |
|                           | 3     | 01. Sept 2016      | Lamps of all Φ use: EEI: 0.95             | B                                       |
| Other lamps               | 1     | 01. Sept. 2013     | All lamps: EEI: 0.5                       | C                                       |
|                           | 3     | 01. Sept 2016      | All lamps: EEI: 0.2                       | A                                       |

\(^9\) For EU definitions of Mains-voltage filament, Other filament and Other, please refer to European Commission regulation (EU) No 1194/2012.
\(^10\) Conversion based on the “general lamps” and does not adjust for allowances.
\(^11\) Table derived from European Commission regulation (EU) No 1194/2012.
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European Union
Domestic Lighting

Phase out regulations for fluorescent lamps – EU

Key notes on Graph (see notes section 1)
National regulations of fluorescent lamps based on pan EU requirement as follows:

- Stage 1: From 7 April 2010, Stage 1 of the Ecodesign requirement applied as follows (with some notes and exceptions):

| T8 (26 mm Ø) | T5 (16 mm Ø) High Efficiency | T5 (16 mm Ø) High Output |
|--------------|------------------------------|--------------------------|
| Nominal wattage (W) | Rated luminous efficacy (lm/W), 100 h initial value | Nominal wattage (W) | Rated luminous efficacy (lm/W), 100 h initial value | Nominal wattage (W) | Rated luminous efficacy (lm/W), 100 h initial value |
| 15 | 63 | 14 | 86 | 24 | 73 |
| 18 | 75 | 21 | 90 | 39 | 79 |
| 25 | 76 | 28 | 93 | 49 | 88 |
| 30 | 80 | 35 | 94 | 54 | 82 |
| 36 | 93 | | | | |
| 38 | 87 | | | | |
| 58 | 90 | | | | |
| 70 | 89 | | | | |

- Stage 2: From 7 April 2012, all fluorescent lamps not listed in the table (except those smaller than T2) must comply with the T8 regulations.

12 The requirements for pin-based CFLs are too complex to show (refer to European Commission regulation (EU) No 245/2009 Annex III for details). Anything above the highest wattage must comply with the highest wattage requirement. T5 lamps below 13W or above 80W are exempt. Table sourced from same regulation.
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**Sales and average efficacy of all domestic lamps - EU**

(Austria, Belgium, France, Germany, Great Britain, Italy and the Netherlands)

Key notes on Graph (See notes section 2)

- Data shown derived from data supplied by GfK, who estimate that data represents on average 70% of overall market in all years reported, ranging from 40% in Belgium and Netherlands to 85% in France, Great Britain and Italy.  
- GfK also believes that market coverage of LED sales is likely to be slightly lower than that for other lamp types in some markets. This means the proportion of LED sales is likely to be slightly higher than shown here e.g. based on their deeper knowledge of some individual EU markets, GfK estimates that the 5% market share of LEDs in 2013 may be approximately 2% higher in reality.
- Annual market average efficacies calculated on a sales weighted basis using estimated average global efficacies for each lamp type and associated wattage range for 230V lamps.

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13 No data was available for Italy in 2007 so 2008 data is used as a proxy.
14 this may be because LEDs are more commonly bought through specialist retailers and online.
### Total instantaneous light output of all domestic lamps sales EU (Austria, Belgium, France, Germany, Great Britain, Italy and the Netherlands)

| Year | Dedicated LED lamps | Retrofit LED Lamps | MV* Self-Ballasted CFLs | MV* Linear Fluorescent Tubes (T12) | MV* Linear Fluorescent Tubes (T8) | MV* Linear Fluorescent Tubes (T5) | MV* Halogens (double ended) | MV* Halogens (single ended) | MV* Linear Fluorescent Tubes (T12) |
|------|---------------------|--------------------|-------------------------|-----------------------------------|---------------------------------|---------------------------------|-------------------------------|-------------------------------|----------------------------------|
| 1999 | 6.0E+09              | 4.0E+09            | 3.6E+09                 | 3.2E+09                           | 3.2E+09                        | 3.2E+09                        | 3.2E+09                       | 3.2E+09                       | 3.2E+09                          |
| 2000 | 6.2E+09              | 4.0E+09            | 3.2E+09                 | 3.2E+09                           | 3.2E+09                        | 3.2E+09                        | 3.2E+09                       | 3.2E+09                       | 3.2E+09                          |
| 2001 | 6.2E+09              | 4.0E+09            | 3.2E+09                 | 3.2E+09                           | 3.2E+09                        | 3.2E+09                        | 3.2E+09                       | 3.2E+09                       | 3.2E+09                          |
| 2002 | 6.2E+09              | 4.0E+09            | 3.2E+09                 | 3.2E+09                           | 3.2E+09                        | 3.2E+09                        | 3.2E+09                       | 3.2E+09                       | 3.2E+09                          |
| 2003 | 6.2E+09              | 4.0E+09            | 3.2E+09                 | 3.2E+09                           | 3.2E+09                        | 3.2E+09                        | 3.2E+09                       | 3.2E+09                       | 3.2E+09                          |
| 2004 | 6.2E+09              | 4.0E+09            | 3.2E+09                 | 3.2E+09                           | 3.2E+09                        | 3.2E+09                        | 3.2E+09                       | 3.2E+09                       | 3.2E+09                          |
| 2005 | 6.2E+09              | 4.0E+09            | 3.2E+09                 | 3.2E+09                           | 3.2E+09                        | 3.2E+09                        | 3.2E+09                       | 3.2E+09                       | 3.2E+09                          |
| 2006 | 6.2E+09              | 4.0E+09            | 3.2E+09                 | 3.2E+09                           | 3.2E+09                        | 3.2E+09                        | 3.2E+09                       | 3.2E+09                       | 3.2E+09                          |
| 2007 | 6.2E+09              | 4.0E+09            | 3.2E+09                 | 3.2E+09                           | 3.2E+09                        | 3.2E+09                        | 3.2E+09                       | 3.2E+09                       | 3.2E+09                          |

Key notes on Graph (See notes section 2)

- Data shown derived from data supplied by GfK, who estimate that data represents on average 70% of overall market in all years reported, ranging from 40% in Belgium and Netherlands to 85% in France, Great Britain and Italy.
- GfK also believes that market coverage of LED sales is likely to be slightly lower than that for other lamp types in some markets. This means the proportion of LED sales is likely to be slightly higher than shown here e.g. GfK estimates that the 5% market share of LEDs in 2013 may be approximately 2% higher in reality.
- Instantaneous light output calculated on a sales weighted basis using estimated average global efficacies for each lamp type and associated wattage range for 230V lamps.
- Instantaneous light output is for lamps sold in each year only, not all installed stock.
- Annual market average efficacies calculated on a sales weighted basis using estimated average global efficacies for each lamp type and associated wattage range for 230V lamps.

15 Due to the variations of lifetime, the variations in wattages, etc, of the differing lamp types, it is very difficult to have a qualitative or quantitative measure of what the market is likely to look like during the transition between lamp types, and hence evaluate the quality of data received. However, on a simple basis, in the short term we can assume lumens purchased should be relatively fixed (although there is a slow increase over time in the “total lumens” consumed by individual households as more lamps are installed in a given space; there is an increase in household numbers, and there is some confusion among consumers in the transition between lamp types and their relative light output which may result in consumers not be buying lumen neutral replacements). Thus, if there are very large variations in the instantaneous light output, there is a likelihood there may be some issues with the base data (e.g changing coverage of the market/sampling methodology over time).

16 No data was available for Italy in 2007 so 2008 data is used as a proxy.

17 This may be because LEDs are more commonly bought through specialist retailers and online.
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- Lifetime light output calculated on a sales weighted basis using estimated average global efficacies and lifetimes for each lamp type and associated wattage range for 230V lamps.

- Lifetime light output is for lamps sold in each year only, not all installed stock.

- Annual market average efficacies calculated on a sales weighted basis using estimated average global efficacies for each lamp type and associated wattage range for 230V lamps.

