Mapping Document

Country:	Australia
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].

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[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
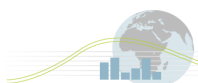
Phase out regulations for domestic lighting Australia
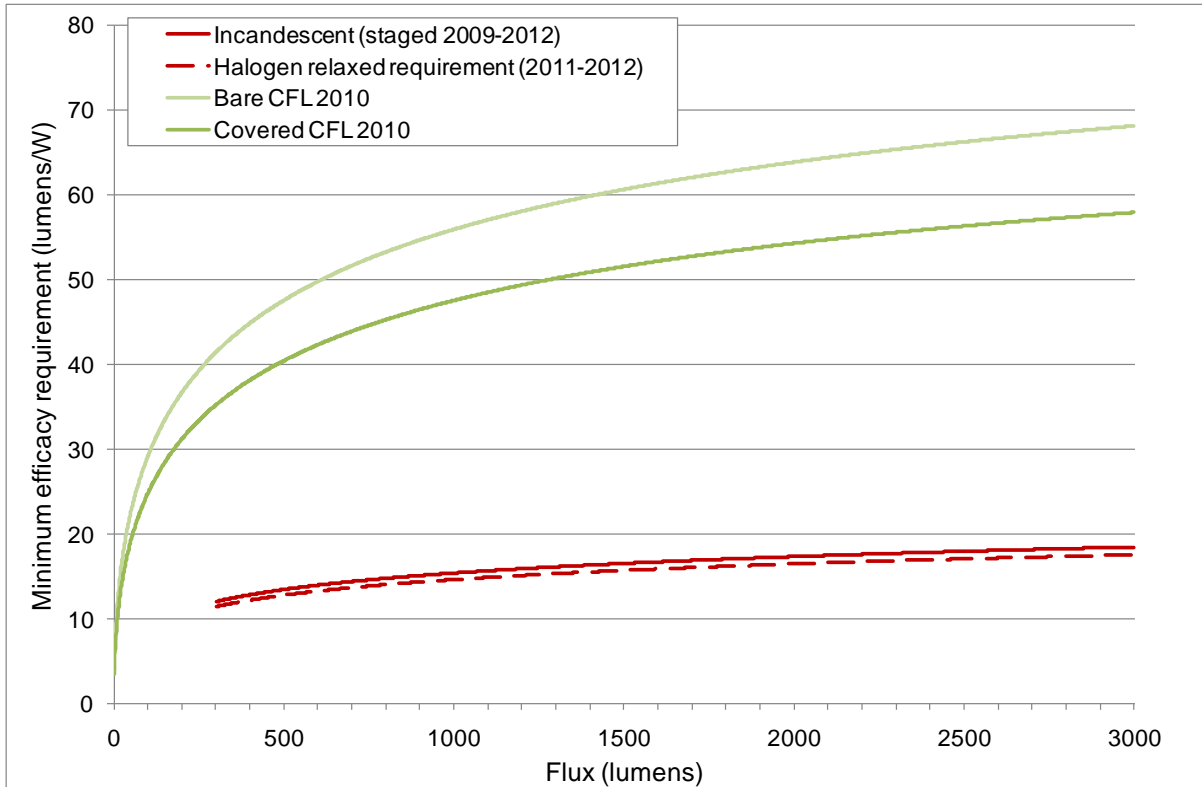
Key notes on Graph (see notes section 1)

- The summary timeline for phased implementation is as follows:

Lamp Types	Sales Restriction From
• Fluorescent Tubes[3]	October 2004
• Tungsten incandescent GLS lamps • ELV halogen non reflector • CFLs with integrated ballasts	November 2009
• >40W Candle, fancy round and decorative lamps • Mains voltage halogen non-reflector (note a 5% relaxed requirement for these lamps 2010-12) • ELV halogen reflector	October 2010 – January 2011
• Mains voltage reflector lamps including halogen (PAR, ER, R, etc) • >25W Candle fancy round and decorative lamps	October 2012
• Pilot lamps 25W and below	To be determined

- Import of none compliant GLS banned February 2009, with sale prohibited from 1 November 2009

- Additional performance criteria are required for all lamps (eg lifetime and lumen maintenance). CFLs with integrated ballasts are also subject to a range of further quality requirements

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[3] Note that the graphic refers to incandescent, halogen and CFLs with integral ballast only, *not* fluorescent tubes.

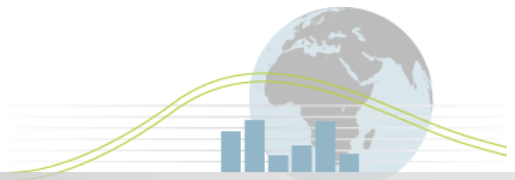## Sales and average efficacy of all domestic lamps - Australia

