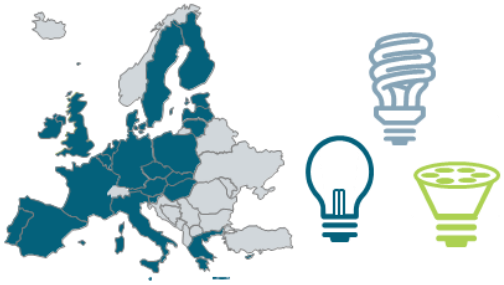


Country:	EU 27 (plus Switzerland/Norway)
Technology:	Domestic Lighting
Sub Category:	All domestic lamps

Introduction

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[1]"*

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) *
- Retrofit LEDs
- Dedicated LEDs

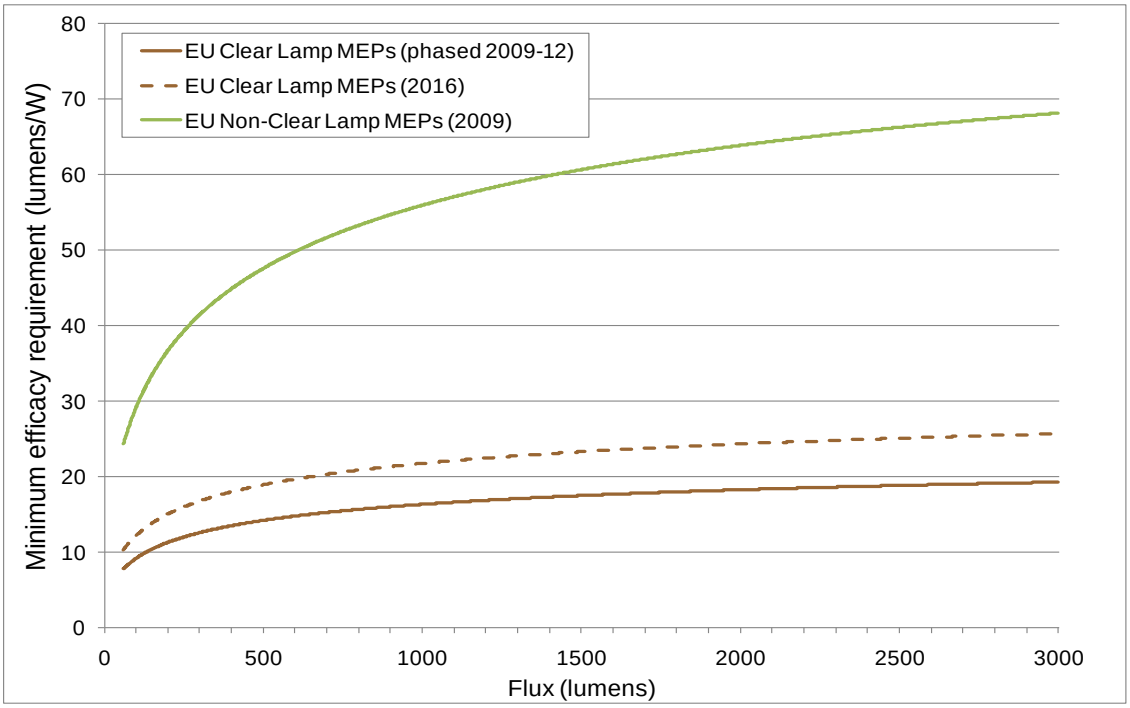
** NOTE: The subsequent analysis in the associated benchmarking report[2] excludes linear fluorescent tubes as, for those countries submitting data, these lamps constituted a small proportion of use in the domestic sector.*

A full product definition is provided at the annex website[2].

[1] *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.*

[2] see http://mappingandbenchmarking.iea-4e.org/matrix?type=product&id=5

Phase out regulations for domestic lighting – EU25



Key notes on Graph (see notes section 1)

National regulations based on pan EU requirement as follows:

- At the time of preparation, regulations for "domestic lighting" covered only non-directional lighting. Proposals for the regulation of directional lighting are well underway and announcements are expected in the near future.
- Each Ecodesign requirement shall apply in accordance with the following stages (with some exceptions)[3]:

	Stage	***Date***	***Range***	***Equivalent to lamps below EU Energy Class***
Clear Lamps	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[4]	C
	Anticipated Review 2014			
	6	01. Sept. 2016	>60lm	B[5]
Non clear (frosted) lamps		01. Sept. 2009	All Lamps	A[6]

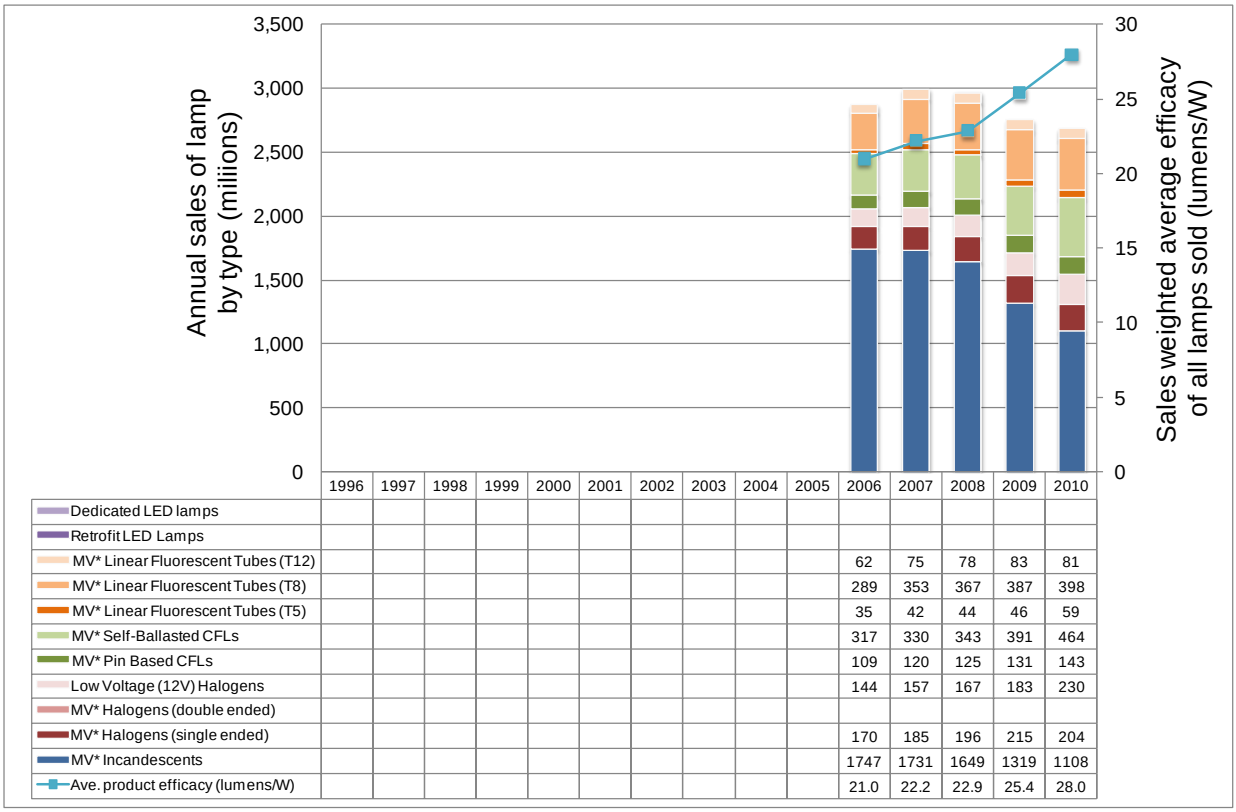
[3] Table derived from European Lamp Federation summary information (http://www.elcfed.org/documents/Questions%20and%20answers%20on%20the%20EU%20decision%20to%20phase%20out%20incandescent%20lamps_external_20090318_final.pdf)

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

[5] Except for clear lamps with G9/R7s caps: EEL C

[6] 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".