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18 In a stable market where consumers purchase a straight replacement lamp (eg incandescent for incandescent), and other variables remain fixed (eg the lifetime of each lamp type), then the lifetime lumen output over the lifetime of the lamps purchased in each year should be the same. However, as the lighting market is currently transitioning to longer lifetime lamps, the total number of lamp purchases should reduce over time (replacement is required less often). The changes in lifetime lumen output gives a soft measure of how fast this reduction in lamp sales will occur; if there is a sudden very rapid increase in lifetime light output, it means there are a high proportion of long lifetime lamps being purchase, so lamp sales will fall quickly; and vice versa.

19 No data was available for Italy in 2007 so 2008 data is used as a proxy.

20 this may be because LEDs are more commonly bought through specialist retailers and online.
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**Key notes on Graph (See notes section 2)**
- Data shown derived from data supplied by GfK, who estimate that data represents on average 70% of overall market in all years reported, ranging from 40% in Belgium and Netherlands to 85% in France, Great Britain and Italy\(^{21}\).
- Within the EU there is an acknowledged problem\(^{22}\) that some incandescent lamps are being imported and sold illegally. Neither the scale of illegal imports nor the extent to which they are captured within the data reported here is known.
- Annual market average efficacies calculated on a sales weighted basis using estimated average global efficiencies for each lamp type and associated wattage range for 230V lamps.

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\(^{21}\) No data was available for Italy in 2007 so 2008 data is used as a proxy.

\(^{22}\) The issues of "illegal" incandescents have been discussed in various European Consultation Forum meetings, the latest of which was on March 12, 2014.
The graphs below are shown only for context; they show the share of sales of each lamp sub-type within the overall lamp family. Note that wattage bucket ranges and their colours vary; refer to the respective lamp sub-type page for details.

**Key notes on Graph (See notes section 2)**

- Data shown derived from data supplied by GfK, who estimate that data represents an average 70% of overall market in all years reported, ranging from 40% in Belgium and Netherlands to 85% in France, Great Britain and Italy.  

- Annual market average efficacies calculated on a sales weighted basis using estimated average global efficacies for each lamp type and associated wattage range for 230V lamps.

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23 No data was available for Italy in 2007 so 2008 data is used as a proxy.
Sales of Double Ended Mains Voltage Halogen lamps by wattage range - EU
(Austria, Belgium, France, Germany, Great Britain, Italy and the Netherlands)

The graphs below are shown only for context; they show the share of sales of each lamp sub-type within the overall lamp family. Note that wattage bucket ranges and their colours vary; refer to the respective lamp sub-type page for details.

Key notes on Graph (See notes section 2)

- Data shown derived from data supplied by GfK, who estimate that data represents on average 70% of overall market in all years reported, ranging from 40% in Belgium and Netherlands to 85% in France, Great Britain and Italy.

- Annual market average efficacies calculated on a sales weighted basis using estimated average global efficacies for each lamp type and associated wattage range for 230V lamps.

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24 No data was available for Italy in 2007 so 2008 data is used as a proxy.
The graphs below are shown only for context; they show the share of sales of each lamp sub-type within the overall lamp family. Note that wattage bucket ranges and their colours vary; refer to the respective lamp sub-type page for details.

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- Annual market average efficacies calculated on a sales weighted basis using estimated average global efficacies for each lamp type and associated wattage range for 230V lamps.

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25 No data was available for Italy in 2007 so 2008 data is used as a proxy.
Sales of Pin Based CFL lamps by wattage range – EU
(Austria, Belgium, France, Germany, Great Britain, Italy and the Netherlands)

The graphs below are shown only for context; they show the share of sales of each lamp sub-type within the overall lamp family. Note that wattage bucket ranges and their colours vary; refer to the respective lamp sub-type page for details.

Key notes on Graph (See notes section 2)

- Data shown derived from data supplied by GfK, who estimate that data represents on average 70% of overall market in all years reported, ranging from 40% in Belgium and Netherlands to 85% in France, Great Britain and Italy.
- Annual market average efficacies calculated on a sales weighted basis using estimated average global efficacies for each lamp type and associated wattage range for 230V lamps.

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26 No data was available for Italy in 2007 so 2008 data is used as a proxy.
Sales of Self Ballasted CFL lamps by wattage range – EU
(Austria, Belgium, France, Germany, Great Britain, Italy and the Netherlands)

The graphs below are shown only for context; they show the share of sales of each lamp sub-type within the overall lamp family. Note that wattage bucket ranges and their colours vary; refer to the respective lamp sub-type page for details.

Key notes on Graph (See notes section 2)

- Data shown derived from data supplied by GfK, who estimate that data represents on average 70% of overall market in all years reported, ranging from 40% in Belgium and Netherlands to 85% in France, Great Britain and Italy.
- Annual market average efficacies calculated on a sales weighted basis using estimated average global efficacies for each lamp type and associated wattage range for 230V lamps.

27 No data was available for Italy in 2007 so 2008 data is used as a proxy.
The graphs below are shown only for context; they show the share of sales of each lamp sub-type within the overall lamp family. Note that wattage bucket ranges and their colours vary; refer to the respective lamp sub-type page for details.

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28 No data was available for Italy in 2007 so 2008 data is used as a proxy.
Sales of T8 Linear Fluorescent Tubes by wattage range: EU (Austria, Belgium, France, Germany, Great Britain, Italy and the Netherlands)

The graphs below are shown only for context; they show the share of sales of each lamp sub-type within the overall lamp family. Note that wattage bucket ranges and their colours vary; refer to the respective lamp sub-type page for details.

Key notes on Graph (See notes section 2)
- Data shown derived from data supplied by GfK, who estimate that data represents on average 70% of the overall market in all years reported, ranging from 40% in Belgium and Netherlands to 85% in France, Great Britain and Italy.29
- Annual market average efficacies calculated on a sales weighted basis using estimated average global efficacies for each lamp type and associated wattage range for 230V lamps.

29 No data was available for Italy in 2007 so 2008 data is used as a proxy.
Sales of T12 Linear Fluorescent Tubes by wattage range: EU (Austria, Belgium, France, Germany, Great Britain, Italy and the Netherlands)

The graphs below are shown only for context; they show the share of sales of each lamp sub-type within the overall lamp family. Note that wattage bucket ranges and their colours vary; refer to the respective lamp sub-type page for details.

Key notes on Graph (See notes section 2)

- Data shown derived from data supplied by GfK, who estimate that data represents on average 70% of overall market in all years reported, ranging from 40% in Belgium and Netherlands to 85% in France, Great Britain and Italy.30

- Annual market average efficacies calculated on a sales weighted basis using estimated average global efficacies for each lamp type and associated wattage range for 230V lamps.

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30 No data was available for Italy in 2007 so 2008 data is used as a proxy.
The graphs below are shown only for context; they show the share of sales of each lamp sub-type within the overall lamp family. Note that wattage bucket ranges and their colours vary; refer to the respective lamp sub-type page for details.

Key notes on Graph (See notes section 2)

- Data shown derived from data supplied by GfK, who estimate that data represents on average 70% of overall market in all years reported, ranging from 40% in Belgium and Netherlands to 85% in France, Great Britain and Italy\(^{31}\).
- GfK also believes that market coverage of LED sales is likely to be slightly lower than that for other lamp types in some markets\(^{32}\). This means the proportion of LED sales is likely to be slightly higher than shown here e.g. GfK estimates that the 5% market share of LEDs in 2013 may be approximately 2% higher in reality.
- Annual market average efficacies calculated on a sales weighted basis using estimated average global efficacies for each lamp type and associated wattage range for 230V lamps.

\(^{31}\) No data was available for Italy in 2007 so 2008 data is used as a proxy.

\(^{32}\) this may be because LEDs are more commonly bought through specialist retailers and online.
Key notes on Graph (See notes section 2)

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- Annual market average efficacies calculated on a sales weighted basis using estimated average global efficacies for each lamp type and associated wattage range for 230V lamps.  