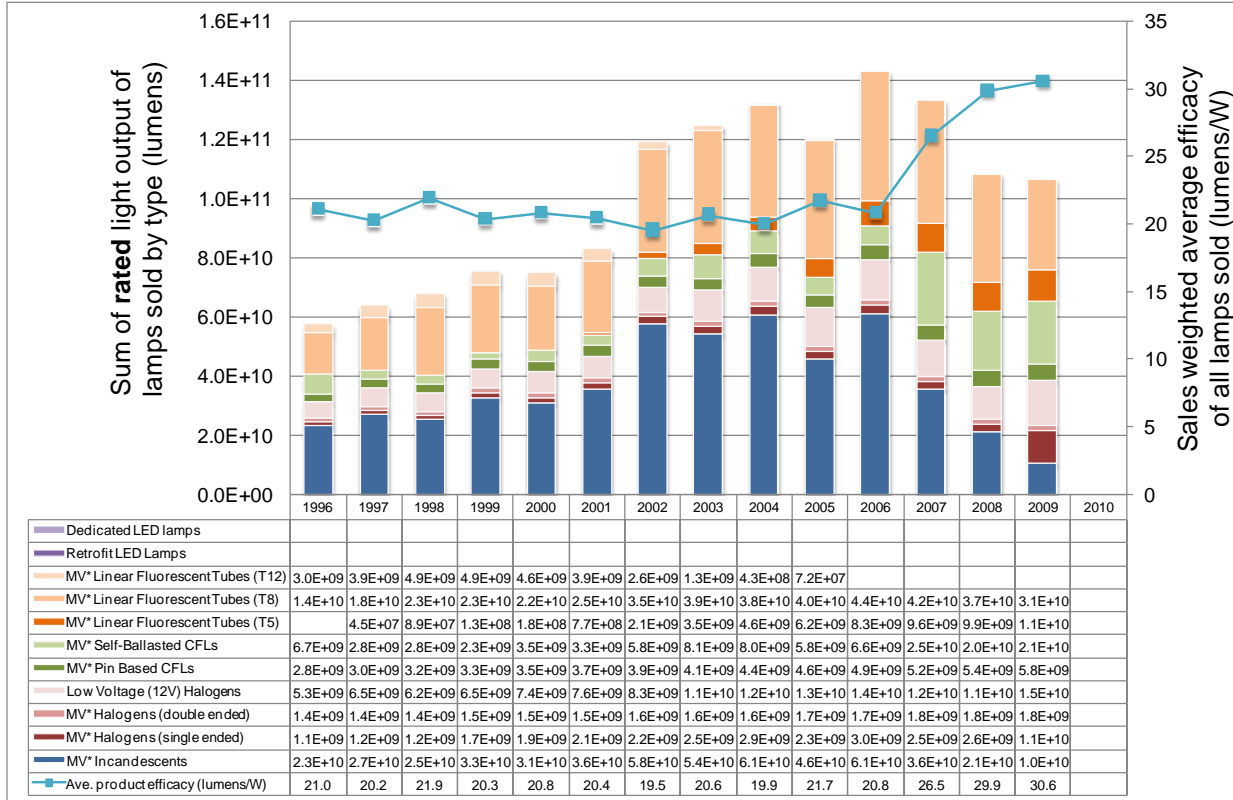|	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Dedicated LED lamps															
Retrofit LED Lamps															
MV* Linear Fluorescent Tubes (T12)	1.1	1.5	1.8	1.8	1.7	1.5	1.0	0.5	0.2	0.0					
MV* Linear Fluorescent Tubes (T8)	6.0	7.7	9.7	9.7	9.2	10.4	14.7	16.3	16.0	16.8	18.4	17.5	15.3	12.8	
MV* Linear Fluorescent Tubes (T5)		0.0	0.0	0.1	0.1	0.3	0.8	1.4	1.8	2.5	3.3	3.8	3.9	4.3	
MV* Self-Ballasted CFLs	5.9	3.5	3.4	2.7	4.2	4.0	6.9	9.6	9.3	6.8	7.6	28.4	22.9	23.9	
MV* Pin Based CFLs	1.9	2.0	2.1	2.2	2.4	2.5	2.6	2.7	2.9	3.0	3.2	3.3	3.5	3.7	
Low Voltage (12V) Halogens	6.7	8.2	7.7	7.9	9.2	9.4	10.2	13.1	14.6	16.2	16.8	15.0	13.7	18.8	
MV* Halogens (double ended)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	
MV* Halogens (single ended)	2.0	2.1	2.1	3.0	3.3	3.6	3.8	4.4	5.0	3.9	5.2	4.3	4.2	16.6	
MV* Incandescents	29.6	38.4	38.1	45.8	40.6	48.3	76.0	71.2	79.2	64.7	82.9	51.4	32.4	16.5	
Ave. product efficacy (lumens/W)	21.0	20.2	21.9	20.3	20.8	20.4	19.5	20.6	19.9	21.7	20.8	26.5	29.9	30.6	

* Mains Voltage

Key notes on Graph (See notes section 2)

- Annual sales values based on import data, a range of assumptions sought from industry, and extrapolation through modelling. Data supplier views the sales values provided as a robust representation of the market for all domestic (household) sector lamps[4]

- Annual market average efficacies calculated on a sales weighted basis using estimated average global efficacies for each lamp type and associated wattage range for 240V lamps.

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[4] *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.*

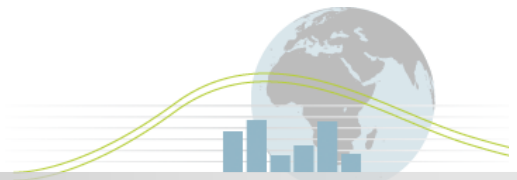## Total instantaneous light output of all domestic lamps sales - Australia

