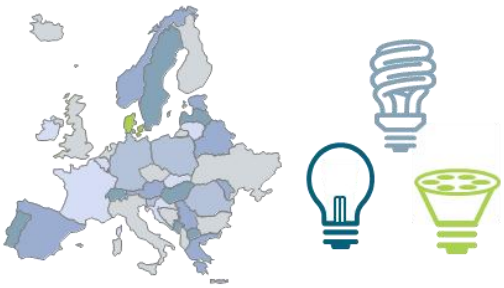


Country:	Denmark
Technology:	Domestic Lighting
Sub Category:	All domestic lamps

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

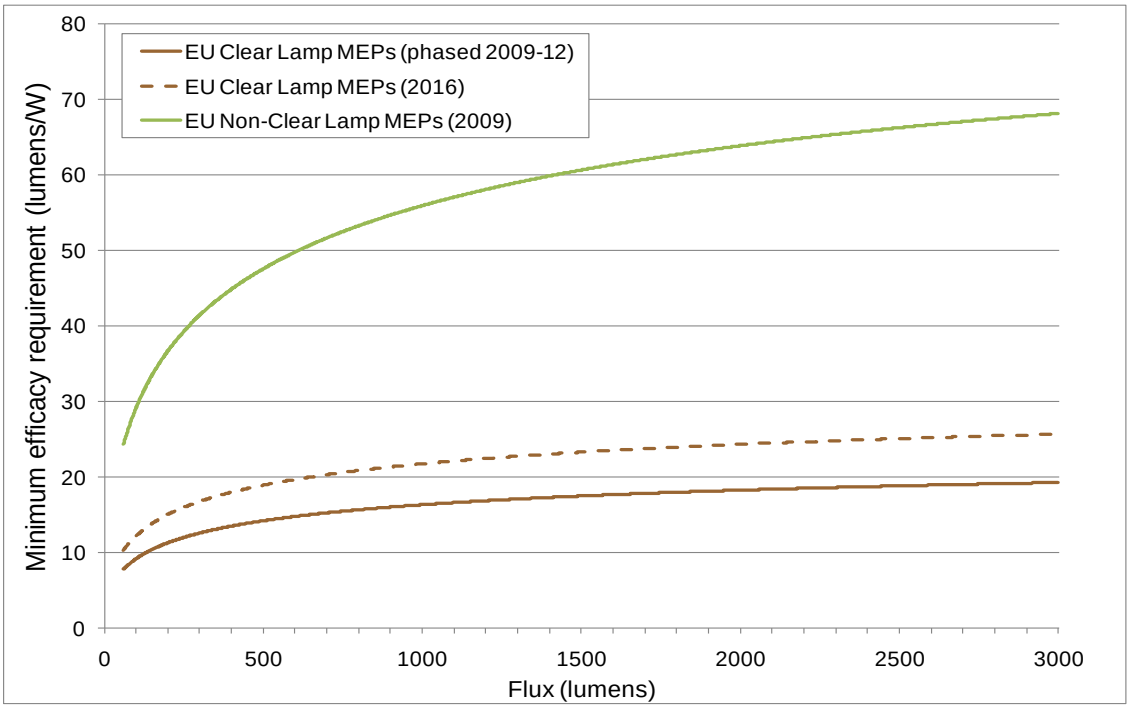
** NOTE: The subsequent analysis in the associated benchmarking report[2] excludes linear fluorescent tubes as, for those countries submitting data, these lamps constituted a small proportion of use in the domestic sector.*

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 - Denmark



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]

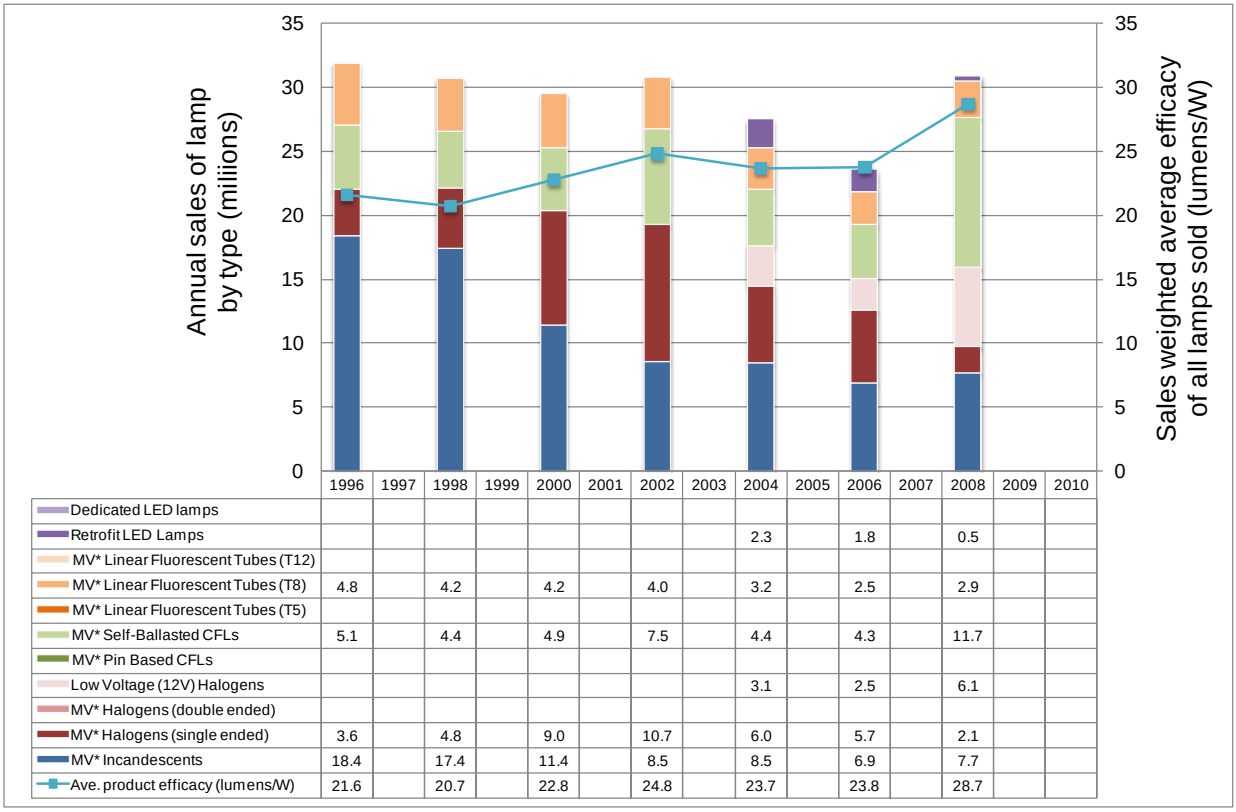
[3] Table derived from European Lamp Federation summary information (http://www.elcfed.org/documents/Questions%20and%20answers%20on%20the%20EU%20decision%20to%20phase%20out%20incandescent%20lamps_external_20090318_final.pdf)