Sales and average efficacy of all domestic lamps – EU27 (plus Switzerland and Norway)



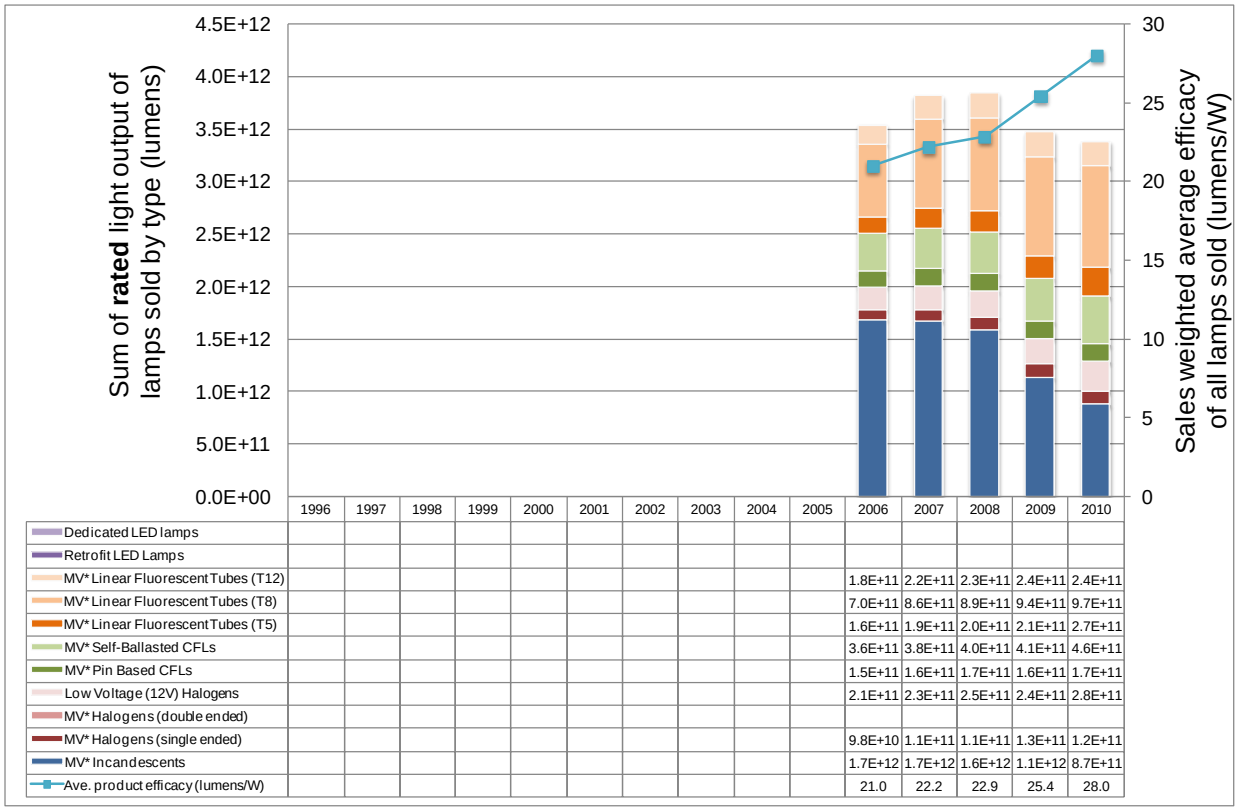
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Dedicated LED lamps															
Retrofit LED Lamps															
MV* Linear Fluorescent Tubes (T12)											62	75	78	83	81
MV* Linear Fluorescent Tubes (T8)											289	353	367	387	398
MV* Linear Fluorescent Tubes (T5)											35	42	44	46	59
MV* Self-Ballasted CFLs											317	330	343	391	464
MV* Pin Based CFLs											109	120	125	131	143
Low Voltage (12V) Halogens											144	157	167	183	230
MV* Halogens (double ended)															
MV* Halogens (single ended)											170	185	196	215	204
MV* Incandescents											1747	1731	1649	1319	1108
Ave. product efficacy (lumens/W)											21.0	22.2	22.9	25.4	28.0

* Mains Voltage

Key notes on Graph (See notes section 2)

- Total sales values for lamps in 2006-7 considered robust, but of less reliability for 2008 onward.
- Breakdown of fluorescent tubes, halogen sales and CFL sales by sub-lamp type (eg CFL pin based and self ballasted) based on assumptions and should be considered approximate only.
- 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. However, derivation of overall efficacy based on a large number of assumptions and should be considered highly illustrative only.

Total instantaneous light output of all domestic lamps sales – EU27 (plus Switzerland and Norway)



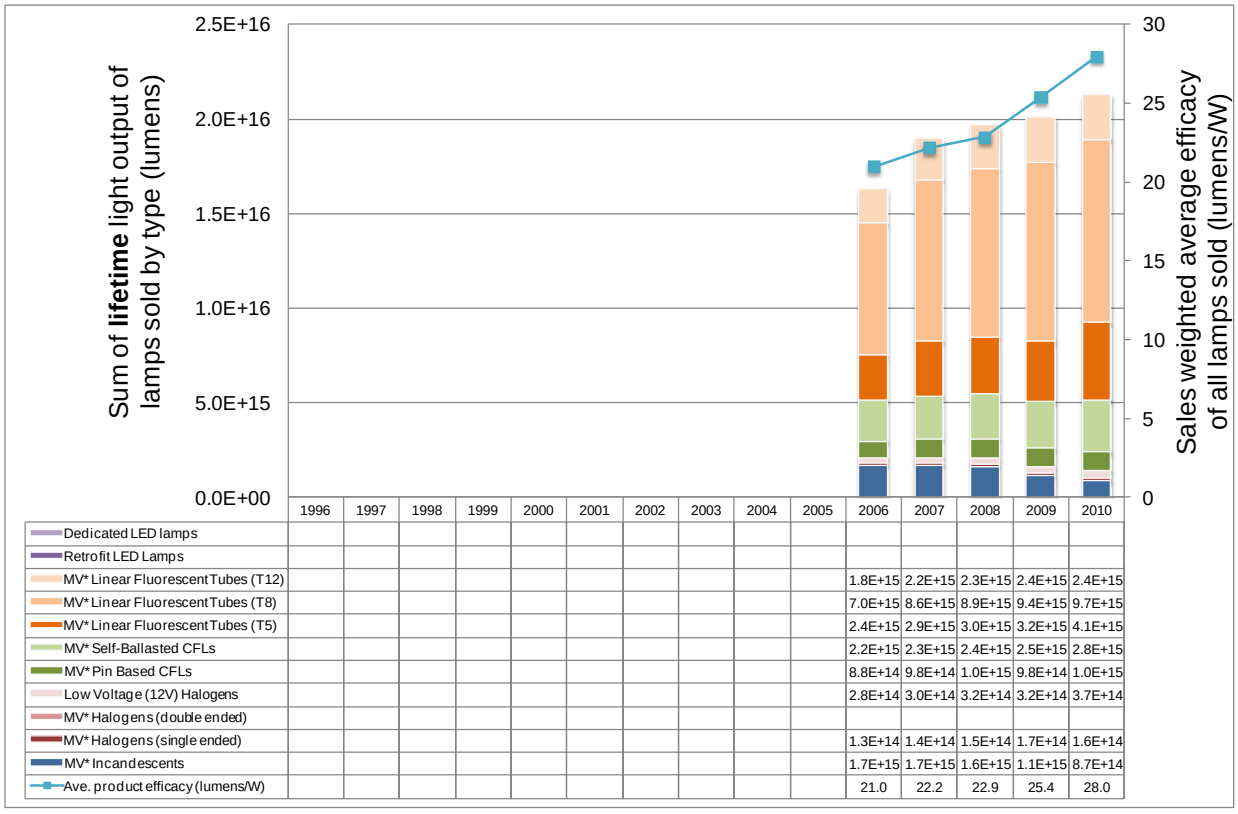
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Dedicated LED lamps															
Retrofit LED Lamps															
MV* Linear Fluorescent Tubes (T12)											1.8E+11	2.2E+11	2.3E+11	2.4E+11	2.4E+11
MV* Linear Fluorescent Tubes (T8)											7.0E+11	8.6E+11	8.9E+11	9.4E+11	9.7E+11
MV* Linear Fluorescent Tubes (T5)											1.6E+11	1.9E+11	2.0E+11	2.1E+11	2.7E+11
MV* Self-Ballasted CFLs											3.6E+11	3.8E+11	4.0E+11	4.1E+11	4.6E+11
MV* Pin Based CFLs											1.5E+11	1.6E+11	1.7E+11	1.6E+11	1.7E+11
Low Voltage (12V) Halogens											2.1E+11	2.3E+11	2.5E+11	2.4E+11	2.8E+11
MV* Halogens (double ended)															
MV* Halogens (single ended)											9.8E+10	1.1E+11	1.1E+11	1.3E+11	1.2E+11
MV* Incandescents											1.7E+12	1.7E+12	1.6E+12	1.1E+12	8.7E+11
Ave. product efficacy (lumens/W)											21.0	22.2	22.9	25.4	28.0

* Mains Voltage

Key notes on Graph (See notes section 2)

- 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. However, derivation of based on a large number of assumptions and should be considered highly illustrative only.
- Instantaneous light output is for lamps sold in each year only, *not* all installed stock.