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33 No data was available for Italy in 2007 so 2008 data is used as a proxy.  
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Key notes on Graph (See notes section 2)

- Data shown derived from data supplied by GfK, who estimate for all years reported that data represents on average 65% of the total lamp market for Poland and 80% for Spain.
- GfK also believes that market coverage of LED sales is likely to be different than that for other lamp types because LEDs are bought through different sales channels. While the exact variation is unknown, GfK believes that the 13% market share of LEDs in 2013 for this data is likely to be higher than reality.
- Annual market average efficacies calculated on a sales weighted basis using estimated average global efficacies for each lamp type and associated wattage range for 230V lamps.
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- GfK also believes that market coverage of LED sales is likely to be different than that for other lamp types because LEDs are bought through different sales channels. While the exact variation is unknown, GfK believes that the 13% market share of LEDs in 2013 for this data is likely to be higher than reality.
- Instantaneous light output calculated on a sales weighted basis using estimated average global efficacies for each lamp type and associated wattage range for 230V lamps.
- Instantaneous light output is for lamps sold in each year only, not all installed stock.
- Annual market average efficacies calculated on a sales weighted basis using estimated average global efficacies for each lamp type and associated wattage range for 230V lamps.
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- Lifetime light output calculated on a sales weighted basis using estimated average global efficacies and lifetimes for each lamp type and associated wattage range for 230V lamps.
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Sales of Mains Voltage Incandescent lamps by wattage range - EU (Poland and Spain)

Key notes on Graph (See notes section 2)

- Data shown derived from data supplied by GfK, who estimate for all years reported that data represents on average 65% of the total lamp market for Poland and 80% for Spain.
- Within the EU there is an acknowledged problem\(^ {35} \) that some incandescent lamps are being imported and sold illegally. Neither the scale of illegal imports nor the extent to which they are captured within the data reported here is known.
- Annual market average efficacies calculated on a sales weighted basis using estimated average global efficacies for each lamp type and associated wattage range for 230V lamps.

\(^ {35} \) The issues of “illegal” incandescents have been discussed in various European Consultation Forum meetings, the latest of which was on March 12, 2014.
The graphs below are shown only for context; they show the share of sales of each lamp sub-type within the overall lamp family. Note that wattage bucket ranges and their colours vary; refer to the respective lamp sub-type page for details.

**Key notes on Graph (See notes section 2)**

- Data shown derived from data supplied by GfK, who estimate for all years reported that data represents on average 65% of the total lamp market for Poland and 80% for Spain.
- Annual market average efficacies calculated on a sales weighted basis using estimated average global efficacies for each lamp type and associated wattage range for 230V lamps.
Sales of Double Ended Mains Voltage Halogen lamps by wattage range - EU (Poland and Spain)

Key notes on Graph (See notes section 2)

- Data shown derived from data supplied by GfK, who estimate for all years reported that data represents on average 65% of the total lamp market for Poland and 80% for Spain.
- Annual market average efficacies calculated on a sales weighted basis using estimated average global efficacies for each lamp type and associated wattage range for 230V lamps.
Sales of Low Voltage (12V) Halogen lamps by wattage range – EU (Poland and Spain)

The graphs below are shown only for context; they show the share of sales of each lamp sub-type within the overall lamp family. Note that wattage bucket ranges and their colours vary; refer to the respective lamp sub-type page for details.

Key notes on Graph (See notes section 2)
- Data shown derived from data supplied by GfK, who estimate for all years reported that data represents on average 65% of the total lamp market for Poland and 80% for Spain.
- Annual market average efficacies calculated on a sales weighted basis using estimated average global efficacies for each lamp type and associated wattage range for 230V lamps.
Sales of Pin Based CFL lamps by wattage range – EU (Poland and Spain)

The graphs below are shown only for context; they show the share of sales of each lamp sub-type within the overall lamp family. Note that wattage bucket ranges and their colours vary; refer to the respective lamp sub-type page for details.

Key notes on Graph (See notes section 2)

- Data shown derived from data supplied by GfK, who estimate for all years reported that data represents on average 65% of the total lamp market for Poland and 80% for Spain.

- Annual market average efficacies calculated on a sales weighted basis using estimated average global efficacies for each lamp type and associated wattage range for 230V lamps.
Sales of Self Ballasted CFL lamps by wattage range – EU (Poland and Spain)

The graphs below are shown only for context; they show the share of sales of each lamp sub-type within the overall lamp family. Note that wattage bucket ranges and their colours vary; refer to the respective lamp sub-type page for details.

**Key notes on Graph (See notes section 2)**

- Data shown derived from data supplied by GfK, who estimate for all years reported that data represents on average 65% of the total lamp market for Poland and 80% for Spain.
- Annual market average efficacies calculated on a sales weighted basis using estimated average global efficacies for each lamp type and associated wattage range for 230V lamps.

**Issue date:** September 2014
Sales of T5 Linear Fluorescent Tubes by wattage range: EU (Poland and Spain)

The graphs below are shown only for context; they show the share of sales of each lamp sub-type within the overall lamp family. Note that wattage bucket ranges and their colours vary; refer to the respective lamp sub-type page for details.

Key notes on Graph (See notes section 2)
- Data shown derived from data supplied by GfK, who estimate for all years reported that data represents on average 65% of the total lamp market for Poland and 80% for Spain.
- Annual market average efficacies calculated on a sales weighted basis using estimated average global efficacies for each lamp type and associated wattage range for 230V lamps.

Issue date: September 2014
Sales of T8 Linear Fluorescent Tubes by wattage range: EU (Poland and Spain)

The graphs below are shown only for context; they show the share of sales of each lamp sub-type within the overall lamp family. Note that wattage bucket ranges and their colours vary; refer to the respective lamp sub-type page for details.

Key notes on Graph (See notes section 2)

- Data shown derived from data supplied by GfK, who estimate for all years reported that data represents on average 65% of the total lamp market for Poland and 80% for Spain.
- Annual market average efficacies calculated on a sales weighted basis using estimated average global efficacies for each lamp type and associated wattage range for 230V lamps.
The graphs below are shown only for context; they show the share of sales of each lamp sub-type within the overall lamp family. Note that wattage bucket ranges and their colours vary; refer to the respective lamp sub-type page for details.

**Key notes on Graph (See notes section 2)**

- Data shown derived from data supplied by GfK, who estimate for all years reported that data represents on average 65% of the total lamp market for Poland and 80% for Spain.
- Annual market average efficacies calculated on a sales weighted basis using estimated average global efficacies for each lamp type and associated wattage range for 230V lamps.

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The graphs below are shown only for context; they show the share of sales of each lamp sub-type within the overall lamp family. Note that wattage bucket ranges and their colours vary; refer to the respective lamp sub-type page for details.

**Sales of retrofit LED lamps by wattage range – EU (Poland and Spain)**

The information and analysis contained within this summary document is developed to inform policy makers. Whilst the information analysed was supplied by representatives of National Governments, a number of assumptions, simplifications and transformations have been made in order to present information that is easily understood by policy makers, and to enable comparisons with other countries. Therefore, information should only be used as guidance in general policy - it may not be sufficiently detailed nor robust for use in setting specific performance requirements. Details of information sources and assumption, simplification and transformations are contained within the document.

**Key notes on Graph (See notes section 2)**

- Data shown derived from data supplied by GfK, who estimate for all years reported that data represents on average 65% of the total lamp market for Poland and 80% for Spain.
- GfK also believes that market coverage of LED sales is likely to be different than that for other lamp types because LEDs are bought through different sales channels. While the exact variation is unknown, GfK believes that the 13% market share of LEDs in 2013 for this data is likely to be higher than reality.
- Annual market average efficacies calculated on a sales weighted basis using estimated average global efficacies for each lamp type and associated wattage range for 230V lamps.

**Issue date: September 2014**
The graphs below are shown only for context; they show the share of sales of each lamp sub-type within the overall lamp family. Note that wattage bucket ranges and their colours vary; refer to the respective lamp sub-type page for details.

**Key notes on Graph (See notes section 2)**

- Data shown derived from data supplied by GfK, who estimate for all years reported that data represents on average 65% of the total lamp market for Poland and 80% for Spain.
- GfK also believes that market coverage of LED sales is likely to be different than that for other lamp types because LEDs are bought through different sales channels. While the exact variation is unknown, GfK believes that the 13% market share of LEDs in 2013 for this data is likely to be higher than reality.
- Annual market average efficacies calculated on a sales weighted basis using estimated average global efficacies for each lamp type and associated wattage range for 230V lamps.
Major Policy Interventions (See notes Section 3)

Policies actions fall into 2 categories, pan-EU member requirements and national interventions.