[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 - Denmark



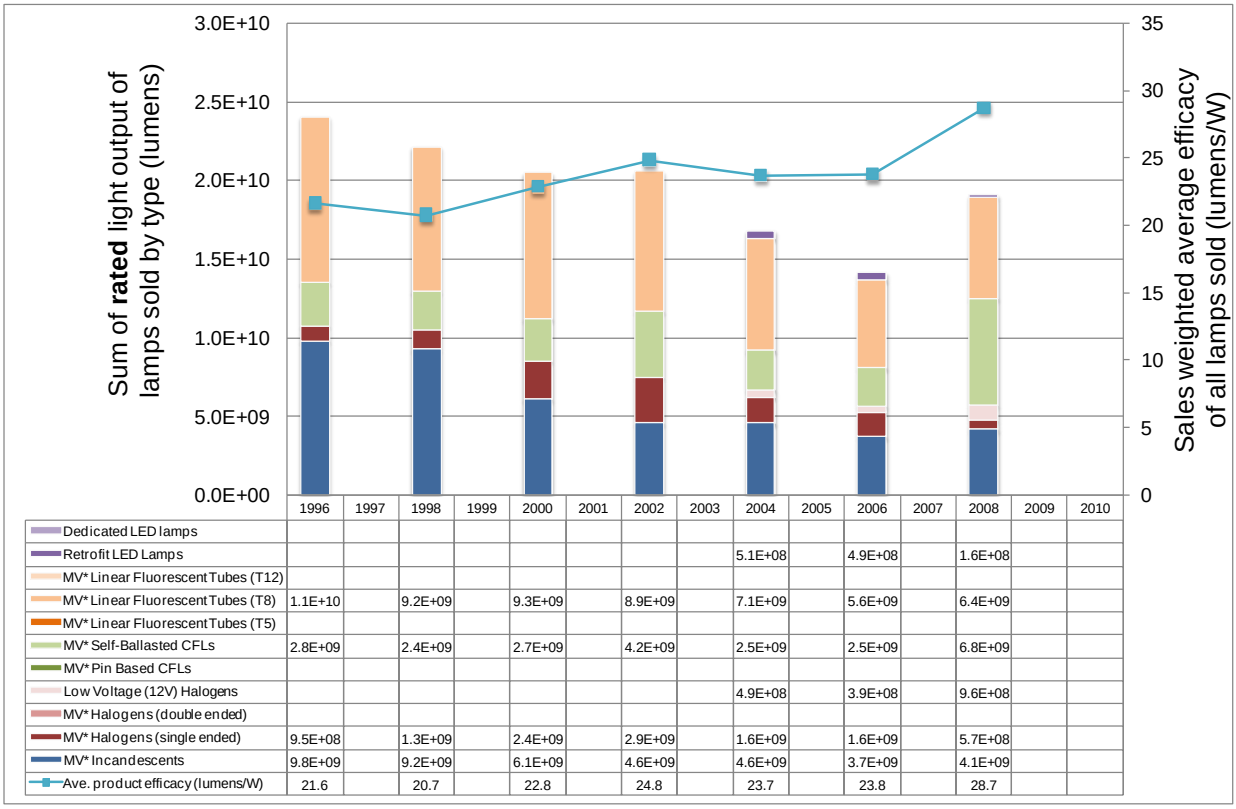
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Dedicated LED lamps															
Retrofit LED Lamps									2.3		1.8		0.5		
MV* Linear Fluorescent Tubes (T12)															
MV* Linear Fluorescent Tubes (T8)	4.8		4.2		4.2		4.0		3.2		2.5		2.9		
MV* Linear Fluorescent Tubes (T5)															
MV* Self-Ballasted CFLs	5.1		4.4		4.9		7.5		4.4		4.3		11.7		
MV* Pin Based CFLs															
Low Voltage (12V) Halogens									3.1		2.5		6.1		
MV* Halogens (double ended)															
MV* Halogens (single ended)	3.6		4.8		9.0		10.7		6.0		5.7		2.1		
MV* Incandescents	18.4		17.4		11.4		8.5		8.5		6.9		7.7		
Ave. product efficacy (lumens/W)	21.6		20.7		22.8		24.8		23.7		23.8		28.7		

* Mains Voltage

Key notes on Graph (See notes section 2)

- Annual sales values based on the ELMODEL-Bolig. Estimated values deviate by 10% at worst from actual values. Model details and caveats given in notes section 2.
- Data available in aggregated form only. To enable comparative processing of data, the following manipulations were undertaken:
  - Average lamp wattages for each lamp type for 2008 were used in all years. Further, all lamp sales for a particular lamp type were assumed to occur at the average wattages.
  - All CFLs were assumed to be self ballasted units
  - All halogen lamp sales were assumed to be single ended halogen lamps
  - All Fluorescent Tubes were assumed to be T8
- 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