Total lifetime light output of all domestic lamps sales - EU27 (plus Switzerland and Norway)



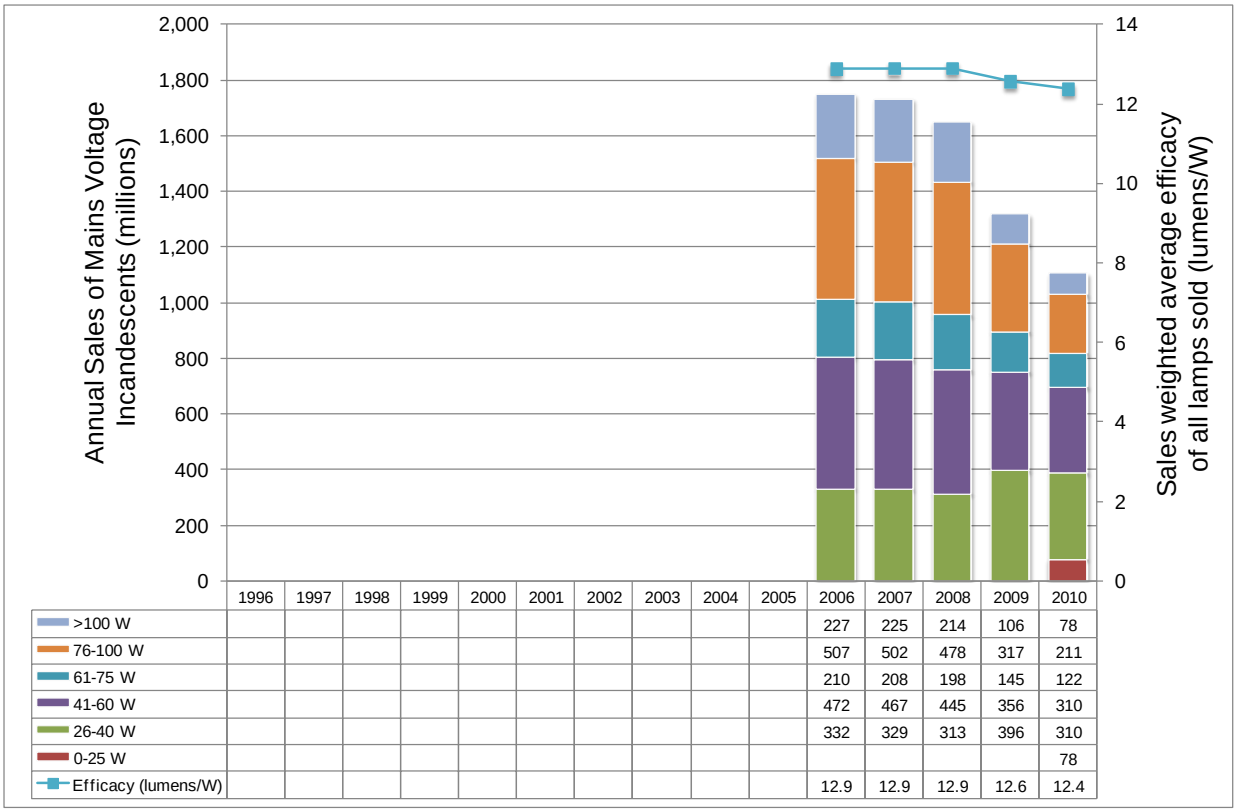
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Dedicated LED lamps															
Retrofit LED Lamps															
MV* Linear Fluorescent Tubes (T12)											1.8E+15	2.2E+15	2.3E+15	2.4E+15	2.4E+15
MV* Linear Fluorescent Tubes (T8)											7.0E+15	8.6E+15	8.9E+15	9.4E+15	9.7E+15
MV* Linear Fluorescent Tubes (T5)											2.4E+15	2.9E+15	3.0E+15	3.2E+15	4.1E+15
MV* Self-Ballasted CFLs											2.2E+15	2.3E+15	2.4E+15	2.5E+15	2.8E+15
MV* Pin Based CFLs											8.8E+14	9.8E+14	1.0E+15	9.8E+14	1.0E+15
Low Voltage (12V) Halogens											2.8E+14	3.0E+14	3.2E+14	3.2E+14	3.7E+14
MV* Halogens (double ended)															
MV* Halogens (single ended)											1.3E+14	1.4E+14	1.5E+14	1.7E+14	1.6E+14
MV* Incandescents											1.7E+15	1.7E+15	1.6E+15	1.1E+15	8.7E+14
Ave. product efficacy (lumens/W)											21.0	22.2	22.9	25.4	28.0

* Mains Voltage

Key notes on Graph (See notes section 2)

- 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. However, derivation of overall efficacy based on a large number of assumptions and should be considered highly illustrative only.
- Lifetime light output is for lamps sold in each year only, not all installed stock.

Sales of Mains Voltage Incandescent lamps by wattage range - EU27 (plus Switzerland and Norway)

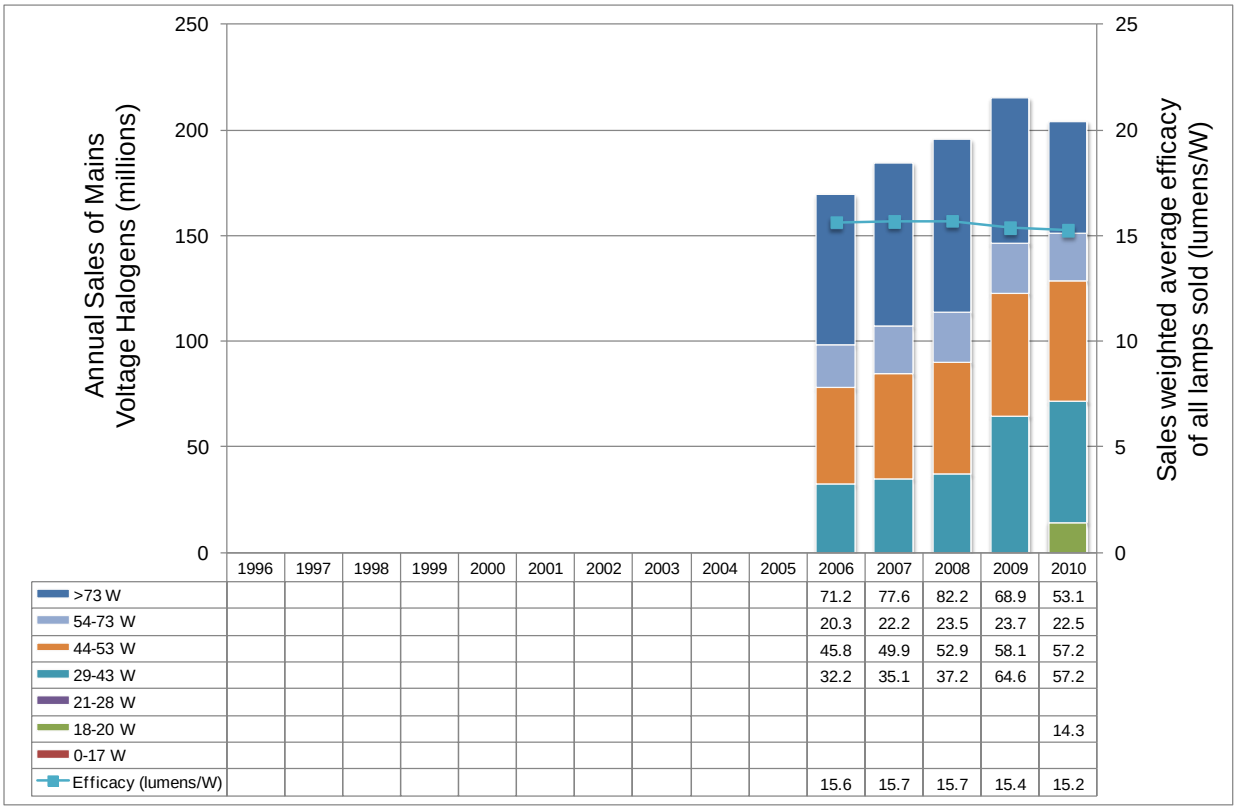


	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
>100 W											227	225	214	106	78
76-100 W											507	502	478	317	211
61-75 W											210	208	198	145	122
41-60 W											472	467	445	356	310
26-40 W											332	329	313	396	310
0-25 W															78
Efficacy (lumens/W)											12.9	12.9	12.9	12.6	12.4

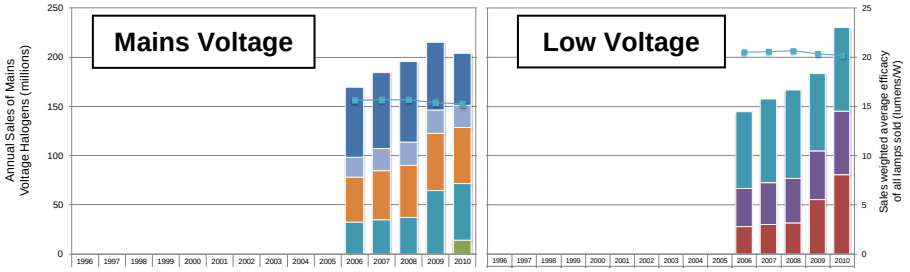
Key notes on Graph (See notes section 2)

- Total sales values for lamps in 2006-7 considered robust, but of less reliability for 2008 onward.
- 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. However, derivation of overall efficacy based on a large number of assumptions and should be considered highly illustrative only.