Pan-EU requirements:

1) **Mandatory MEPS**: As summarized in from page 2 in the sections and graphs titled "Phase out regulations" and described further in notes section 1

2) **Mandatory Product Labelling**: From the 1 July 1999 (with exclusions until 31 December 2000), lighting products within the EU were required to carry compulsory energy A-G labels. The packaging/labelling requirements have since been revised/extended in 2012 with the label scale being revised to A++ - E and refining of the associated derivation metrics.

National Level Interventions

National actions vary substantially from CFL promotion and subsidy programmes to retailer voluntary agreements. Please refer to individual country mapping documents for more details.
Cultural Issues (See Notes Section 4)

Variations in the use of lighting across Europe are significant. Variations include:

- Number of lighting outlets per dwelling
- Type of lighting in the dwelling
- Usage patterns

However, the level of investigation required to articulate the specific variations are beyond the scope of this study. Interested parties are recommended to review the EuP study on domestic lighting in the first instance (refer to http://www.eup4light.net/assets/pdffiles/Final_part1_2/EuP_Domestic_Part1en2_V11.pdf)
Notes on data

Section 1: Notes on Phase out regulations

1.1 Overview

The European Union announced their intention to “phase-out inefficient lighting” in April 2007.

At the time of preparation, regulations for “domestic lighting” covered only non-directional lighting. However, more recently directional lighting was regulated separately. Separate provisions are in place for street lighting and commercial lighting. At the time of publication of this document, the European Commission has just initiated a process seeking to update, and bring together into a single document, the regulations for domestic and commercial directional and non-directional lighting, and ideally the labelling requirements for these products.

Implementation of regulations is required to occur at the national level (ie individual EU member states) by inclusion in their relevant regulatory process within the timescales defined by the European Union.

1.1.1 Regulatory Requirements for Non-Directional Lighting

The Regulation was adopted and published in the EU Commission Official Journal on 18 March 2009 as Commission Regulation (EC) No 244/2009. It became law 20 days after publication. Key items within this text are as follows:

1.1.1.1 Overall requirement

(5) Products subject to this Regulation are designed essentially for the full or partial illumination of a household room, by replacing or complementing natural light with artificial light, in order to enhance visibility within that space. Special purpose lamps designed essentially for other types of applications (such as traffic signals, terrarium lighting, or household appliances) and clearly indicated as such on accompanying product information should not be subject to the ecodesign requirements set out in this Regulation.

(6) New technologies emerging on the market such as light emitting diodes should be subject to this Regulation.

(7) The environmental aspects of the products covered that are identified as significant for the purposes of this Regulation are energy in the use phase as well as mercury content and mercury emissions.

36 Performance requirements for non-directional LEDs are included in Commission Regulation (EC) No 1194/2012, details of which can be found in section 1.1.2.

37 While the official journal reference may be followed, interested parties are recommended to visit the http://www.lightingassociation.com/pdf/EUP_DIM1_FAQ.pdf. The link is to the UK Lighting Associations webpage which reproduces the legislative requirement, but also provides and interpretation of the legislation and associated other material.
The information and analysis contained within this summary document is developed to inform policy makers. Whilst the information analysed was supplied by representatives of National Governments, a number of assumptions, simplifications and transformations have been made in order to present information that is easily understood by policy makers, and to enable comparisons with other countries. Therefore, information should only be used as guidance in general policy—it may not be sufficiently detailed nor robust for use in setting specific performance requirements. Details of information sources and assumption, simplification and transformations are contained within the document.

(9) Although the mercury content of compact fluorescent lamps is considered to be a significant environmental aspect, it is appropriate to regulate it under Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

(14) Requirements should not affect functionality from the user’s perspective and should not negatively affect health, safety or the environment. In particular, the benefits of reducing the electricity consumption during the use phase should overcompensate potential, if any, additional environmental impacts during the production phase of products subject to this Regulation.

(15) A staged entry into force of the ecodesign requirements should provide a sufficient timeframe for manufacturers to re-design products subject to this Regulation as appropriate.

(20) A review of this measure should take particular note of the evolution of sales of special purpose lamp types so as to verify that they are not used for general lighting purposes, of the development of new technologies such as LEDs and of the feasibility of establishing energy efficiency requirements at the ‘A’ class level as defined in Commission Directive 98/11/EC of 27 January 1998 implementing Council Directive 92/75 with regard to energy labelling of household lamps.

(21) The requirements contained in this measure allow halogen lamps of socket G9 and R7s to remain on the market for a limited period of time, recognising the need to service the existing luminaire stock, to prevent undue costs on consumers and to give time to manufacturers to develop luminaires dedicated to more efficient lighting technologies.

1.1.1.2 Subject matter and scope (within Article 1)
.... requirements for the placing on the market of non-directional household lamps, including when they are marketed for non-household use or when they are integrated into other products.

1.1.1.3 Timings (within Article 3)
Defined within Article 3:

Each ecodesign requirement shall apply in accordance with the following stages:

Stage 1: 1 September 2009,
Stage 2: 1 September 2010,
Stage 3: 1 September 2011,
Stage 4: 1 September 2012,
Stage 5: 1 September 2013,
Stage 6: 1 September 2016

Defined within Annex II:

Incandescent lamps with S14, S15 or S19 caps shall be exempted from the efficacy requirements of Stages 1 to 4 as defined in Article 3 of this Regulation, but not from Stages 5 and 6

1.1.1.4 Technical Requirements (Annex 1)
Defined within Annex II:
The maximum rated power ($P_{\text{max}}$) for a given rated luminous flux ($\Phi$) is provided in Table 1.

The exceptions to these requirements are listed in Table 2 and the correction factors applicable to the maximum rated power are in Table 3.

**Table 1**

| Application date       | Maximum rated power ($P_{\text{max}}$) for a given rated luminous flux ($\Phi$) (W) |
|------------------------|------------------------------------------------------------------------------------------|
|                        | Clear lamps | Non-clear lamps |
| Stages 1 to 5          | 0.8 * (0.88$\sqrt{\Phi}$+0.049$\Phi$) | 0.24$\sqrt{\Phi}$+0.0103$\Phi$ |
| Stage 6                | 0.6 * (0.88$\sqrt{\Phi}$+0.049$\Phi$) | 0.24$\sqrt{\Phi}$+0.0103$\Phi$ |

**Table 2**

| Scope of the exception | Maximum rated power (W) |
|------------------------|-------------------------|
| Clear lamps 60 lm $\leq \Phi$ $\leq$ 950 lm in Stage 1 | $P_{\text{max}} = 1.1 * (0.88\sqrt{\Phi}+0.049\Phi)$ |
| Clear lamps 60 lm $\leq \Phi$ $\leq$ 725 lm in Stage 2 | $P_{\text{max}} = 1.1 * (0.88\sqrt{\Phi}+0.049\Phi)$ |
| Clear lamps 60 lm $\leq \Phi$ $\leq$ 450 lm in Stage 3 | $P_{\text{max}} = 1.1 * (0.88\sqrt{\Phi}+0.049\Phi)$ |
| Clear lamps with G9 or R7s cap in Stage 6 | $P_{\text{max}} = 0.8 * (0.88\sqrt{\Phi}+0.049\Phi)$ |

The correction factors in Table 3 are cumulative where appropriate and also applicable to the products covered by the exceptions of Table 2.