Total instantaneous light output of all domestic lamps sales - Denmark



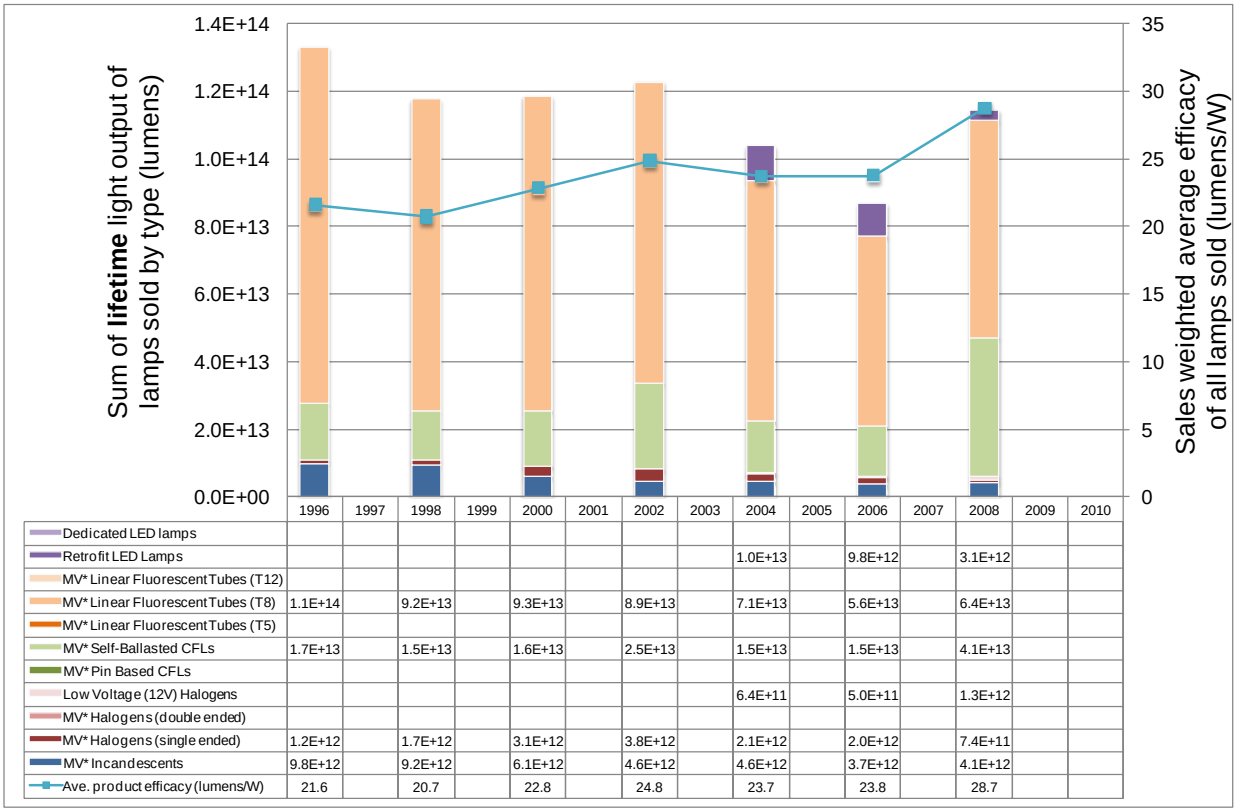
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Dedicated LED lamps															
Retrofit LED Lamps									5.1E+08		4.9E+08		1.6E+08		
MV* Linear Fluorescent Tubes (T12)															
MV* Linear Fluorescent Tubes (T8)	1.1E+10		9.2E+09		9.3E+09		8.9E+09		7.1E+09		5.6E+09		6.4E+09		
MV* Linear Fluorescent Tubes (T5)															
MV* Self-Ballasted CFLs	2.8E+09		2.4E+09		2.7E+09		4.2E+09		2.5E+09		2.5E+09		6.8E+09		
MV* Pin Based CFLs															
Low Voltage (12V) Halogens									4.9E+08		3.9E+08		9.6E+08		
MV* Halogens (double ended)															
MV* Halogens (single ended)	9.5E+08		1.3E+09		2.4E+09		2.9E+09		1.6E+09		1.6E+09		5.7E+08		
MV* Incandescents	9.8E+09		9.2E+09		6.1E+09		4.6E+09		4.6E+09		3.7E+09		4.1E+09		
Ave. product efficacy (lumens/W)	21.6		20.7		22.8		24.8		23.7		23.8		28.7		

* Mains Voltage

Key notes on Graph (See notes section 2)

- Annual sales values based on the ELMODEL-Bolig. Estimated values deviate by 10% at worst from actual values. Model details and caveats given in notes section 2.
- Data available in aggregated form only. To enable comparative processing of data, the following manipulations were undertaken:
  - Average lamp wattages for each lamp type for 2008 were used in all years. Further, all lamp sales for a particular lamp type were assumed to occur at the average wattages.
  - All CFLs were assumed to be self ballasted units
  - All halogen lamp sales were assumed to be single ended halogen lamps
  - All Fluorescent Tubes were assumed to be T8
- 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