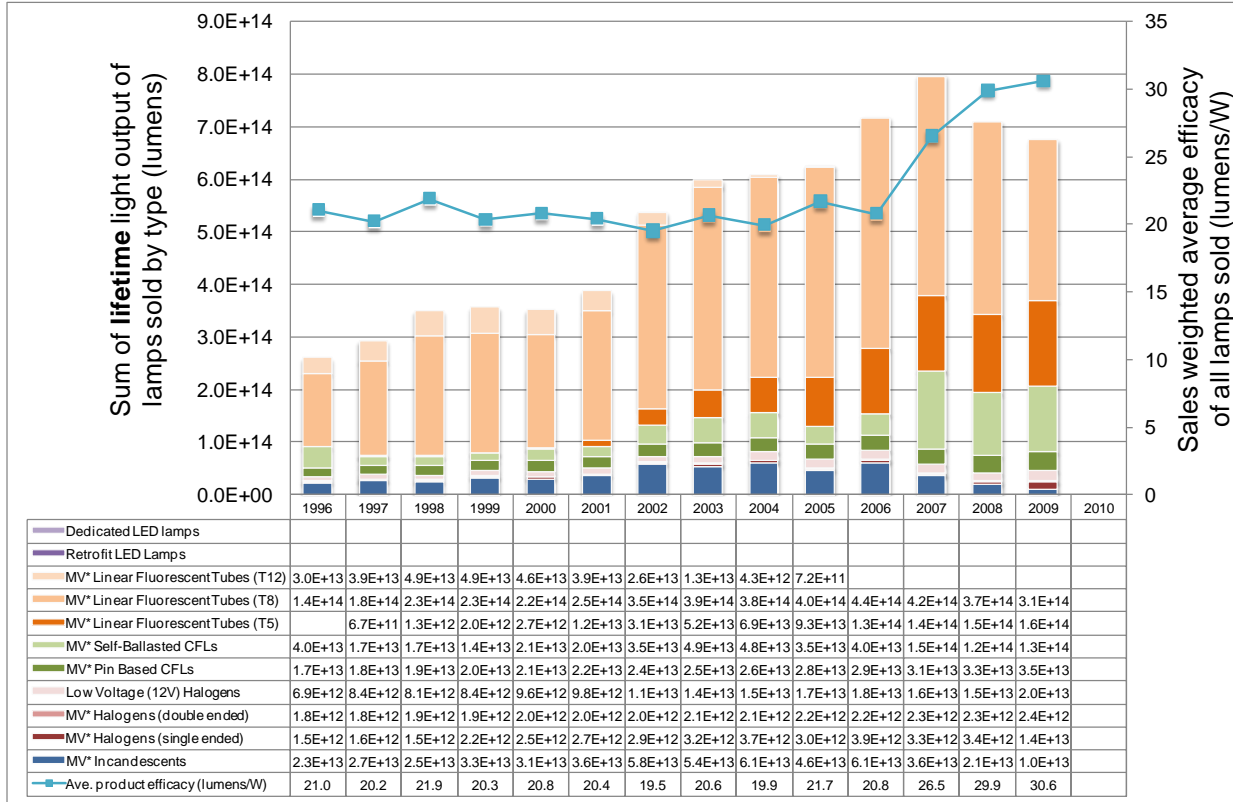|	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Dedicated LED lamps															
Retrofit LED Lamps															
MV* Linear Fluorescent Tubes (T12)	3.0E+09	3.9E+09	4.9E+09	4.9E+09	4.6E+09	3.9E+09	2.6E+09	1.3E+09	4.3E+08	7.2E+07					
MV* Linear Fluorescent Tubes (T8)	1.4E+10	1.8E+10	2.3E+10	2.3E+10	2.2E+10	2.5E+10	3.5E+10	3.9E+10	3.8E+10	4.0E+10	4.4E+10	4.2E+10	3.7E+10	3.1E+10	
MV* Linear Fluorescent Tubes (T5)		4.5E+07	8.9E+07	1.3E+08	1.8E+08	7.7E+08	2.1E+09	3.5E+09	4.6E+09	6.2E+09	8.3E+09	9.6E+09	9.9E+09	1.1E+10	
MV* Self-Ballasted CFLs	6.7E+09	2.8E+09	2.8E+09	2.3E+09	3.5E+09	3.3E+09	5.8E+09	8.1E+09	8.0E+09	5.8E+09	6.6E+09	2.5E+10	2.0E+10	2.1E+10	
MV* Pin Based CFLs	2.8E+09	3.0E+09	3.2E+09	3.3E+09	3.5E+09	3.7E+09	3.9E+09	4.1E+09	4.4E+09	4.6E+09	4.9E+09	5.2E+09	5.4E+09	5.8E+09	
Low Voltage (12V) Halogens	5.3E+09	6.5E+09	6.2E+09	6.5E+09	7.4E+09	7.6E+09	8.3E+09	1.1E+10	1.2E+10	1.3E+10	1.4E+10	1.2E+10	1.1E+10	1.5E+10	
MV* Halogens (double ended)	1.4E+09	1.4E+09	1.4E+09	1.5E+09	1.5E+09	1.5E+09	1.6E+09	1.6E+09	1.6E+09	1.7E+09	1.7E+09	1.8E+09	1.8E+09	1.8E+09	
MV* Halogens (single ended)	1.1E+09	1.2E+09	1.2E+09	1.7E+09	1.9E+09	2.1E+09	2.2E+09	2.5E+09	2.9E+09	2.9E+09	3.0E+09	2.5E+09	2.6E+09	1.1E+10	
MV* Incandescents	2.3E+10	2.7E+10	2.5E+10	3.3E+10	3.1E+10	3.6E+10	5.8E+10	5.4E+10	6.1E+10	4.6E+10	6.1E+10	3.6E+10	2.1E+10	1.0E+10	
Ave. product efficacy (lumens/W)	21.0	20.2	21.9	20.3	20.8	20.4	19.5	20.6	19.9	21.7	20.8	26.5	29.9	30.6	

* Mains Voltage

Key notes on Graph (See notes section 2)

- Annual sales values based on import data, a range of assumptions sought from industry, and extrapolation through modelling. Data supplier views the sales values provided as a robust representation of the market for all domestic (household) sector lamps[5]
- Instantaneous light output calculated on a sales weighted basis using estimated average global efficacies for each lamp type and associated wattage range for 240V lamps
- Instantaneous light output is for lamps sold in each year only, *not* all installed stock