Sales of Mains Voltage Halogen lamps by wattage range - EU27 (plus Switzerland and Norway)



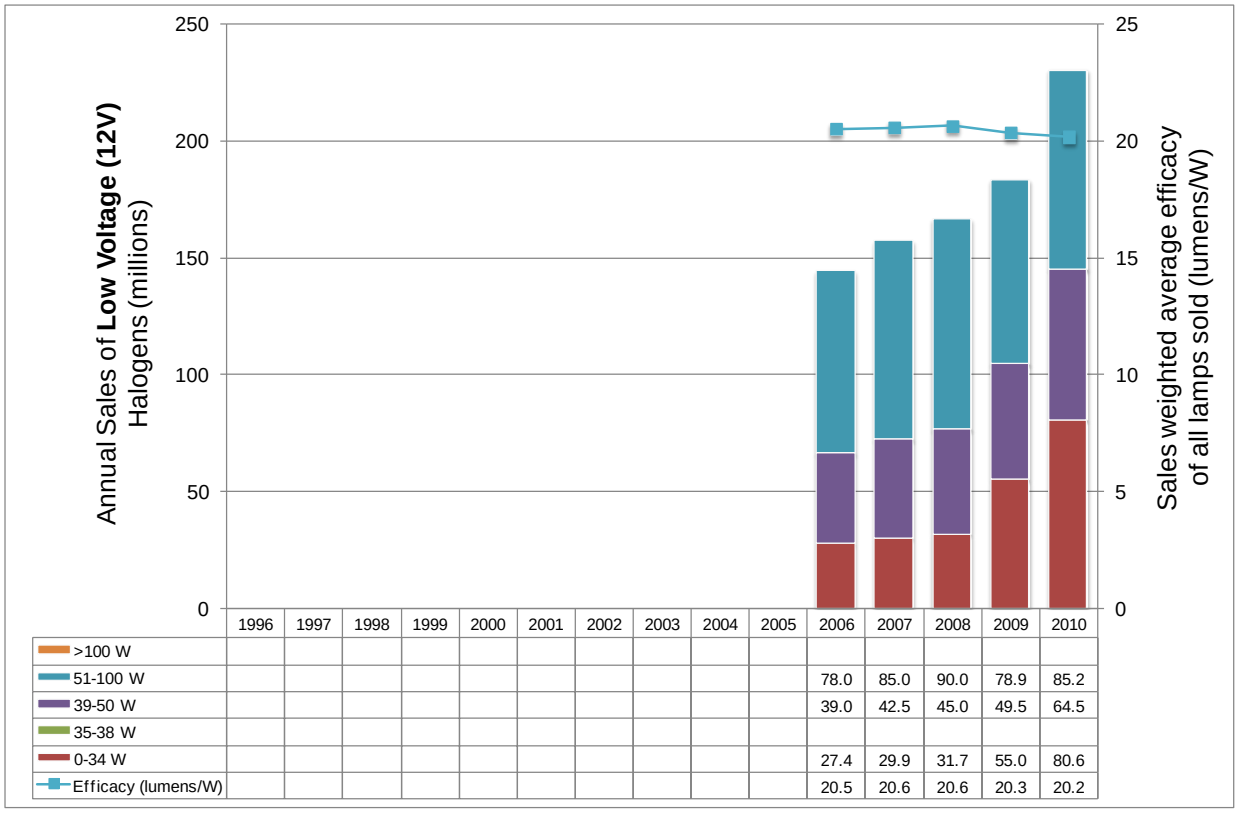
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
>73 W											71.2	77.6	82.2	68.9	53.1
54-73 W											20.3	22.2	23.5	23.7	22.5
44-53 W											45.8	49.9	52.9	58.1	57.2
29-43 W											32.2	35.1	37.2	64.6	57.2
21-28 W															
18-20 W															14.3
0-17 W															
Efficacy (lumens/W)											15.6	15.7	15.7	15.4	15.2



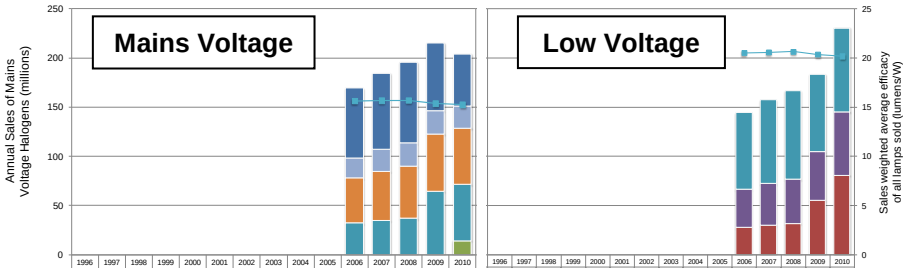
Key notes on Graph (See notes section 2)

- Total halogen sales values for lamps in 2006-7 considered robust, but of less reliability for 2008 onward.
- Breakdown of percentage sales by product type considered robust for 2009-2010 considered robust, but of less reliability prior to this period.
- Breakdown of sales by wattage type considered robust for 2008-2010t, but prior to 2008 are unknown and are fixed at 2008 levels.
- 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. However, derivation of overall efficacy based on a large number of assumptions and should be considered highly illustrative only.

Sales of Low Voltage (12V) Halogen lamps by wattage range – EU27 (plus Switzerland and Norway)



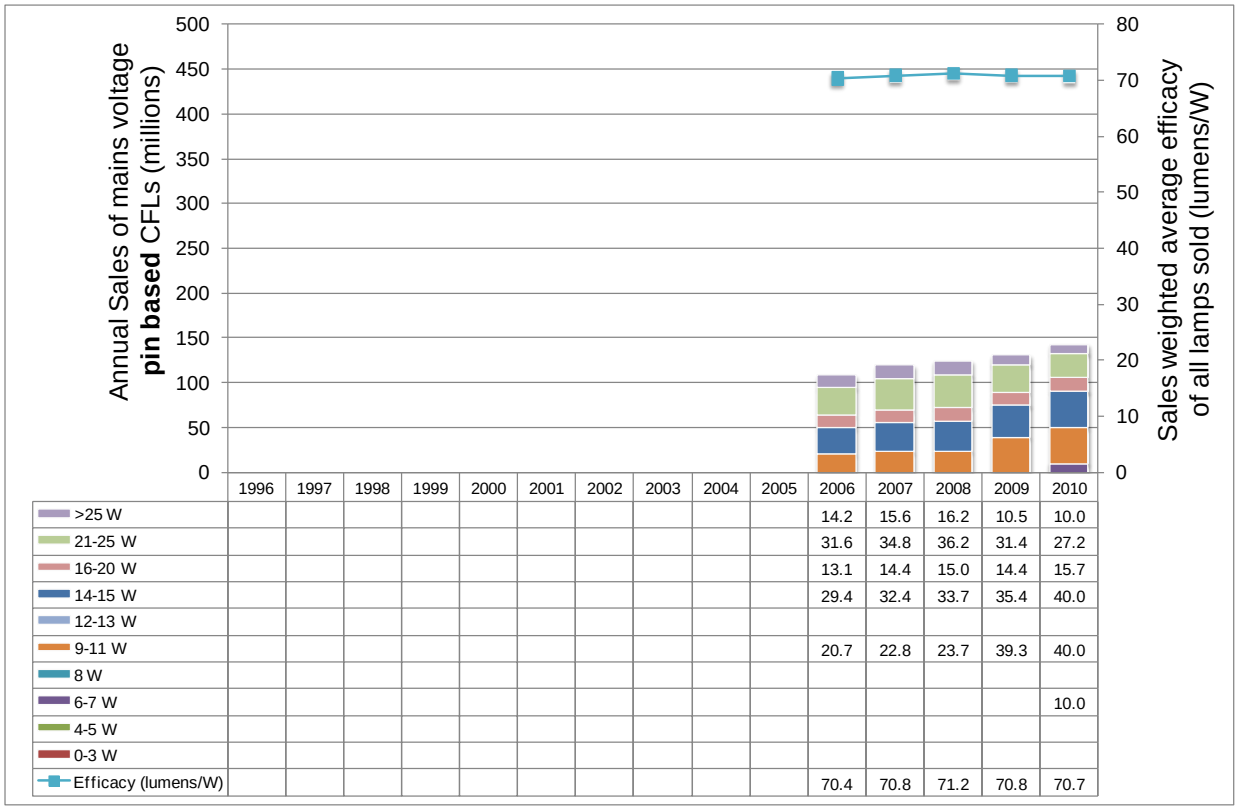
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
>100 W															
51-100 W											78.0	85.0	90.0	78.9	85.2
39-50 W											39.0	42.5	45.0	49.5	64.5
35-38 W															
0-34 W											27.4	29.9	31.7	55.0	80.6
Efficacy (lumens/W)											20.5	20.6	20.6	20.3	20.2