Total lifetime light output of all domestic lamps sales - Denmark



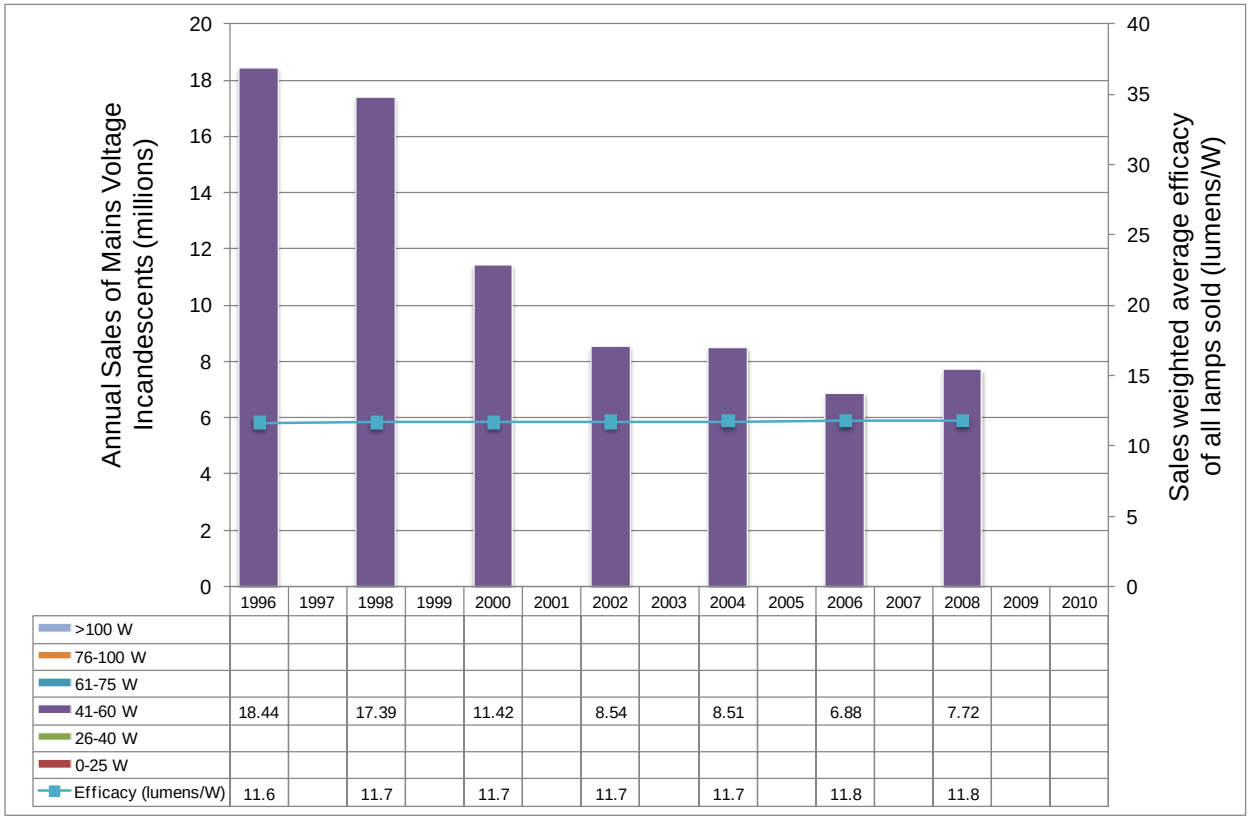
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Dedicated LED lamps															
Retrofit LED Lamps									1.0E+13		9.8E+12		3.1E+12		
MV* Linear Fluorescent Tubes (T12)															
MV* Linear Fluorescent Tubes (T8)	1.1E+14		9.2E+13		9.3E+13		8.9E+13		7.1E+13		5.6E+13		6.4E+13		
MV* Linear Fluorescent Tubes (T5)															
MV* Self-Ballasted CFLs	1.7E+13		1.5E+13		1.6E+13		2.5E+13		1.5E+13		1.5E+13		4.1E+13		
MV* Pin Based CFLs															
Low Voltage (12V) Halogens									6.4E+11		5.0E+11		1.3E+12		
MV* Halogens (double ended)															
MV* Halogens (single ended)	1.2E+12		1.7E+12		3.1E+12		3.8E+12		2.1E+12		2.0E+12		7.4E+11		
MV* Incandescents	9.8E+12		9.2E+12		6.1E+12		4.6E+12		4.6E+12		3.7E+12		4.1E+12		
Ave. product efficacy (lumens/W)	21.6		20.7		22.8		24.8		23.7		23.8		28.7		

* Mains Voltage

Key notes on Graph (See notes section 2)

- Annual sales values based on the ELMODEL-Bolig. Estimated values deviate by 10% at worst from actual values. Model details and caveats given in notes section 2.
- Data available in aggregated form only. To enable comparative processing of data, the following manipulations were undertaken:
  - Average lamp wattages for each lamp type for 2008 were used in all years. Further, all lamp sales for a particular lamp type were assumed to occur at the average wattages.
  - All CFLs were assumed to be self ballasted units
  - All halogen lamp sales were assumed to be single ended halogen lamps
  - All Fluorescent Tubes were assumed to be T8
- 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