[5] *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.*

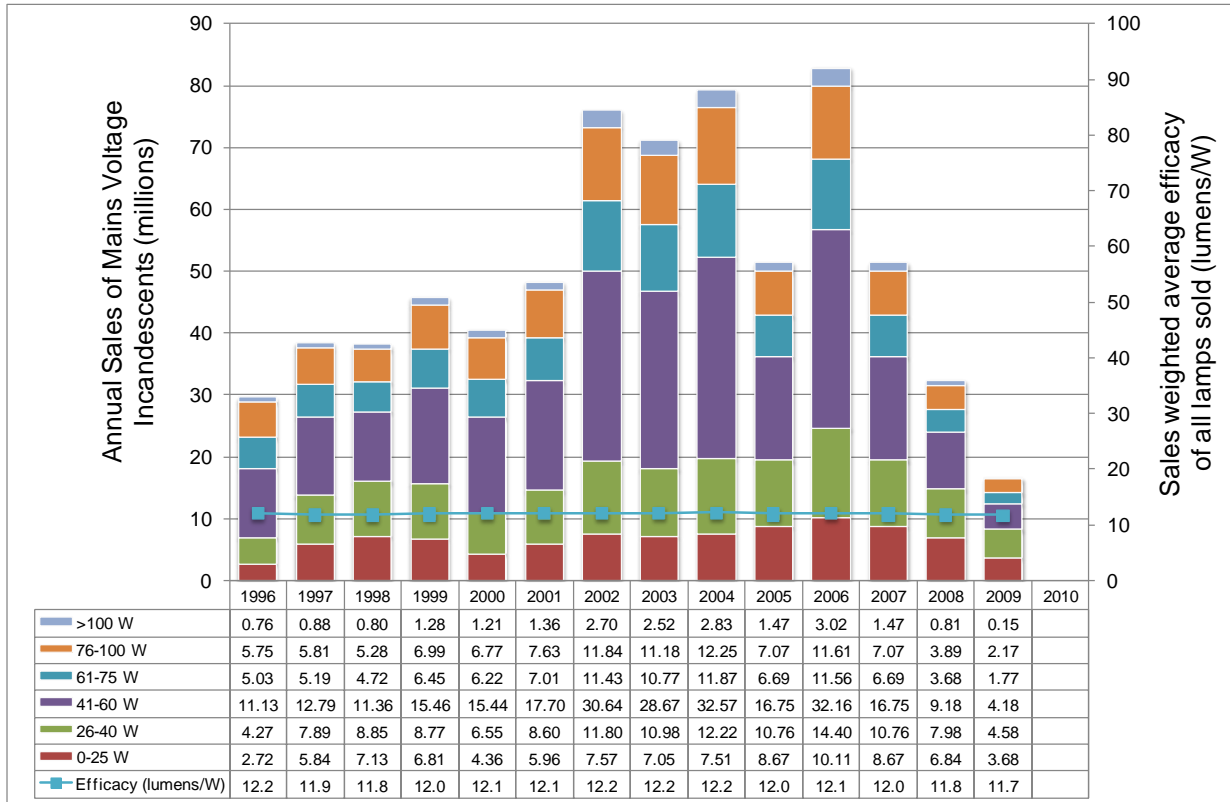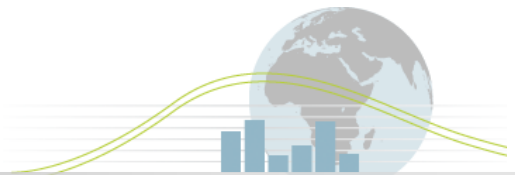## Total lifetime light output of all domestic lamps sales - Australia