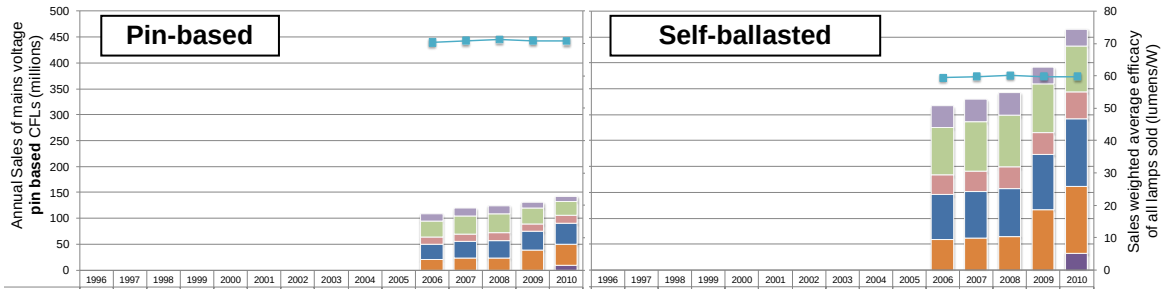
Key notes on Graph (See notes section 2)

- Total halogen sales values for lamps in 2006-7 considered robust, but of less reliability for 2008 onward.
- Breakdown of percentage sales by product type considered robust for 2009-2010 considered robust, but of less reliability prior to this period.
- Breakdown of sales by wattage type considered robust for 2008-2010t, but prior to 2008 are unknown and are fixed at 2008 levels.
- 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. However, derivation of overall efficacy based on a large number of assumptions and should be considered highly illustrative only.

Sales of pin-based mains Voltage CFL lamps by wattage range - EU27 (plus Switzerland and Norway)



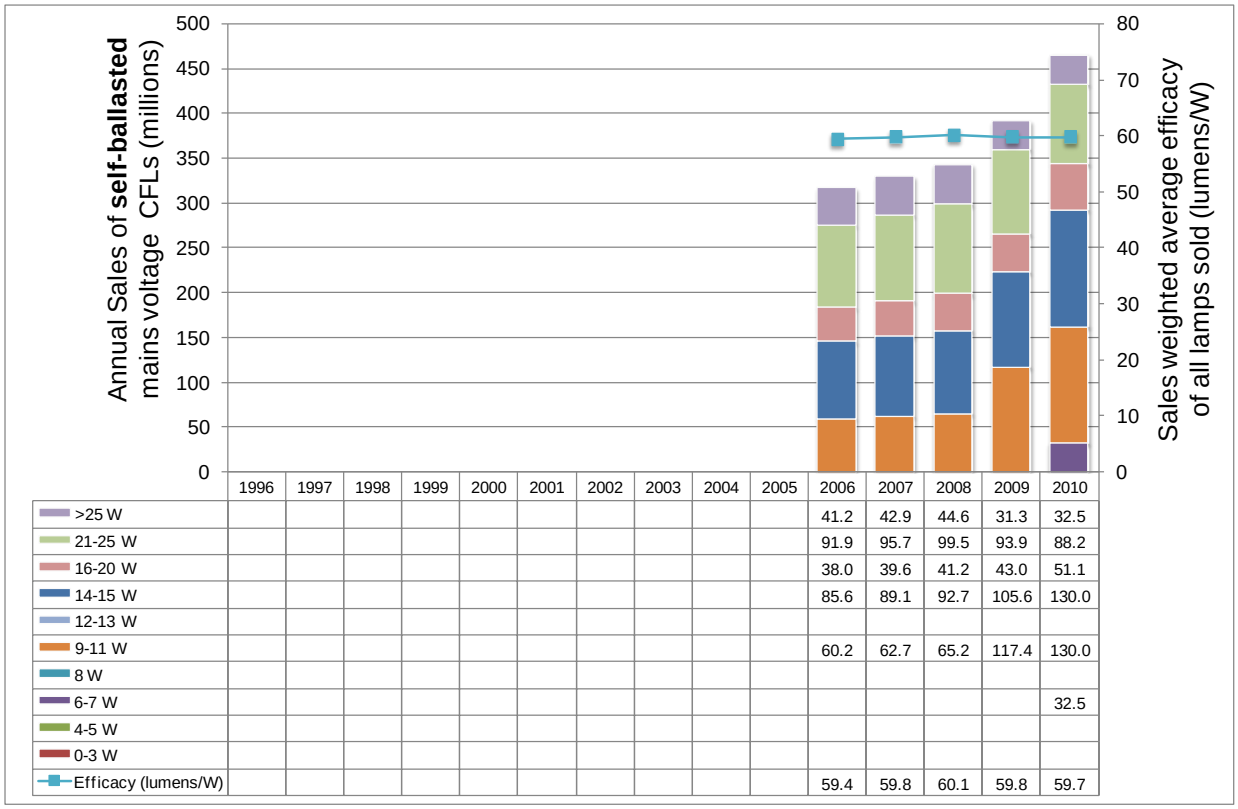
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
>25 W											14.2	15.6	16.2	10.5	10.0
21-25 W											31.6	34.8	36.2	31.4	27.2
16-20 W											13.1	14.4	15.0	14.4	15.7
14-15 W											29.4	32.4	33.7	35.4	40.0
12-13 W															
9-11 W											20.7	22.8	23.7	39.3	40.0
8 W															
6-7 W															10.0
4-5 W															
0-3 W															
Efficacy (lumens/W)											70.4	70.8	71.2	70.8	70.7



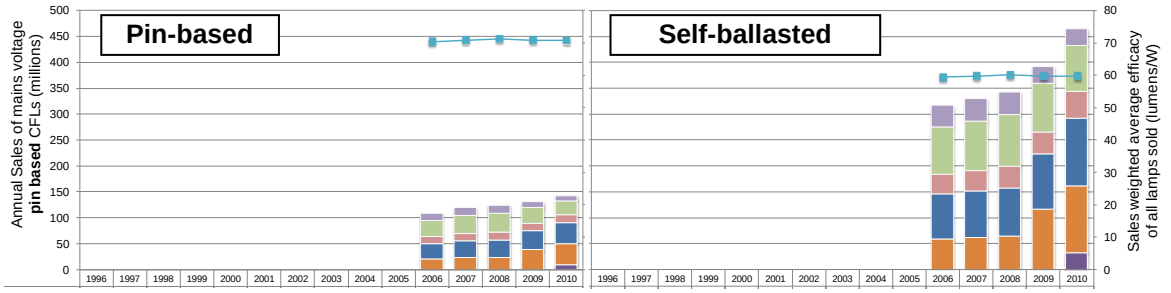
Key notes on Graph (See notes section 2)

- Total CFL sales values for lamps in 2006-7 considered robust, but of less reliability for 2008 onward.
- Breakdown of sales by wattage type considered robust for 2008-2010t, but prior to 2008 are unknown and are fixed at 2008 levels.
- 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. However, derivation of overall efficacy based on a large number of assumptions and should be considered highly illustrative only.