Sales of Mains Voltage Incandescent lamps - Denmark

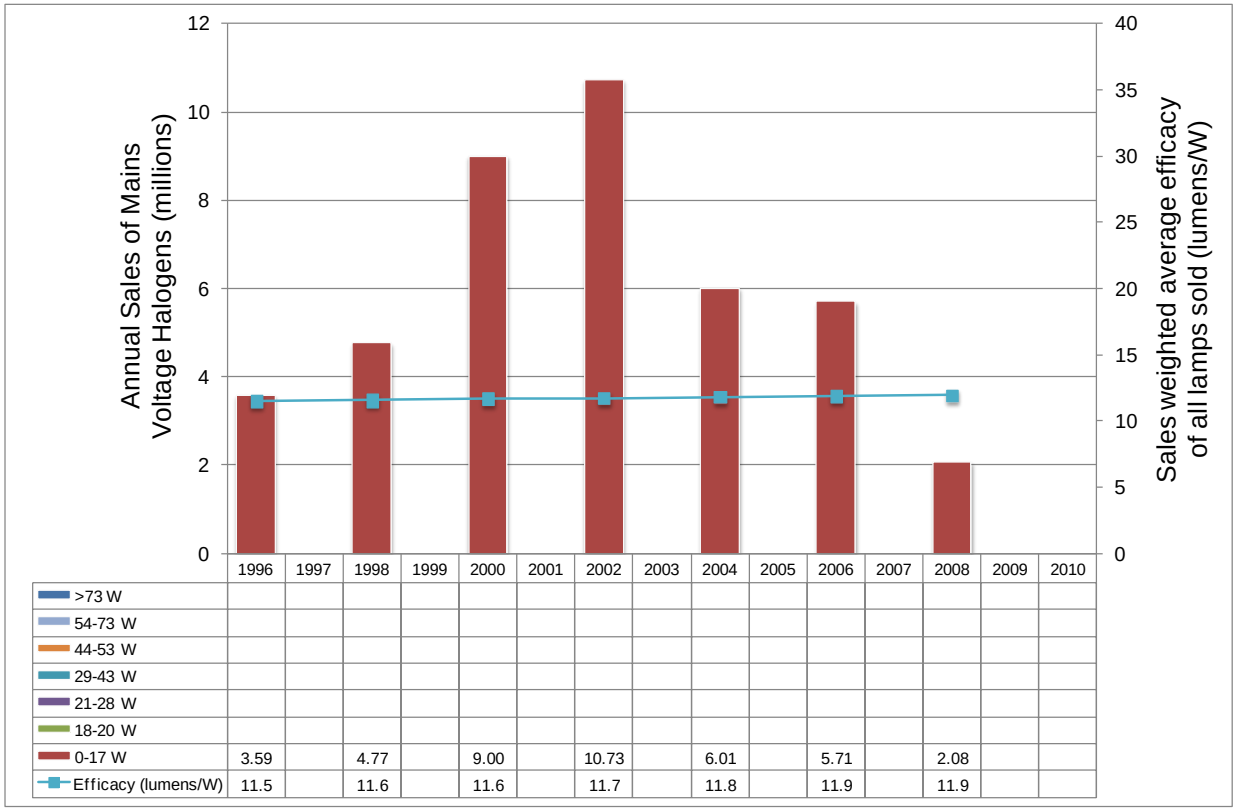


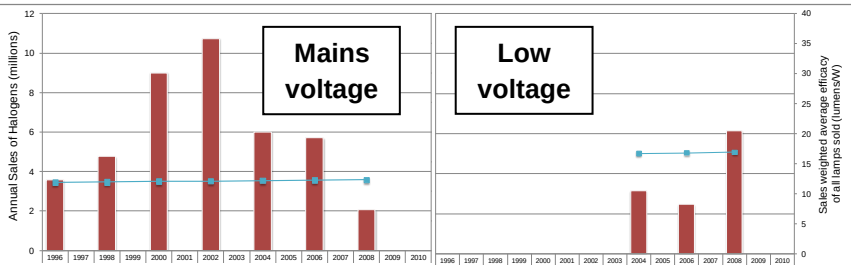
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
>100 W															
76-100 W															
61-75 W															
41-60 W	18.44		17.39		11.42		8.54		8.51		6.88		7.72		
26-40 W															
0-25 W															
Efficacy (lumens/W)	11.6		11.7		11.7		11.7		11.7		11.8		11.8		

Key notes on Graph (See notes section 2)

- Annual sales values based on the ELMODEL-Bolig. Estimated values deviate by 10% at worst from actual values. Model details and caveats given in notes section 2.
- Data available in aggregated form only. To enable comparative processing of data, the following manipulations were undertaken:
  - Average lamp wattages for each lamp type for 2008 were used in all years. Further, all lamp sales for a particular lamp type were assumed to occur at the average wattages.
  - All CFLs were assumed to be self ballasted units
  - All halogen lamp sales were assumed to be single ended halogen lamps
  - All Fluorescent Tubes were assumed to be T8
- 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 Mains Voltage Halogen lamps - Denmark