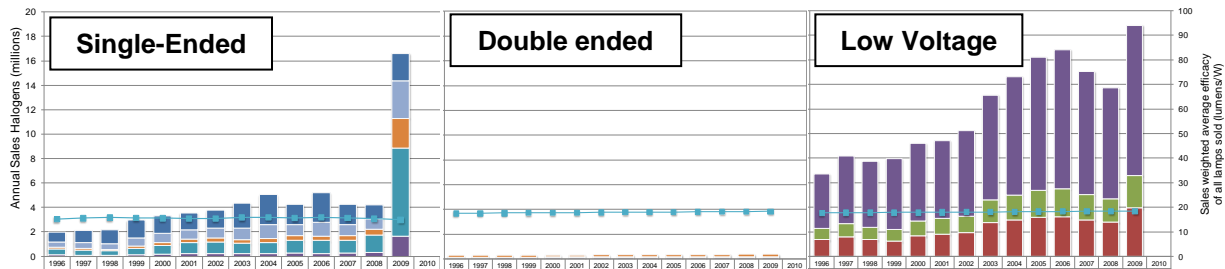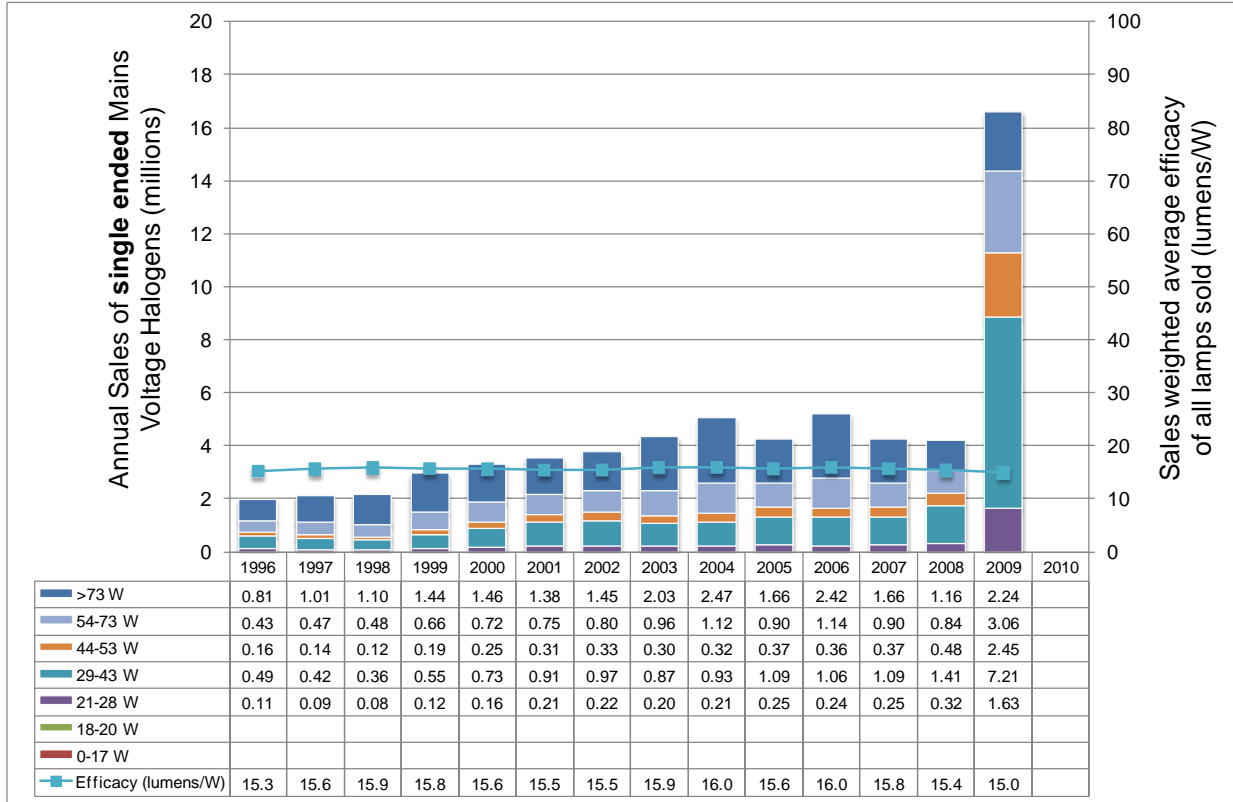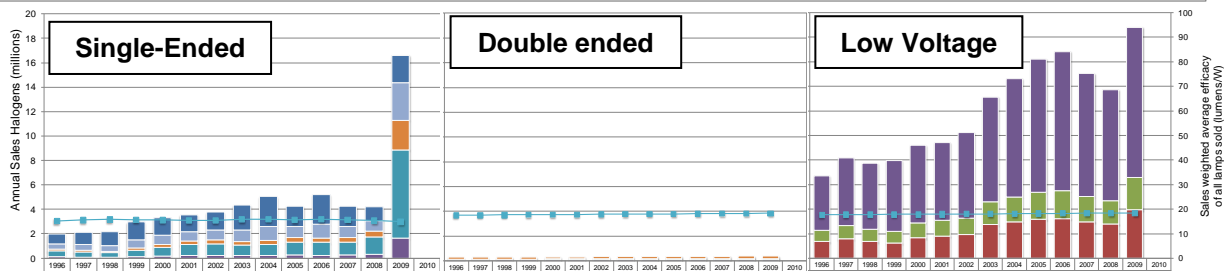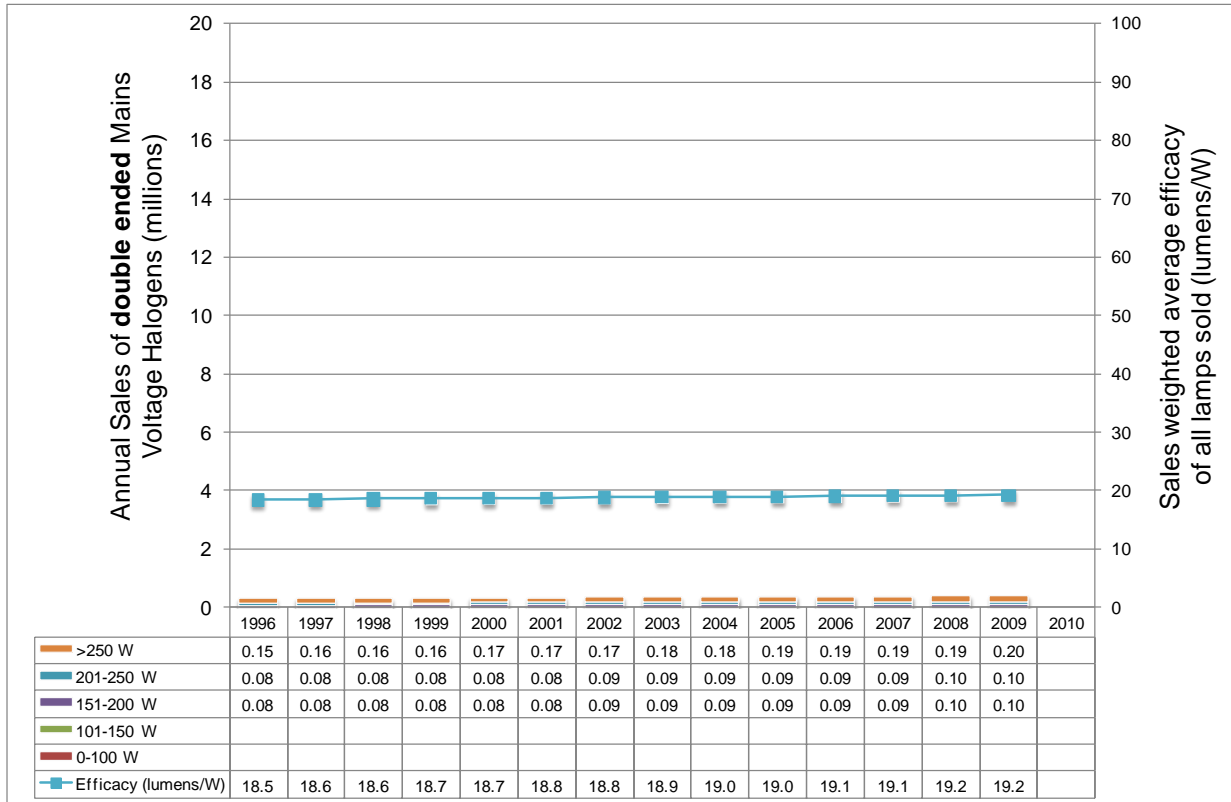|	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Dedicated LED lamps															
Retrofit LED Lamps															
MV* Linear Fluorescent Tubes (T12)	3.0E+13	3.9E+13	4.9E+13	4.9E+13	4.6E+13	3.9E+13	2.6E+13	1.3E+13	4.3E+12	7.2E+11					
MV* Linear Fluorescent Tubes (T8)	1.4E+14	1.8E+14	2.3E+14	2.3E+14	2.2E+14	2.5E+14	3.5E+14	3.9E+14	3.8E+14	4.0E+14	4.4E+14	4.2E+14	3.7E+14	3.1E+14	
MV* Linear Fluorescent Tubes (T5)		6.7E+11	1.3E+12	2.0E+12	2.7E+12	1.2E+13	3.1E+13	5.2E+13	6.9E+13	9.3E+13	1.3E+14	1.4E+14	1.5E+14	1.6E+14	
MV* Self-Ballasted CFLs	4.0E+13	1.7E+13	1.7E+13	1.4E+13	2.1E+13	2.0E+13	3.5E+13	4.9E+13	4.8E+13	3.5E+13	4.0E+13	1.5E+14	1.2E+14	1.3E+14	
MV* Pin Based CFLs	1.7E+13	1.8E+13	1.9E+13	2.0E+13	2.1E+13	2.2E+13	2.4E+13	2.5E+13	2.6E+13	2.8E+13	2.9E+13	3.1E+13	3.3E+13	3.5E+13	
Low Voltage (12V) Halogens	6.9E+12	8.4E+12	8.1E+12	8.4E+12	9.6E+12	9.8E+12	1.1E+13	1.4E+13	1.5E+13	1.7E+13	1.8E+13	1.6E+13	1.5E+13	2.0E+13	
MV* Halogens (double ended)	1.8E+12	1.8E+12	1.9E+12	1.9E+12	2.0E+12	2.0E+12	2.0E+12	2.1E+12	2.1E+12	2.2E+12	2.2E+12	2.3E+12	2.3E+12	2.4E+12	
MV* Halogens (single ended)	1.5E+12	1.6E+12	1.5E+12	2.2E+12	2.5E+12	2.7E+12	2.9E+12	3.2E+12	3.2E+12	3.7E+12	3.0E+12	3.9E+12	3.3E+12	3.4E+12	1.4E+13
MV* Incandescents	2.3E+13	2.7E+13	2.5E+13	3.3E+13	3.1E+13	3.6E+13	5.8E+13	5.4E+13	6.1E+13	4.6E+13	6.1E+13	3.6E+13	2.1E+13	1.0E+13	
Ave. product efficacy (lumens/W)	21.0	20.2	21.9	20.3	20.8	20.4	19.5	20.6	19.9	21.7	20.8	26.5	29.9	30.6	