Sales of self-ballasted mains Voltage CFL lamps by wattage range - EU27 (plus Switzerland and Norway)



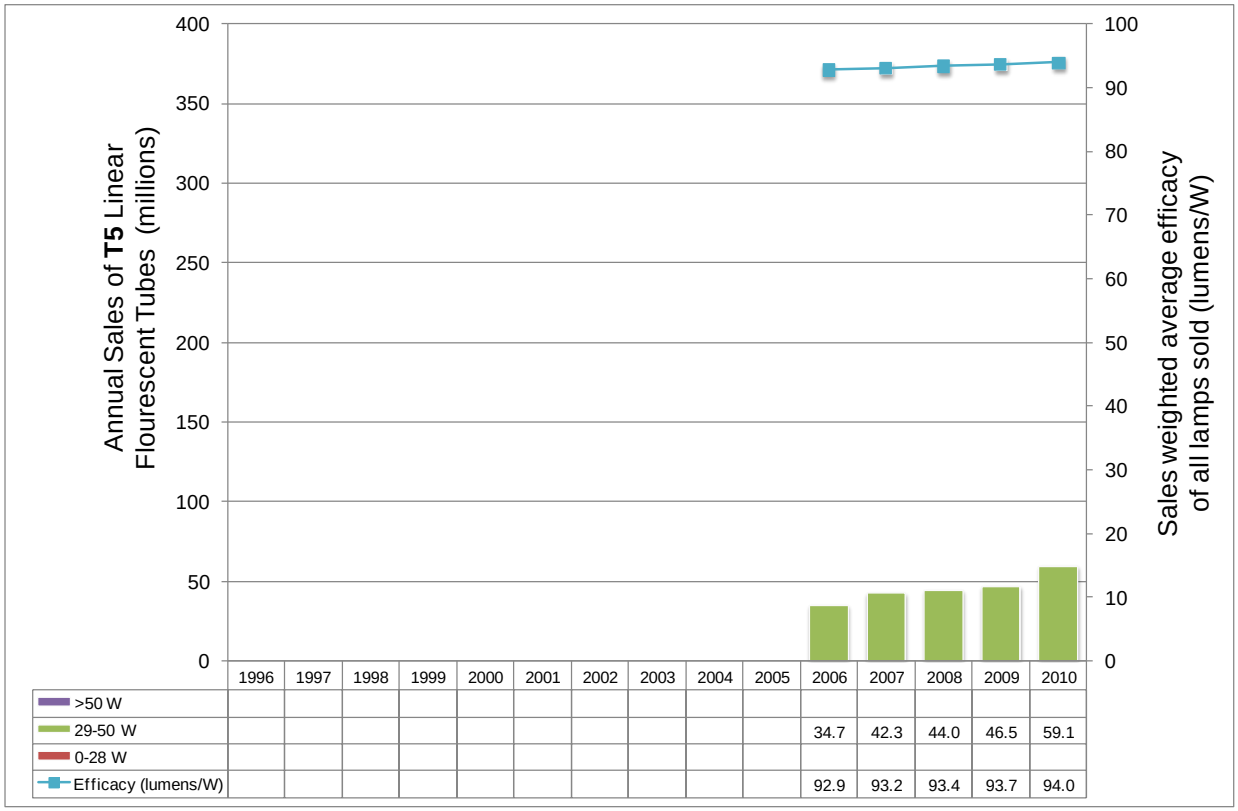
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
>25 W											41.2	42.9	44.6	31.3	32.5
21-25 W											91.9	95.7	99.5	93.9	88.2
16-20 W											38.0	39.6	41.2	43.0	51.1
14-15 W											85.6	89.1	92.7	105.6	130.0
12-13 W															
9-11 W											60.2	62.7	65.2	117.4	130.0
8 W															
6-7 W															32.5
4-5 W															
0-3 W															
Efficacy (lumens/W)											59.4	59.8	60.1	59.8	59.7

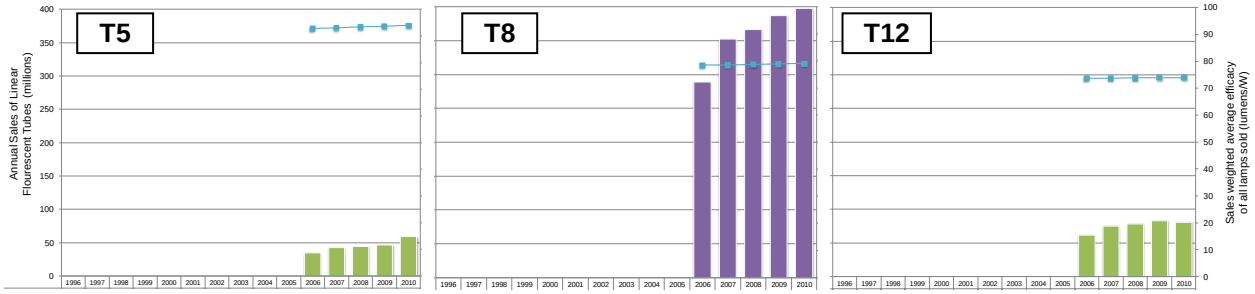


Key notes on Graph (See notes section 2)

- Total CFL sales values for lamps in 2006-7 considered robust, but of less reliability for 2008 onward.
- Breakdown of sales by wattage type considered robust for 2008-2010t, but prior to 2008 are unknown and are fixed at 2008 levels.
- 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. However, derivation of overall efficacy based on a large number of assumptions and should be considered highly illustrative only.

Sales of T5 Linear Fluorescent Tubes by wattage range - EU27 (plus Switzerland and Norway)