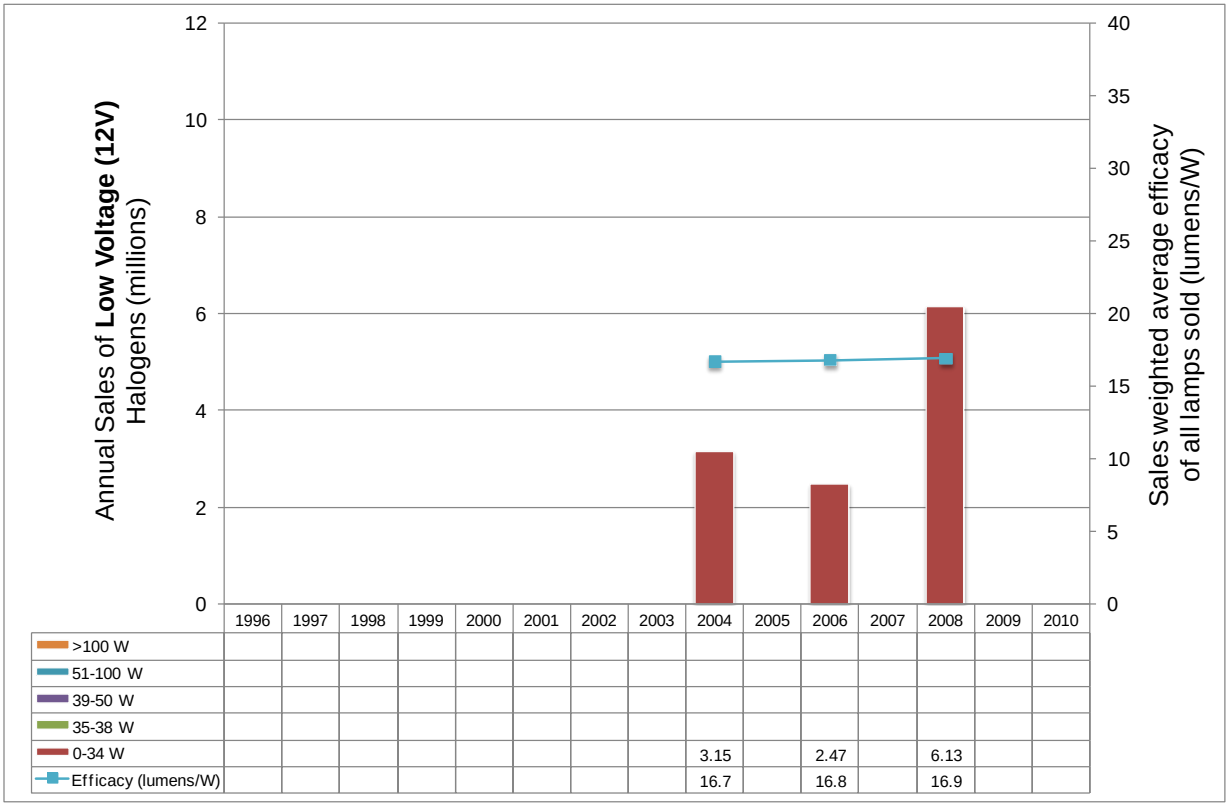


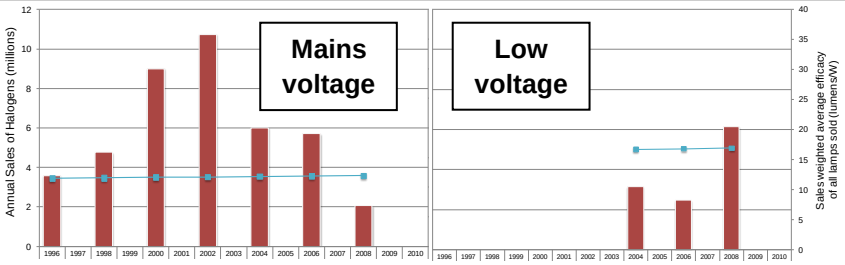


Key notes on Graph (See notes section 2)

- Annual sales values based on the ELMODEL-Bolig. Estimated values deviate by 10% at worst from actual values. Model details and caveats given in notes section 2.
- Data available in aggregated form only. To enable comparative processing of data, the following manipulations were undertaken:
  - Average lamp wattages for each lamp type for 2008 were used in all years. Further, all lamp sales for a particular lamp type were assumed to occur at the average wattages.
  - All CFLs were assumed to be self ballasted units
  - All halogen lamp sales were assumed to be single ended halogen lamps
  - All Fluorescent Tubes were assumed to be T8
- 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 Halogen lamps - Denmark

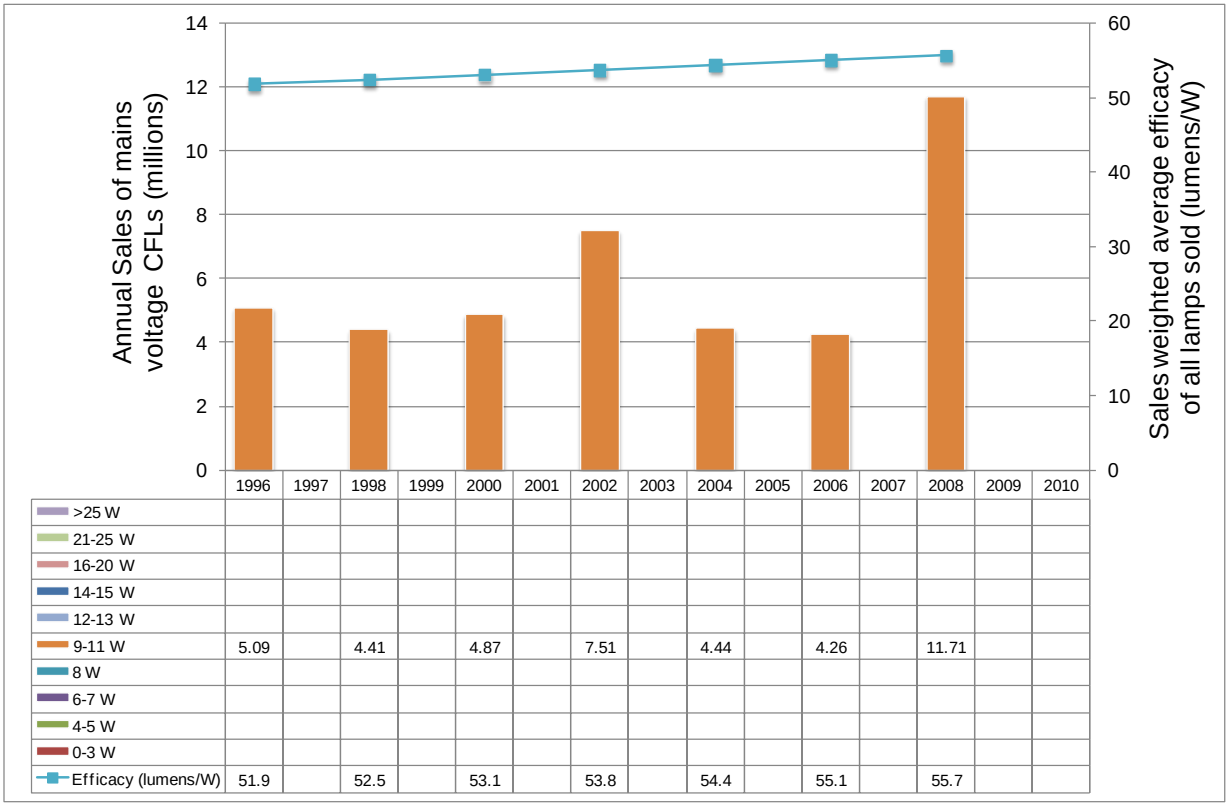




Key notes on Graph (See notes section 2)

- Annual sales values based on the ELMODEL-Bolig. Estimated values deviate by 10% at worst from actual values. Model details and caveats given in notes section 2.
- Data available in aggregated form only. To enable comparative processing of data, the following manipulations were undertaken:
  - Average lamp wattages for each lamp type for 2008 were used in all years. Further, all lamp sales for a particular lamp type were assumed to occur at the average wattages.
  - All CFLs were assumed to be self ballasted units
  - All halogen lamp sales were assumed to be single ended halogen lamps
  - All Fluorescent Tubes were assumed to be T8
- 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 Mains Voltage CFL lamps - Denmark