**Table 3**

| Scope of the correction | Maximum rated power (W) |
|-------------------------|-------------------------|
| filament lamp requiring external power supply | $P_{\text{max}}/1.06$ |
| discharge lamp with cap GX53 | $P_{\text{max}}/0.75$ |
| non-clear lamp with colour rendering index $\geq$ 90 and $P \leq 0.5 * (0.88\sqrt{\Phi}+0.049\Phi)$ | $P_{\text{max}}/0.85$ |
| discharge lamp with colour rendering index $\geq$ 90 and $T_c \geq 5000$ K | $P_{\text{max}}/0.76$ |
| non-clear lamp with second envelope and $P \leq 0.5 * (0.88\sqrt{\Phi}+0.049\Phi)$ | $P_{\text{max}}/0.95$ |
| LED lamp requiring external power supply | $P_{\text{max}}/1.1$ |
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**Additional functionality requirements for CFLs (Table 4 Annex II):**

| Functionality parameter                              | Stage 1 | Stage 5 |
|------------------------------------------------------|---------|---------|
| Lamp survival factor at 6 000 h                      | ≥ 0.50  | ≥ 0.70  |
| Lumen maintenance                                    | At 2 000 h: ≥ 85 % (≥ 80 % for lamps with second lamp envelope) | At 2 000 h: ≥ 88 % (≥ 83 % for lamps with second lamp envelope) |
| Number of switching cycles before failure            | ≥ half the lamp lifetime expressed in hours | ≥ lamp lifetime expressed in hours |
|                                                      | ≥ 10 000 if lamp starting time > 0.3 s | ≥ 30 000 if lamp starting time > 0.3 s |
| Starting time                                        | < 2.0 s | < 1.5 s if P < 10 W |
|                                                      |        | < 1.0 s if P ≥ 10 W |
| Lamp warm-up time to 60 % Φ                          | < 60 s  | < 40 s |
|                                                      | or < 120 s for lamps containing mercury in amalgam form | or < 100 s for lamps containing mercury in amalgam form |
| Premature failure rate                               | ≤ 2.0 % at 200 h | ≤ 2.0 % at 400 h |
| UVA + UVB radiation                                  | ≤ 2.0 mW/klm | ≤ 2.0 mW/klm |
| UVC radiation                                        | ≤ 0.01 mW/klm | ≤ 0.01 mW/klm |
| Lamp power factor                                    | ≥ 0.50 if P < 25 W |
|                                                      | ≥ 0.90 if P ≥ 25 W | ≥ 0.55 if P < 25 W |
|                                                      |        | ≥ 0.90 if P ≥ 25 W |
| Colour rendering (Ra)                                | ≥ 80    | ≥ 80    |

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**Additional functionality requirements for lamps excluding CFLs and LEDS38 (Table 5 Annex II):**

| Functionality parameter                              | Stage 1 | Stage 5 |
|------------------------------------------------------|---------|---------|
| Rated lamp lifetime                                 | ≥ 1 000 h | ≥ 2 000 h |
| Lumen maintenance                                    | ≥ 85 % at 75 % of rated average lifetime | ≥ 85 % at 75 % of rated average lifetime |
| Number of switching cycles                           | ≥ four times the rated lamp life expressed in hours | ≥ four times the rated lamp life expressed in hours |
| Starting time                                        | < 0.2 s | < 0.2 s |
| Lamp warm-up time to 60 % Φ                          | ≤ 1.0 s | ≤ 1.0 s |
| Premature failure rate                               | ≤ 5.0 % at 100 h | ≤ 5.0 % at 200 h |
| UVA + UVB radiation                                  | ≤ 2.0 mW/klm | ≤ 2.0 mW/klm |
| UVC radiation                                        | ≤ 0.01 mW/klm | ≤ 0.01 mW/klm |
| Lamp power factor                                    | ≥ 0.95  | ≥ 0.95  |

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38 Where the rated lamp lifetime is higher than 2 000 h, the Stage 1 requirements for the parameters 'Rated lamp lifetime', 'Lamp Survival Factor' and 'Lumen maintenance' in Tables 4 and 5 are only applicable as from Stage 2.
1.1.1.5  Exemptions/Exclusions
Defined within Article 1:

a) lamps having the following chromaticity coordinates x and y:
   —  x < 0,200 or x > 0,600
   —  y < −2,3172 x2 + 2,3653 x − 0,2800 or y > −2,3172 x2 + 2,3653 x − 0,1000;

b) directional lamps;

c) lamps having a luminous flux below 60 lumens or above 12 000 lumens;

d) lamps having:
   —  6 % or more of total radiation of the range 250-780 nm in the range of 250-400 nm,
   —  the peak of the radiation between 315-400 nm (UVA) or 280-315 nm (UVB);

e) fluorescent lamps without integrated ballast;

f) high-intensity discharge lamps;

g) incandescent lamps with E14/E27/B22/B15 caps, with a voltage equal to or below 60 volts
   and without integrated transformer in Stages 1-5 according to Article 3.

1.1.1.6  Marking Requirements (within Article 3)
Defined within Article 1:

Starting from 1 September 2009: For special purpose lamps, the following information shall be clearly
and prominently indicated on their packaging and in all forms of product information accompanying
the lamp when it is placed on the market:

a) their intended purpose; and

b) that they are not suitable for household room illumination.

Defined within Annex 3:

For non-directional household lamps, the following information shall be provided as from Stage 2,
except where otherwise stipulated.

Information to be visibly displayed prior to purchase to end-users on the packaging and on free
access websites

The information does not need to be specified using the exact wording of the list below. It may be
displayed using graphs, figures or symbols rather than text. These information requirements do not
apply to filament lamps not fulfilling the efficacy requirements of Stage 4.

a) When the nominal lamp power is displayed outside the energy label in accordance with
   Directive 98/11/EC, the nominal luminous flux of the lamp shall also be separately displayed
   in a font at least twice as large as the nominal lamp power display outside the label;

b) Nominal life time of the lamp in hours (not higher than the rated life time);

c) Number of switching cycles before premature lamp failure;

d) Colour temperature (also expressed as a value in Kelvins);
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**e)** Warm-up time up to 60 % of the full light output (may be indicated as ‘instant full light’ if less than 1 second);

**f)** A warning if the lamp cannot be dimmed or can be dimmed only on specific dimmers;

**g)** If designed for optimal use in non-standard conditions (such as ambient temperature $T_a \neq 25 \, ^\circ\text{C}$), information on those conditions;

**h)** Lamp dimensions in millimetres (length and diameter);

**i)** If equivalence with an incandescent lamp is claimed on the packaging, the claimed equivalent incandescent lamp power (rounded to 1 W) shall be that corresponding in Table 6 to the luminous flux of the lamp contained in the packaging.

The intermediate values of both the luminous flux and the claimed incandescent lamp power (rounded to 1 W) shall be calculated by linear interpolation between the two adjacent values.

#### Table 6

| Rated lamp luminous flux $\Phi$ [lm] | Claimed equivalent incandescent lamp power [W] |
|-------------------------------------|---------------------------------------------|
| CRL 125                            | 119                                        | 136 | 15        |
| CRL 229                            | 217                                        | 249 | 25        |
| CRL 432                            | 410                                        | 470 | 40        |
| CRL 741                            | 702                                        | 806 | 60        |
| CRL 970                            | 920                                        | 1055| 75        |
| CRL 1398                           | 1326                                       | 1521| 100       |
| 2 253                              | 2 137                                      | 2 452| 150       |
| 3 172                              | 3 009                                      | 3 452| 200       |

**j)** The term ‘energy saving lamp’ or any similar product related promotional statement about lamp efficacy may only be used if the lamp complies with the efficacy requirements applicable to non-clear lamps in Stage 1 according to Tables 1, 2 and 3.

If the lamp contains mercury

**k)** Lamp mercury content as X,X mg;

**l)** Indication which website to consult in case of accidental lamp breakage to find instructions on how to clean up the lamp debris.

**Information to be made publicly available on free-access websites**

As a minimum, the following information shall be expressed at least as values.

**a)** The information specified in [the section above];

**b)** Rated wattage (0,1 W precision);
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| c) | Rated luminous flux; |
| d) | Rated lamp life time; |
| e) | Lamp power factor; |
| f) | Lumen maintenance factor at the end of the nominal life; |
| g) | Starting time (as X,X seconds); |
| h) | Colour rendering. |

If the lamp contains mercury

| i) | Instructions on how to clean up the lamp debris in case of accidental lamp breakage; |
| j) | Recommendations on how to dispose of the lamp at its end of life. |

1.1.1.7  **Review Requirements (Article 7)**
A review of the regulation is required within 5 years of the date of regulation (ie March 2014).