* Mains Voltage

Key notes on Graph (See notes section 2)

- Annual sales values based on import data, a range of assumptions sought from industry, and extrapolation through modelling. Data supplier views the sales values provided as a robust representation of the market for all domestic (household) sector lamps[6]

- 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 240V lamps

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

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[6] *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.*
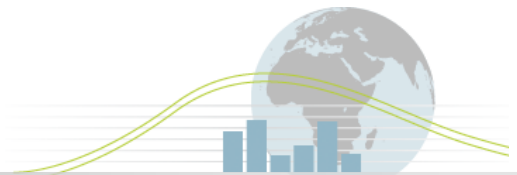
Sales of Mains Voltage Incandescent lamps by wattage range - Australia

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
>100 W	0.76	0.88	0.80	1.28	1.21	1.36	2.70	2.52	2.83	1.47	3.02	1.47	0.81	0.15	
76-100 W	5.75	5.81	5.28	6.99	6.77	7.63	11.84	11.18	12.25	7.07	11.61	7.07	3.89	2.17	
61-75 W	5.03	5.19	4.72	6.45	6.22	7.01	11.43	10.77	11.87	6.69	11.56	6.69	3.68	1.77	
41-60 W	11.13	12.79	11.36	15.46	15.44	17.70	30.64	28.67	32.57	16.75	32.16	16.75	9.18	4.18	
26-40 W	4.27	7.89	8.85	8.77	6.55	8.60	11.80	10.98	12.22	10.76	14.40	10.76	7.98	4.58	
0-25 W	2.72	5.84	7.13	6.81	4.36	5.96	7.57	7.05	7.51	8.67	10.11	8.67	6.84	3.68	
Efficacy (lumens/W)	12.2	11.9	11.8	12.0	12.1	12.1	12.2	12.2	12.2	12.0	12.1	12.0	11.8	11.7	