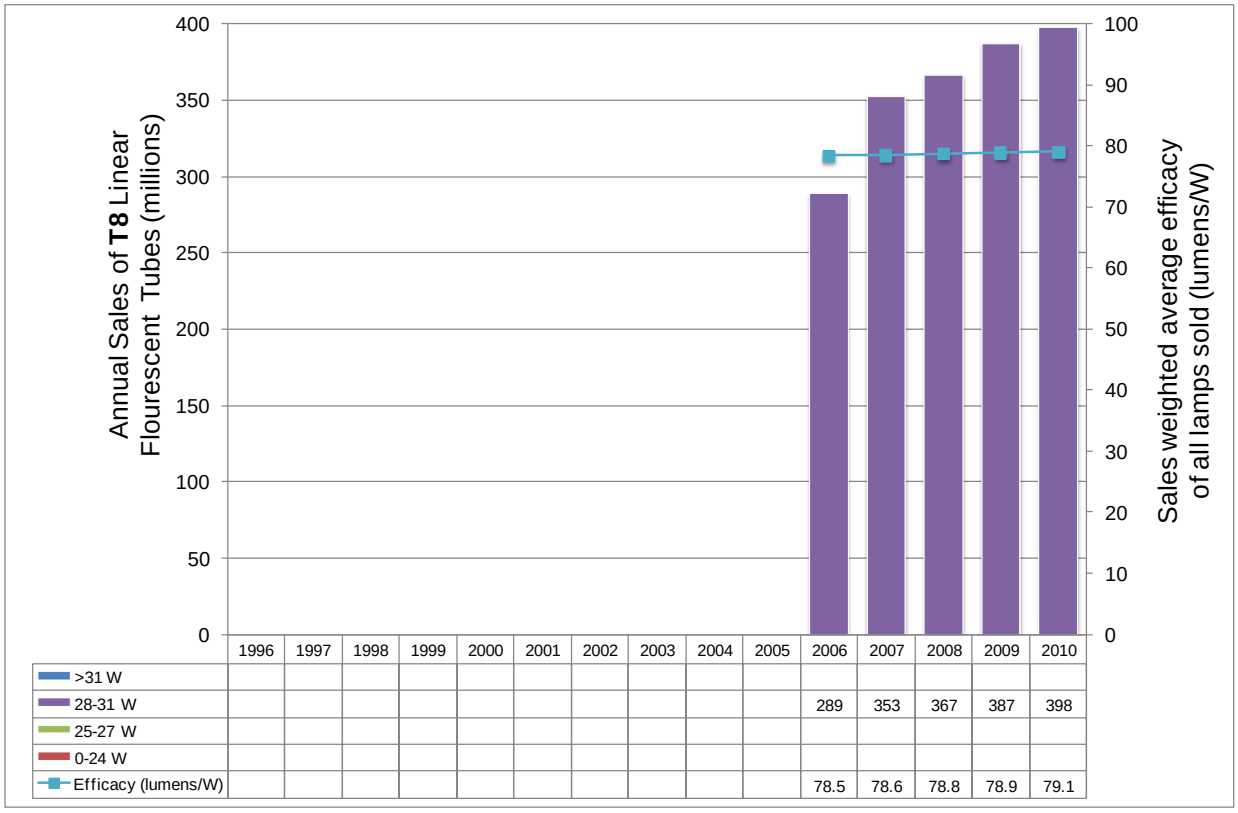


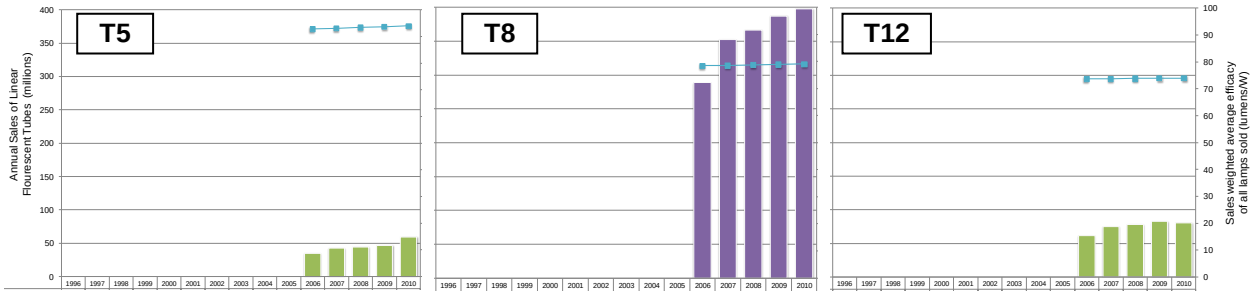


Key notes on Graph (See notes section 2)

- Total fluorescent tube sales values for lamps in 2006-7 considered robust, but of less reliability for 2008 onward.
- Breakdown of percentage sales by product type considered robust for 2009-2010 considered robust, but of less reliability prior to this period.
- Breakdown of sales by wattage type unknown and based on international average.
- 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. However, derivation of overall efficacy based on a large number of assumptions and should be considered highly illustrative only.

Sales of T8 Linear Fluorescent Tubes by wattage range - EU27 (plus Switzerland and Norway)

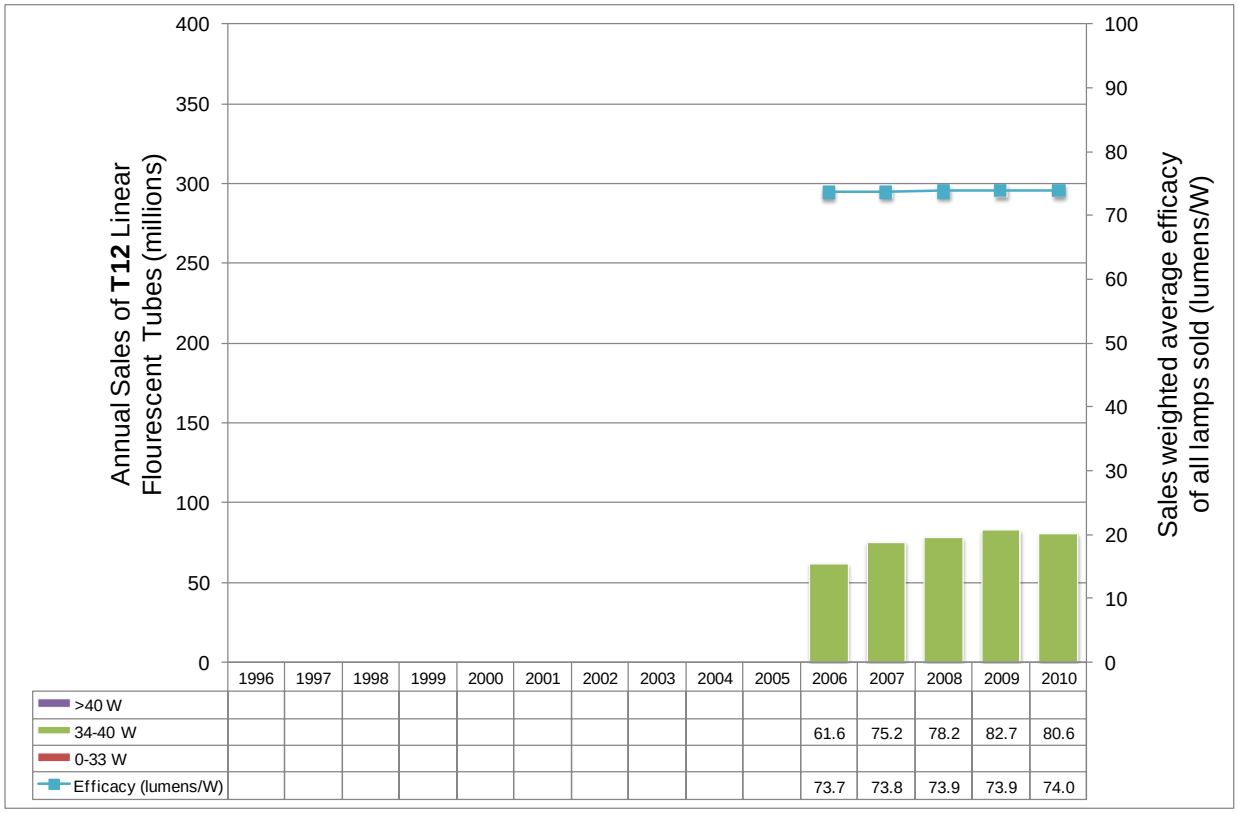


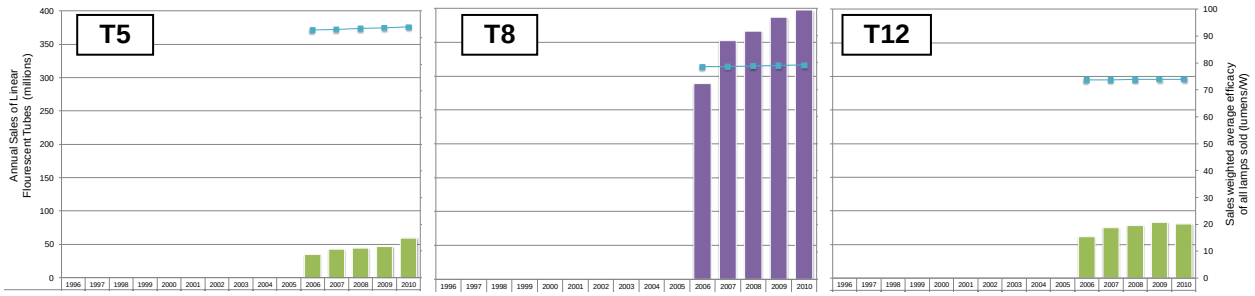


Key notes on Graph (See notes section 2)

- Total fluorescent tube sales values for lamps in 2006-7 considered robust, but of less reliability for 2008 onward.
- Breakdown of percentage sales by product type considered robust for 2009-2010 considered robust, but of less reliability prior to this period.
- Breakdown of sales by wattage type unknown and based on international average.
- 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. However, derivation of overall efficacy based on a large number of assumptions and should be considered highly illustrative only.

Sales of T12 Linear Fluorescent Tubes by wattage range - EU27 (plus Switzerland and Norway)





Key notes on Graph (See notes section 2)

- Total fluorescent tube sales values for lamps in 2006-7 considered robust, but of less reliability for 2008 onward.
- Breakdown of percentage sales by product type considered robust for 2009-2010 considered robust, but of less reliability prior to this period.
- Breakdown of sales by wattage type unknown and based on international average.
- 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. However, derivation of overall efficacy based on a large number of assumptions and should be considered highly illustrative only.

Sales of LED lamps by wattage range - EU27 (plus Switzerland and Norway)

No data on the sales of dedicated or retrofit LED lamps in the EU was available to the Annex at the time of publication.

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 summarised above and 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 A-G labels (the packaging/labelling requirement is extended by the MEPs noted above)

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 announcement their intention to "phase-out inefficient lighting" in April 2007.

At the time of preparation, regulations for "domestic lighting" covered only *non-directional lighting*. Proposals for the regulation of *directional lighting* are well underway and announcements are expected in the near future. Separate provisions are in place for street lighting and commercial lighting.

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 (attached). It becomes law 20 days after publication in the Official Journal. Key items within this text are as follows[7]:

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.

(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

[7] 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 EU25 Lighting Associations webpage which reproduces the legislative requirement, but also provides and interpretation of the legislation and associated other material.