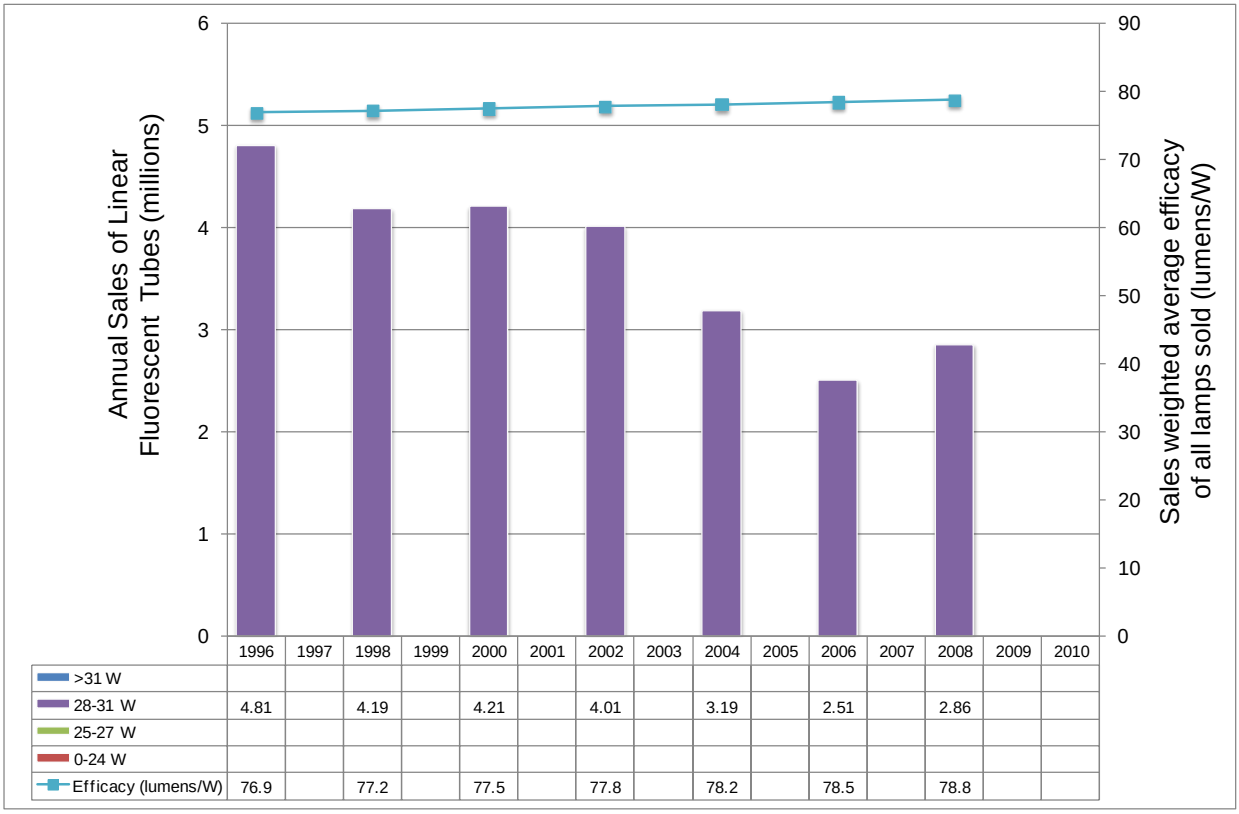


	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
>25 W															
21-25 W															
16-20 W															
14-15 W															
12-13 W															
9-11 W	5.09		4.41		4.87		7.51		4.44		4.26		11.71		
8 W															
6-7 W															
4-5 W															
0-3 W															
Efficacy (lumens/W)	51.9		52.5		53.1		53.8		54.4		55.1		55.7		

Key notes on Graph (See notes section 2)

- Annual sales values based on the ELMODEL-Bolig. Estimated values deviate by 10% at worst from actual values. Model details and caveats given in notes section 2.
- Data available in aggregated form only. To enable comparative processing of data, the following manipulations were undertaken:
  - Average lamp wattages for each lamp type for 2008 were used in all years. Further, all lamp sales for a particular lamp type were assumed to occur at the average wattages.
  - All CFLs were assumed to be self ballasted units
  - All halogen lamp sales were assumed to be single ended halogen lamps
  - All Fluorescent Tubes were assumed to be T8
- 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 Mains Voltage Fluorescent Tubes - Denmark