1.1.2  **Regulatory Requirements for Directional Lighting and LEDs**

The Regulation was adopted and published in the EU Commission Official Journal on 12 December 2012 as Commission Regulation (EC) No 1194/2012. It became law 20 days after publication. Key items within this text are as follows:

1.1.2.1  **Overall requirement**
Relevant items 5-7 identical to those detailed in Section 1.1.1.1. Additional items of relevance as follows:

(9) Although the mercury content of compact fluorescent lamps is considered to be a significant environmental aspect, it is appropriate to regulate it under Directive 2011/65/EU… It is appropriate to regulate the ultraviolet light emissions from lamps and other parameters with potential health effects under Directives 2006/95/EC and 2001/95/EC…

(15) … should not affect functionality from the user’s perspective and should not negatively affect health, safety or the environment. In particular, the benefits of reducing the electricity consumption during the use phase should outweigh any potential additional environmental impact during the production phase of products subject to this Regulation. In order to ensure consumer satisfaction with energy-saving lamps, in particular LEDs, functionality requirements should be set not only for directional lamps, but also to non-directional LEDs, as they were not covered by the functionality requirements in Commission Regulation (EC) No 244/2009.

(16) LED luminaires from which no LED lamp or module can be extracted for independent testing should not offer a way for LED manufacturers to escape the requirements of this Regulation.

39 Performance requirements for LEDs covers both directional and non-directional lamps. The regulation also contains requirements for control gear (ie functional units between the switch and the lamp, eg ballast), but this is excluded from the information presented as it is beyond the scope of the main document

40 While the official journal reference may be followed, interested parties are recommended to visit the [http://www.lightingassociation.com/pdf/EUP_DIM1_FAQ.pdf](http://www.lightingassociation.com/pdf/EUP_DIM1_FAQ.pdf). The link is to the UK Lighting Associations webpage which reproduces the legislative requirement, but also provides and interpretation of the legislation and associated other material.
Phasing the ecodesign requirements should provide a sufficient timeframe for manufacturers to re-design products subject to this Regulation. The timing of the stages should be such that any negative impact on functionalities of equipment on the market are avoided and that the cost impact for end-users and manufacturers, in particular small and medium-sized enterprises, is taken into account, while ensuring timely achievement of the objectives of this Regulation.

1.1.2.1.1 Subject matter and scope (within Article 1)
...requirements for placing on the market the following electrical lighting products:

a) directional lamps
b) light-emitting diode (LED) lamps;
c) equipment designed for installation between the mains and the lamps, including lamp control gear, control devices and luminaires (other than ballasts and luminaires for fluorescent and high-intensity discharge lamps);

including when they are integrated into other products. The Regulation also establishes product information requirements for special purpose products.

1.1.2.1.2 Timings (within Article 3)
Defined within Article 3:

Each ecodesign requirement shall apply in accordance with the following stages:

Stage 1: 1 September 2013,
Stage 2: 1 September 2014,
Stage 3: 1 September 2016,

1.1.2.1.3 Technical Requirements (Annex 1)
Defined within Annex III:

The energy efficiency index \(\text{EEI} \) of the lamp is calculated as follows and rounded to two decimal places:

\[
\text{EEI} = \frac{P_{cor}}{P_{ref}}
\]

where:

- \( P_{cor} \) is the rated power measured at nominal input voltage and corrected where appropriate in accordance with Table 1. The correction factors are cumulative where appropriate.
Table 1
Correction factors

| Scope of the correction                                                                 | Corrected power ($P_{cor}$)                        |
|----------------------------------------------------------------------------------------|----------------------------------------------------|
| Lamps operating on external halogen lamp control gear                                  | $P_{\text{rated}} \times 1.06$                     |
| Lamps operating on external LED lamp control gear                                       | $P_{\text{rated}} \times 1.10$                     |
| Fluorescent lamps of 16 mm diameter (T5 lamps) and 4-pin single capped fluorescent lamps operating on external fluorescent lamp control gear | $P_{\text{rated}} \times 1.10$                     |
| Other lamps operating on external fluorescent lamp control gear                         | $P_{\text{rated}} \times \frac{0.24\sqrt{\Phi_{\text{use}}} + 0.0103\Phi_{\text{use}}}{0.15\sqrt{\Phi_{\text{use}}} + 0.0097\Phi_{\text{use}}}$ |
| Lamps operating on external high-intensity discharge lamp control gear                  | $P_{\text{rated}} \times 1.10$                     |
| Compact fluorescent lamps with colour rendering index ≥ 90                             | $P_{\text{rated}} \times 0.85$                     |
| Lamps with anti-glare shield                                                           | $P_{\text{rated}} \times 0.80$                     |

$P_{\text{ref}}$ is the reference power obtained from the useful luminous flux of the lamp ($\Phi_{\text{use}}$) by the following formula:

For models with $\Phi_{\text{use}} < 1300$ lumen: $P_{\text{ref}} = 0.88\sqrt{\Phi_{\text{use}}} + 0.049\Phi_{\text{use}}$

For models with $\Phi_{\text{use}} \geq 1300$ lumen: $P_{\text{ref}} = 0.0734\Phi_{\text{use}}$

$\Phi_{\text{use}}$ is defined as follows:

- directional lamps with a beam angle ≥ 90° other than filament lamps and carrying a warning on their packaging in accordance with point 3.1.2(j) of this Annex: rated luminous flux in a 120° cone ($\Phi_{120}$)

- other directional lamps: rated luminous flux in a 90° cone ($\Phi_{90}$).

The maximum EEI of directional lamps is indicated in Table 2.

Table 2

| Application date | Maximum energy efficiency index (EEI) |
|------------------|----------------------------------------|
|                  | Mains-voltage filament lamps           | Other filament lamps | High-intensity discharge lamps | Other lamps |
| Stage 1          | If $\Phi_{\text{use}} > 450$ lm: 1.75   | If $\Phi_{\text{use}} \leq 450$ lm: 1.20 | 0.50                            | 0.50        |
|                  | If $\Phi_{\text{use}} > 450$ lm: 0.95  |                        |                                  |             |
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| Application date | Maximum energy efficiency index (EEI) |
|------------------|--------------------------------------|
|                  | Mains-voltage filament lamps | Other filament lamps | High-intensity discharge lamps | Other lamps |
| Stage 2          | 1,75          | 0,95            | 0,50               | 0,50        |
| Stage 3          | 0,95          | 0,95            | 0,36               | 0,20        |

Stage 3 for mains-voltage filament lamps shall apply only if no later than 30 September 2015, evidence is produced by the Commission through a detailed market assessment and communicated to the Consultation Forum that there are mains-voltage lamps on the market that are:

- compliant with the maximum EEI requirement in stage 3;
- affordable in terms of not entailing excessive costs for the majority of end-users;
- broadly equivalent in terms of consumer-relevant functionality parameters to mains-voltage filament lamps available on the date of entry into force of this Regulation, including in terms of luminous fluxes spanning the full range of reference luminous fluxes listed in Table 6;
- compatible with equipment designed for installation between the mains and filament lamps available on the date of entry into force of this Regulation according to state-of-the-art requirements for compatibility.

### Additional functionality requirements for directional CFLs

**Table 3**

| Functionality parameter | Stage 1 (except where indicated otherwise) | Stage 3 |
|-------------------------|------------------------------------------|---------|
| Lamp survival factor at 6 000 h | From 1 March 2014: ≥ 0,50 | ≥ 0,70 |
| Lumen maintenance       | At 2 000 h: ≥ 80 %                      | At 2 000 h: ≥ 83 % |
|                         | At 6 000 h: ≥ 70 %                      | At 6 000 h: ≥ 70 % |
| Number of switching cycles before failure | ≥ half the lamp lifetime expressed in hours ≥ 10 000 if lamp starting time > 0,3 s | ≥ lamp lifetime expressed in hours ≥ 30 000 if lamp starting time > 0,3 s |
| Starting time            | < 2,0 s                                  | < 1,5 s if P < 10 W |
|                         |                                         | < 1,0 s if P ≥ 10 W |
| Lamp warm-up time to 60 % Φ | < 40 s or < 100 s for lamps containing mercury in amalgam form | < 40 s or < 100 s for lamps containing mercury in amalgam form |
| Premature failure rate   | ≤ 5,0 % at 500 h                         | ≤ 5,0 % at 1 000 h |
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Additional functionality requirements for directional lamps excluding CFLs, LEDs and HIDs
Additional functionality requirements for directional and non-directional LEDs