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_{max}) for a given rated luminous flux (Φ) 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_{max}) for a given rated luminous flux (Φ) (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

Exceptions

Scope of the exception	Maximum rated power (W)
Clear lamps 60 lm ≤ Φ ≤ 950 lm in Stage 1	$P_{max} = 1,1 * (0,88\sqrt{\Phi}+0,049\Phi)$
Clear lamps 60 lm ≤ Φ ≤ 725 lm in Stage 2	$P_{max} = 1,1 * (0,88\sqrt{\Phi}+0,049\Phi)$
Clear lamps 60 lm ≤ Φ ≤ 450 lm in Stage 3	$P_{max} = 1,1 * (0,88\sqrt{\Phi}+0,049\Phi)$
Clear lamps with G9 or R7s cap in Stage 6	$P_{max} = 0,8 * (0,88\sqrt{\Phi}+0,049\Phi)$

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

Correction factors

Scope of the correction	Maximum rated power (W)
filament lamp requiring external power supply	$P_{max}/1,06$
discharge lamp with cap GX53	$P_{max}/0,75$
non-clear lamp with colour rendering index ≥ 90 and $P \leq 0,5 * (0,88\sqrt{\Phi}+0,049\Phi)$	$P_{max}/0,85$
discharge lamp with colour rendering index ≥ 90 and Tc ≥ 5 000 K	$P_{max}/0,76$
non-clear lamp with second envelope and $P \leq 0,5 * (0,88\sqrt{\Phi}+0,049\Phi)$	$P_{max}/0,95$
LED lamp requiring external power supply	$P_{max}/1,1$

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) 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	< 60 s or < 120 s for lamps containing mercury in amalgam form	< 40 s 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

Additional functionality requirements for lamps excluding CFLs and LEDS[8] (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

[8] 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);

(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 Ta ≠ 25 °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 1W) shall be calculated by linear interpolation between the two adjacent values.

Table 6

Rated lamp luminous flux Φ [lm]			Claimed equivalent incandescent lamp power
CFL	Halogen	LED and other lamps	[W]
125	119	136	15
229	217	249	25
432	410	470	40
741	702	806	60
970	920	1 055	75
1 398	1 326	1 521	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);

(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).

Section 2: Notes on Sales and efficacy of all lamps, total light output And sales by product type

2.1 Data Source

All data covers EU 27 + IEA 2 (Switzerland & Norway)

Sales values for 2006 – 2007

Data sourced from IEA 'Phase Out of Incandescent Lamps – Implications for international supply and demand for regulatory compliant lamps' dated April 2010. Data was originally sourced from well-known industry sources and is considered robust.

Sales values for 2008 – 2010

Sales values for 2008-2010 based on percentage growth from 2007 of individual product groups. Growth values are average aggregated values from confidential industry and other sources listed below. Given aggregation of data and inability to verify through secondary sources, ***information and as such should be treated with caution***. Source data:

- Enerlin and Remodece EU funded projects - stock data in VITO study was provided in response to an end-user survey in the EU R&D project REMODECE including 500 consumers per country for 11 countries. Sweden and UK have provided data from large national surveys performed in 2007.
- Bertoldi & Atanasiu (Joint Research Centre EU Commission) – data is from a JRC questionnaire to national experts [Bertoldi and Atanasiu, 2007]. It was estimated that 13 countries use 76% of the total EU-27 stock. The detailed data for the 13 countries were finally rescaled to four EU regions and summed for EU-27.
- Energy Saving Trust UK
- ELC Federation (data submitted to VITO for EUP study & publication environmental aspects of lamps)
- Gesellschaft für Konsumforschung (Germany)
- Germany Trade and invest Dec 2010 (Vorreiter für neue Lampengenerationen / Energieeffiziente Beleuchtung im Fokus Von Jürgen Maurer)
- Ademe, France
- VITO (Belgium)
- Frost & Sullivan's 'The Impact of the EU Ban on Energy Efficient Lighting',
- Strategies in Light Europe, Frankfurt Sep 2010, McKinsey & Company.

Breakdown of Lamp Types

2009-2010 breakdown of CFLs between integrated and self ballasted, and breakdown of halogen between low voltage and mains voltage based on industry and other sources as shown above. Data is considered of intermediate reliability. Breakdown of these categories prior to this time unknown and ***assumed*** to be equal to 2009 values.

Breakdown of Lamp Wattages (excluding linear fluorescents)

Breakdown of average product wattages from VITO in Project Report, *Lot 19: Domestic lighting Oct 2009 Study for the European Commission* and major manufacturers.

Breakdown of sales by average lamp wattages for incandescent, halogens and CFLs is based on actual sales split into buckets labelled with incandescent equivalent wattages as follows *(assumed CFL: Incandescent wattage equivalance = 4:1, assumed Halogen: Incandescent wattage equivalence = 1.25:1):*

			Percentage of incandescent, halogen & CFL in each wattage category		
			2008	**2009**	**2010**
Incandescent Wattage	**Halogen Wattage**	**CFL Wattage**	**% of total sales by Wattage**		
25	20	6.25	-	-	7%
40	32	10	19%	30%	28%
60	48	15	27%	27%	28%
75	60	18.75	12%	11%	11%
100	80	25	29%	24%	19%
106.05	84.84	26.51	13%	8%	7%

Wattages breakdown are believed to be robust for lamp sales for 2008-10 but may not represent a true picture of wattages of installed lamps.

Wattages breakdown are believed to be robust for all non-linear tube lamp sales for 2008-10. However lamp wattages breakdowns for all lamps prior to 2008 unknown and ***assumed*** to be equal to 2008 values.

Breakdown of Lamp Wattages (linear fluorescents)

Breakdown for lamp wattages unknown and so ***assumed*** to be global average values ***for all years*** as follows:

Lamp Type	Average wattage
Mains Voltage Linear Fluorescent Tubes (T5)	43.0
Mains Voltage Linear Fluorescent Tubes (T8)	28.5
Mains Voltage Linear Fluorescent Tubes (T12)	38.0

2.2 Manipulations of Data Supplied

Average efficacies calculated on a sales weighted basis by:

> Sum (sales of lamp type *a* sales * efficacy of lamp type *a*) +…..+ Sum (sales of lamp type *x* sales * efficacy of lamp type *x*) / Sum (*all* lamp sales)

Instantaneous light output calculated as sales weighted basis by:

> Sum (sales of lamp type *a* sales * efficacy of lamp type *a* * wattage of lamp type *a*) +…..+ Sum (sales of lamp type *x* sales * efficacy of lamp type *x* * wattage of lamp type *n*)

Lifetime light output calculated as sales weighted basis by:

> Sum (sales of lamp type *a* sales * efficacy of lamp type *a* * wattage of lamp type *a* * lifetime of lamp type *a*) +…..+ Sum (sales of lamp type *x* sales * efficacy of lamp type *x* * wattage of lamp type *n* * 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 1995-2010 can be viewed in the supporting documents section of the Domestic Lighting area of the Mapping and Benchmarking website – see http://mappingandbenchmarking.iea-4e.org/matrix.

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.

   Full details of the labelling requirement can be found in COMMISSION DIRECTIVE 98/11/EC of 27 January 1998 implementing Council Directive 92/75/EEC with regard to energy labelling of household lamps[9]

   However, calculation of the labelling requirement is described as follows (from Annex IV of the directive):

The energy efficiency class of a lamp shall be determined as follows:

Lamps shall be classified in class A if:

– Fluorescent lamps without integral ballast
(those requiring a ballast and/or other control gear to connect them to the mains)

$W \leq 0{,}15 \sqrt{\Phi} + 0{,}0097\ \Phi$

– Other lamps

$W \leq 0{,}24 \sqrt{\Phi} + 0{,}0103\ \Phi$

where Φ is the lumen output of the lamp

where W is the power input into the lamp in watts.

If a lamp is not classified in class A, a reference wattage W_R shall be calculated as follows:

$W_R = 0{,}88 \sqrt{\Phi} + 0{,}049\ \Phi$, when $\Phi > 34$ lumens

$0{,}2\ \Phi$, when $\Phi \leq 34$ lumens

where Φ is the lumen output of the lamp.

An energy efficiency index E_I is then set as

$$E_I = \frac{W}{W_R}$$

where W is the power input into the lamp in watts.

The energy efficiency classes are then set in accordance with the following table:

Energy efficiency class	Energy efficiency index E_I
B	$E_I < 60\ \%$
C	$60\ \% \leq E_I < 80\ \%$
D	$80\ \% \leq E_I < 95\ \%$
E	$95\ \% \leq E_I < 110\ \%$
F	$110\ \% \leq E_I < 130\ \%$
G	$E_I \geq 130\ \%$

[9] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:1998:071:0001:0008:EN:PDF

Note the packaging/labelling requirement is extended by the MEPs noted above

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.

Section 4: Notes on Cultural Issues

No additional Notes