Key notes on Graph (See notes section 2)

- Annual sales values based on import data, a range of assumptions sought from industry, and extrapolation through modelling. Data supplier views the sales values provided as a robust representation of the market for all domestic (household) sector lamps[7]

- Annual market average efficacies calculated on a sales weighted basis using estimated average global efficacies for each lamp type and associated wattage range for 240V lamps

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[7] *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.*

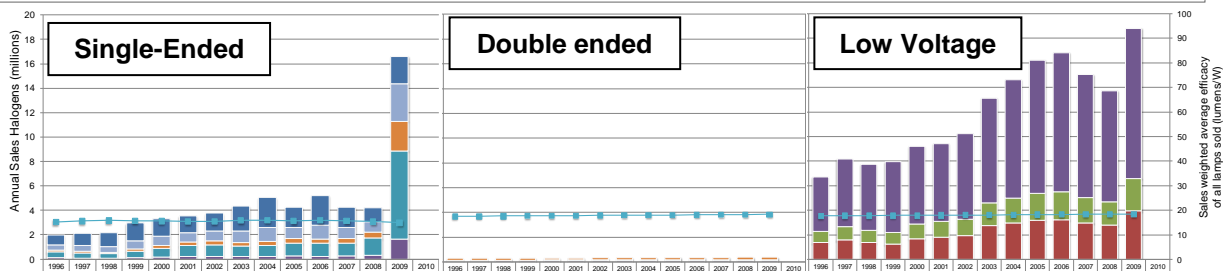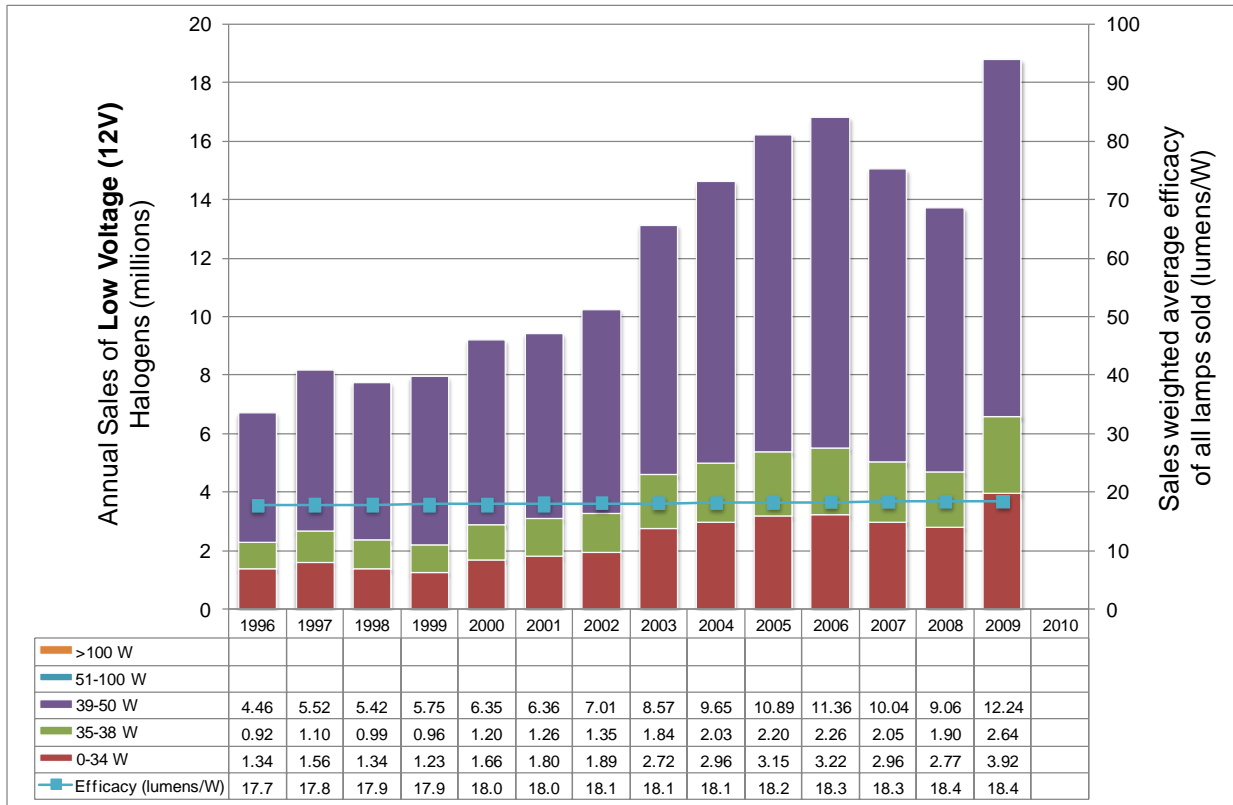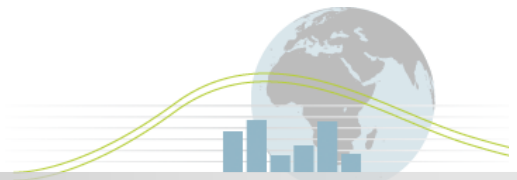## Sales of Single Ended Mains Voltage Halogen lamps by wattage range - Australia