| Functionality parameter                        | Requirement as from stage 1, except where indicated otherwise |
|-----------------------------------------------|---------------------------------------------------------------|
| Lamp survival factor at 6 000 h               | From 1 March 2014: ≥ 0.90                                     |
| Lumen Maintenance at 6 000 h                  | From 1 March 2014: ≥ 0.80                                     |
| Number of switching cycles before failure     | ≥ 15 000 if rated lamp life ≥ 30 000 h otherwise:           |
|                                              | ≥ half the rated lamp life expressed in hours                |
| Starting time                                 | < 0.5 s                                                      |
| Lamp warm-up time to 95 % Φ                   | < 2 s                                                        |
| Premature failure rate                        | ≤ 5.0 % at 1 000 h                                           |

| Functionality parameter                        | Requirement as from stage 1, except where indicated otherwise |
|-----------------------------------------------|---------------------------------------------------------------|
| Colour rendering (Ra)                         | ≥ 80                                                         |
|                                              | ≥ 65 if the lamp is intended for outdoor or industrial       |
|                                              | applications in accordance with point 3.1.3(l) of this       |
|                                              | Annex                                                        |
| Colour consistency                            | Variation of chromaticity coordinates within a six-step      |
|                                              | MacAdam ellipse or less.                                     |
| Lamp power factor (PF) for lamps with integrated control gear | P ≤ 2 W: no requirement                                     |
|                                              | 2 W < P ≤ 5 W: PF > 0.4                                     |
|                                              | 5 W < P ≤ 25 W: PF > 0.5                                    |
|                                              | P > 25 W: PF > 0.9                                          |

1.1.2.1.4 Exemptions/Exclusions

*Defined within Article 1:*

a) LED modules shall be exempted from the requirements of this Regulation if they are marketed as part of luminaires that are placed on the market in less than 200 units per year.

*Defined within Article 2:*

a) ‘Special purpose product’ … that require technical parameters not necessary for the purposes of lighting average scenes or objects in average circumstances. They are of the following types:

(a) applications where the primary purpose of the light is not lighting, such as:

- emission of light as an agent in chemical or biological processes (such as polymerisation, ultraviolet light used for curing/drying/hardening, photodynamic therapy, horticulture, petcare, anti-insect products);
- image capture and image projection (such as camera flashlights, photocopiers, video projectors);
- heating (such as infrared lamps);
- signalling (such as traffic control or airfield lamps);
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(b) lighting applications where:
   (i) the spectral distribution of the light is intended to change the appearance of the scene or object lit, in addition to making it visible (such as food display EN 14.12.2012 Official Journal of the European Union L 342/3 lighting or coloured lamps as defined in point 1 of Annex I), with the exception of variations in correlated colour temperature; or
   (ii) the spectral distribution of the light is adjusted to the specific needs of particular technical equipment, in addition to making the scene or object visible for humans (such as studio lighting, show effect lighting, theatre lighting); or
   (iii) the scene or object lit requires special protection from the negative effects of the light source (such as lighting with dedicated filtering for photosensitive patients or photosensitive museum exhibits); or
   (iv) lighting is required only for emergency situations (such as emergency lighting luminaires or control gears for emergency lighting); or
   (v) the lighting products have to withstand extreme physical conditions (such as vibrations or temperatures below – 20 °C or above 50 °C);

(c) products incorporating lighting products, where the primary purpose is not lighting and the product is dependent on energy input in fulfilling its primary purpose during use (such as refrigerators, sewing machines, endoscopes, blood analysers);

**Defined by Annex 1:**

b) lamps having the following chromaticity coordinates x and y:
   — x < 0.270 or x > 0.530
   — y <− 2,3172 x2 + 2,3653 x − 0,2199 or y > − 2,3172 x2 + 2,3653 x − 0,1595;

1.1.2.1.5 Marking Requirements (within Article 3)

**Defined by Annex 1 for special purpose (ie exempt) lamps:**
If the product is placed on the market in a packaging containing information to be visibly displayed to the end-user prior to purchase, the following information shall be clearly and prominently indicated on the packaging and in all other forms of product information:

a) the intended purpose; and

b) that it is not suitable for household room illumination.

**Defined by Annex IV for general cases**
In all forms of product information, the term ‘energy-saving lamp’ or any similar product related promotional statement about lamp efficacy may be used only if the energy efficiency index of the lamp (calculated in accordance with the method set out in point 1.1 of this Annex) is 0.40 or below.

Information to be displayed on the lamp itself:

For lamps other than high-intensity discharge lamps, the value and unit (‘lm’, ‘K’ and “°”) of the nominal useful luminous flux, of the colour temperature and of the nominal beam angle shall be displayed in a legible font on the surface of the lamp if, after the inclusion of safety-related information such as power and voltage, there is sufficient space available for it on the lamp without unduly obstructing the light coming from the lamp.

If there is room for only one of the three values, the nominal useful luminous flux shall be provided. If there is room for two values, the nominal useful luminous flux and the colour temperature shall be provided.

Information to be visibly displayed to end-users, prior to their purchase, on the packaging and on free access websites:
If the product is placed on the market in a packaging containing information to be visibly displayed to the end-users, prior to their purchase, the information shall also be clearly and prominently indicated on the packaging.

The information does not need to use the exact wording on the list below. It may be displayed in the form of graphs, drawings or symbols rather than text.

- Nominal useful luminous flux displayed in a font at least twice as large as any display of the nominal lamp power;
- Nominal life time of the lamp in hours (not longer than the rated life time);
- Colour temperature, as a value in Kelvins and also expressed graphically or in words;
- Number of switching cycles before premature failure;
- Warm-up time up to 60% of the full light output (may be indicated as ‘instant full light’ if less than 1 second);
- A warning if the lamp cannot be dimmed or can be dimmed only on specific dimmers; in the latter case a list of compatible dimmers shall be also provided on the manufacturer’s website;
- If designed for optimum use in non-standard conditions (such as ambient temperature $T_a \neq 25 \, ^\circ C$ or specific thermal management is necessary), information on those conditions;
- Lamp dimensions in millimetres (length and largest diameter);
- Nominal beam angle in degrees;
- If the lamp’s beam angle is $\geq 90^\circ$ and its useful luminous flux as defined in point 1.1 of this Annex is to be measured in a 120° cone, a warning that the lamp is not suitable for accent lighting;
- If the lamp cap is a standardised type also used with filament lamps, but the lamp’s dimensions are different from the dimensions of the filament lamp(s) that the lamp is meant to replace, a drawing comparing the lamp’s dimensions to the dimensions of the filament lamp(s) it replaces;
- An indication that the lamp is of a type listed in the first column of Table 6 may be displayed only if the luminous flux of the lamp in a 90° cone ($\Phi_{90^\circ}$) is not lower than the reference luminous flux indicated in Table 6 for the smallest wattage among the lamps of the type concerned. The reference luminous flux shall be multiplied by the correction factor in Table 7. For LED lamps, it shall be in addition multiplied by the correction factor in Table 8;
- An equivalence claim involving the power of a replaced lamp type may be displayed only if the lamp type is listed in Table 6 and if the luminous flux of the lamp in a 90° cone ($\Phi_{90^\circ}$) is not lower than the corresponding reference luminous flux in Table 6. The reference luminous flux shall be multiplied by the correction factor in Table 7. For LED lamps, it shall be in addition multiplied by the correction factor in Table 8. The intermediate values of both the luminous flux and the claimed equivalent lamp power (rounded to the nearest 1 W) shall be calculated by linear interpolation between the two adjacent values.
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### Table 6