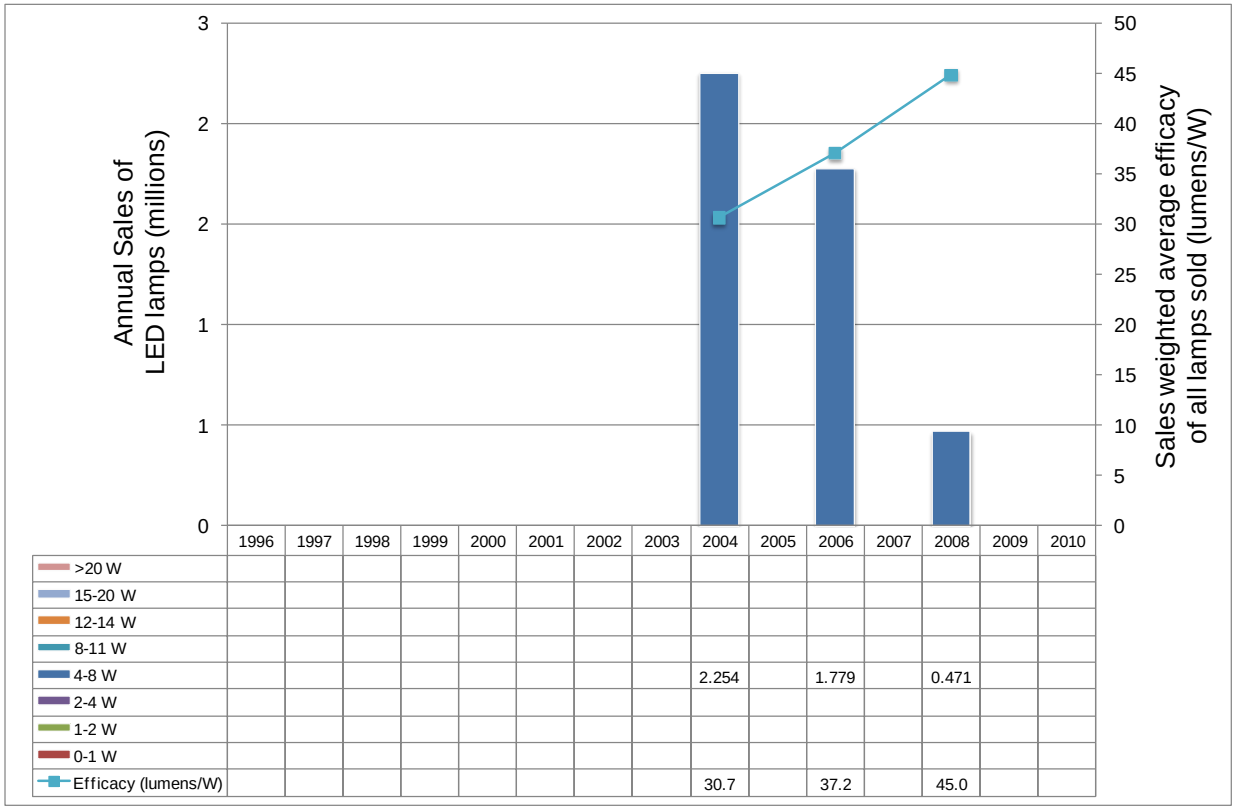


	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
>31 W															
28-31 W	4.81		4.19		4.21		4.01		3.19		2.51		2.86		
25-27 W															
0-24 W															
Efficacy (lumens/W)	76.9		77.2		77.5		77.8		78.2		78.5		78.8		

Key notes on Graph (See notes section 2)

- Annual sales values based on the ELMODEL-Bolig. Estimated values deviate by 10% at worst from actual values. Model details and caveats given in notes section 2.
- Data available in aggregated form only. To enable comparative processing of data, the following manipulations were undertaken:
  - Average lamp wattages for each lamp type for 2008 were used in all years. Further, all lamp sales for a particular lamp type were assumed to occur at the average wattages.
  - All CFLs were assumed to be self ballasted units
  - All halogen lamp sales were assumed to be single ended halogen lamps
  - All Fluorescent Tubes were assumed to be T8
- 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 LED Lamps- Denmark



Key notes on Graph (See notes section 2)

- Annual sales values based on the ELMODEL-Bolig. Estimated values deviate by 10% at worst from actual values. Model details and caveats given in notes section 2.
- Data available in aggregated form only. To enable comparative processing of data, the following manipulations were undertaken:
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  - All CFLs were assumed to be self ballasted units
  - All halogen lamp sales were assumed to be single ended halogen lamps
  - All Fluorescent Tubes were assumed to be T8
- 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 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

3) **Danish Energy Saving Trust Promotions**: From the late 1990's, the Danish Energy Saving Trust (DEST) has been promoting CFLs, including supporting some subsidy programmes by Danish utilities. Over the period, it is believed several million CFLs have entered the market earlier than would have been the case without this market stimulation

Cultural Issues (See Notes Section 4)

No significant cultural information considered relevant by data supplier.

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 UK 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

Annual sales values are based on Elmodel Bolig. Elmodel Bolig is a comprehensive model for domestic electricity use in Denmark. The model is managed by the government, Utilities and network authority. It is basically a stock-model. The model is using specific consumption data for various appliances etc. When possible actual efficiency weighted sales data is available from manufactures / importers they are included in the model e.g. for white goods where the sales data are much better than e.g. GfK data. In this case the sales data is calculated on the basis of saturation rates and life time information. The data supplier estimates the data inaccuracy to be < 5-10%.

The most formal reference is perhaps the homepage associated with this modeling tool www.elmodelbolig.dk (however reader should be aware that this site is only available in Danish[9)]. However, a brief description of the model has been supplied in English and can be accessed at http://mappingandbenchmarking.iea-4e.org/matrix in the "Denmark" lighting area.

2.2 Manipulations of Data Supplied

Data supplied was aggregated data for a lamp type, ie:

- Not broken down into individual wattage buckets. Data on average wattage for the lamp type was given for 2008
- For CFLs, Linear Tubes and Halogen Lamps, no breakdown by lamp type (eg integrated and pin type CFLs) was provided.

To enable comparative processing of data, the following data manipulations were undertaken:

- Average wattages for each lamp type for 2008 were used in all years. Further, all lamp sales for a particular lamp type were assumed to occur at these wattages.
- All CFLs were assumed to be self ballasted units
- All halogen lamp sales were assumed to be single ended halogen lamps
- All Fluorescent Tubes were assumed to be T8

It is unknown what impact this has had on the quality of data outcomes.

[9] Model developed by IT Energy, contact: mkj@itenergy.dk

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[10]

   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:

$$W_R = \begin{cases} 0{,}88 \sqrt{\Phi} + 0{,}049 \Phi, & \text{when } \Phi > 34 \text{ lumens} \\ 0{,}2 \Phi, & \text{when } \Phi \leq 34 \text{ lumens} \end{cases}$$

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	$E_I \geq 130\ \%$

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

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

National Level Interventions

No additional information

Section 4: Notes on Cultural Issues

No additional Notes