**Reference luminous flux for equivalence claims**

| Extra-low voltage reflector type | Power (W) | Reference $\Phi_{90'}$ (lm) |
|----------------------------------|-----------|------------------------------|
| MR11 GU4                        | 20        | 160                          |
|                                  | 35        | 300                          |
| MR16 GU 5.3                     | 20        | 180                          |
|                                  | 35        | 300                          |
|                                  | 50        | 540                          |
| AR111                           | 35        | 250                          |
|                                  | 50        | 390                          |
|                                  | 75        | 640                          |
|                                  | 100       | 785                          |

| Mains-voltage blown glass reflector type | Power (W) | Reference $\Phi_{90'}$ (lm) |
|-----------------------------------------|-----------|------------------------------|
| R50/NR50                                | 25        | 90                           |
|                                         | 40        | 170                          |
| R63/NR63                                | 40        | 180                          |
|                                         | 60        | 300                          |
| R80/NR80                                | 60        | 300                          |
|                                         | 75        | 350                          |
|                                         | 100       | 580                          |
| R95/NR95                                | 75        | 350                          |
|                                         | 100       | 540                          |
| R125                                    | 100       | 580                          |
|                                         | 150       | 1000                         |
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### Table 7

#### Multiplication factors for lumen maintenance

| Lamp type                      | Luminous flux multiplication factor |
|--------------------------------|-------------------------------------|
| Halogen lamps                  | 1                                   |
| Compact fluorescent lamps      | 1.08                                |
| LED lamps                      | \(1 + 0.5 \times (1 - LLMF)\) where LLMF is the lumen maintenance factor at the end of the nominal life |
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If the lamp contains mercury:
   m) Lamp mercury content as X,X mg;

   n) Indication of which website to consult in case of accidental lamp breakage to find instructions on how to clean up the lamp debris.

**Information to be made publicly available on free-access websites**

As a minimum, the following information shall be expressed at least as values.

   a) The information specified in [the section above];
   b) Rated power (0,1 W precision);
   c) Rated useful luminous flux;
   d) Rated lamp life time;
   e) Lamp power factor;
   f) Lumen maintenance factor at the end of the nominal life (except for filament lamps);
   g) Starting time (as X,X seconds);
   h) Colour rendering;
   i) Colour consistency (only for LEDs);
   j) Rated peak intensity in candela (cd);
   k) Rated beam angle;
   l) If intended for use in outdoor or industrial applications, an indication to this effect;
   m) Spectral power distribution in the range 180-800 nm;
   n) If the lamp contains mercury:
      — Instructions on how to clean up the lamp debris in case of accidental lamp breakage;

---

**Table 8**

| LED lamp beam angle | Luminous flux multiplication factor |
|--------------------|------------------------------------|
| 20° ≤ beam angle   | 1                                  |
| 15° ≤ beam angle < 20° | 0,9                              |
| 10° ≤ beam angle < 15° | 0,85                             |
| beam angle < 10°    | 0,80                               |
Additional requirements are placed on LEDs without integral ballast and for products inserted in luminaires.

1.1.2.1.6 Review Requirements (Article 7)
A review of the regulation is required within three years after its entry into force (ie September 2015). The review should:

...take particular note of the trend in sales of special-purpose lamp types in order to make sure that they are not used outside special applications, and of the development of new technologies such as LED and organic LED. It should assess the feasibility of establishing energy-efficiency requirements at class A level as defined in Regulation (EU) No 874/2012, or at least at class B level for directional mains voltage halogen lamps.... It should also assess whether the energy-efficiency requirements for other filament lamps can be significantly tightened. The review should also assess the functionality requirements regarding colour rendering index for LED lamps.

1.1.3 Regulatory Requirements for fluorescent lamps without integrated ballast
Flourescent lamps without integrated ballast were original regulated in 2000 under Directive 2000/55/EC. These regulations were revised and extended in March 2009 by No 245/2009, and further amended under regulation No 347/2010 in April 2010. Details are not presented here due to the complex nature and cross referencing of the various legislative requirement. Please refer to the relevant regulation for details.
Section 2: Notes on Sales and efficacy of all lamps, total light output
And sales by product type

2.1 Data Sources

2.1.1 Data coverage by country

Data is aggregated sales data supplied by GfK, split by lamp type and broken down into sales by a series of wattage ranges. GfK estimates that data represents on average 70% of overall market in all years reported, with details of their estimated coverage by each market shown below:

| Estimated Coverage:                  |                |
|--------------------------------------|----------------|
| Austria (2007-13)                    | 75%            |
| Germany (2007-13)                    | 75%            |
| France (2007-13)                     | 85%            |
| Spain (2011-13)                      | 80%            |
| Italy (2008-13)                      | 85%            |
| Poland (2011-13)                     | 65%            |
| Belgium (2007-13)                    | 40%            |
| Netherlands (2007-13)                | 40%            |
| Great Britain (England, Scotland and Wales) (2007-13) | 85% |

2.1.1.1 Notes on LED lamp market coverage

GfK also suggests that market coverage for LED lamps is likely to be different to that of other lamps as this is a new technology which is sold through specialist channels more often than standard lamps. While the exact variation in LED market coverage is unknown, GfK offers the following analysis to give some context to the uncertainty in the coverage\textsuperscript{41}:

The volume share of LED is around 5% around Europe according to our panel [the data as presented here]. If we take only the big 4 markets (DE, UK, FR, IT), the share is between 9% (Germany) and 3% (UK and IT). The share in France is 5%. However, LED sales are growing sharply in all countries.

2.2 Manipulations of Data Supplied

Average efficacies calculated on a sales weighted basis by:

\[
\text{Average efficacy} = \frac{\text{Sum (sales of lamp type } a \text{ sales } \times \text{efficacy of lamp type } a) + \ldots + \text{Sum (sales of lamp type } x \text{ sales } \times \text{efficacy of lamp type } x)}{\text{Sum (all lamp sales)}}
\]

Instantaneous light output calculated as sales weighted basis by:

\[
\text{Light output} = \frac{\text{Sum (sales of lamp type } a \text{ sales } \times \text{efficacy of lamp type } a \times \text{wattage of lamp type } a) + \ldots + \text{Sum (sales of lamp type } x \text{ sales } \times \text{efficacy of lamp type } x \times \text{wattage of lamp type } n)}{\text{Sum (all lamp sales)}}
\]

\textsuperscript{41} text slightly edited for presentation here but only for clarity.
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Lifetime light output calculated as sales weighted basis by:

\[ \text{Sum (sales of lamp type } a \text{ sales } \times \text{efficacy of lamp type } a \times \text{wattage of lamp type } a \times \text{lifetime of lamp type } a) + \ldots + \text{Sum (sales of lamp type } x \text{ sales } \times \text{efficacy of lamp type } x \times \text{wattage of lamp type } n \times \text{lifetime of lamp type } n) \]

2.2.1 Key assumptions:

Efficacies used for all calculations based on estimated average global efficacies for each lamp type and associated wattage range for 230V lamps.

Lifetimes used for all calculations based on estimated average global lamp life for each lamp type and associated wattage range for 230V lamps.

Tables for efficacy and assumed lifetimes of each lamp type/wattage range for the years 1996-2013 can be viewed in the product definition which is in the supporting documents section of the Domestic Lighting area of the Mapping and Benchmarking website – see http://mappingandbenchmarking.iea-4e.org/matrix?type=product&id=5

2.2.2 EU specific adjustments:

A very low percentage of sales in some lamp categories were provided as of “unknown wattage”. In order to capture these sales, they were distributed across the wattages for that lamp type in the same proportion as that of the sales for which the wattage was known.
Section 3: Notes on Policy Interventions

Policies actions fall into 2 categories, pan-EU member requirements and national interventions.

Pan-EU requirements:

1) Mandatory MEPS: As described in notes section 1

2) Mandatory Product Labelling: From the 1 July 1999 (with exclusions until 31 December 2000), lighting products within the EU have been required to carry compulsory energy labels.

Original labelling requirements placing lamps on an A-G comparative scale were set out in 98/11/EC of 27 January 1998 implementing Council Directive 92/75/EEC with regard to energy labelling of household lamps. This regulation was revised by No 874/2012 of 12 July 2012 to change the labelling scale to A++ - E. Specific allocation of label “grade” on the scale is based on an Energy Efficiency Index defined in each regulation (please refer to the individual regulations for full information on the various labelling requirements).

National Level Interventions

National actions vary substantially from CFL promotion and subsidy programmes to retailer voluntary agreements. Please refer to individual country mapping documents for more details.

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42 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:1998:071:0001:0008:EN:PDF
Section 4: Notes on Cultural Issues

No additional notes.