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
>73 W	0.81	1.01	1.10	1.44	1.46	1.38	1.45	2.03	2.47	1.66	2.42	1.66	1.16	2.24	
54-73 W	0.43	0.47	0.48	0.66	0.72	0.75	0.80	0.96	1.12	0.90	1.14	0.90	0.84	3.06	
44-53 W	0.16	0.14	0.12	0.19	0.25	0.31	0.33	0.30	0.32	0.37	0.36	0.37	0.48	2.45	
29-43 W	0.49	0.42	0.36	0.55	0.73	0.91	0.97	0.87	0.93	1.09	1.06	1.09	1.41	7.21	
21-28 W	0.11	0.09	0.08	0.12	0.16	0.21	0.22	0.20	0.21	0.25	0.24	0.25	0.32	1.63	
18-20 W															
0-17 W															
Efficacy (lumens/W)	15.3	15.6	15.9	15.8	15.6	15.5	15.5	15.9	16.0	15.6	16.0	15.8	15.4	15.0	

Single-Ended
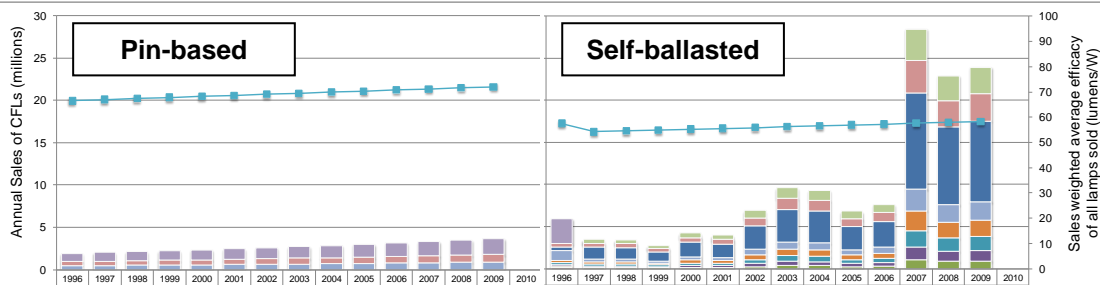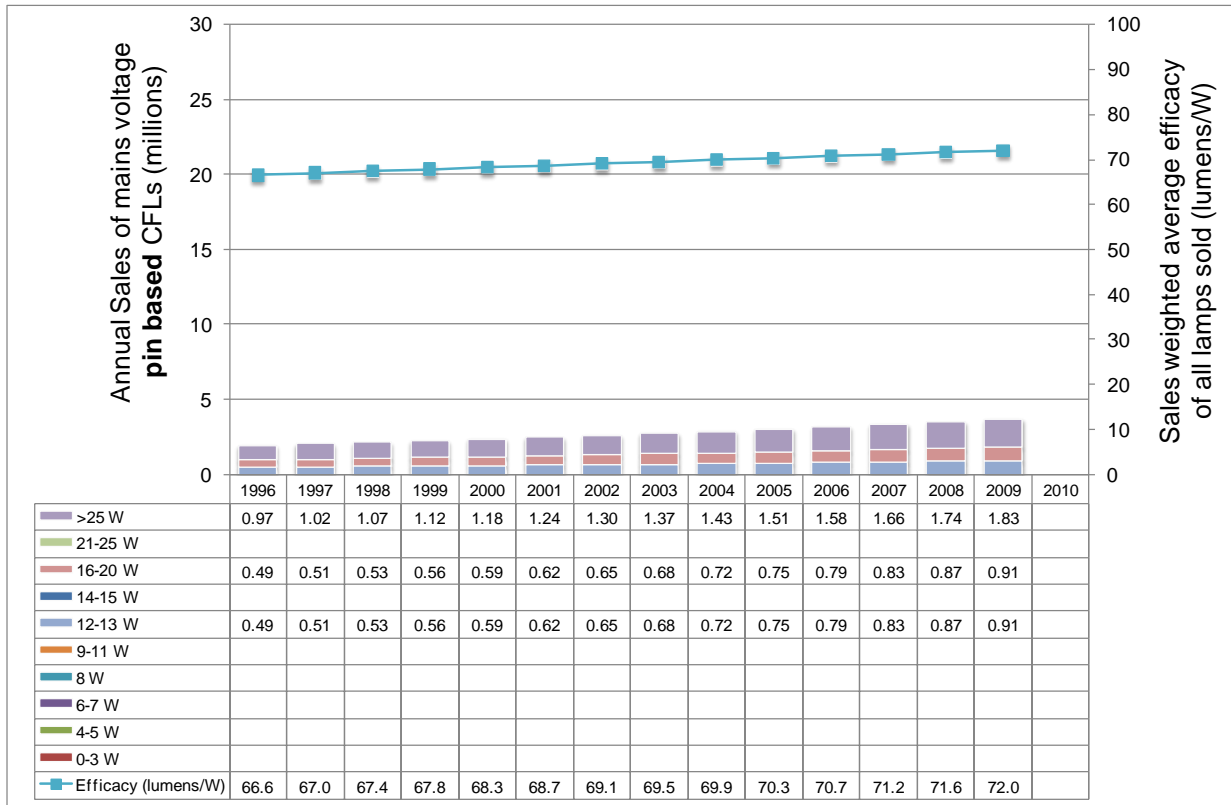

Double ended

Low Voltage

Key notes on Graph (See notes section 2)

- Annual sales values based on import data, a range of assumptions sought from industry, and extrapolation through modelling. Data supplier views the sales values provided as a robust representation of the market for all domestic (household) sector lamps[8]

- Annual market average efficacies calculated on a sales weighted basis using estimated average global efficacies for each lamp type and associated wattage range for 240V lamps

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[8] *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.*
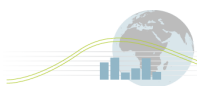
Sales of Double Ended Mains Voltage Halogen lamps by wattage range - Australia

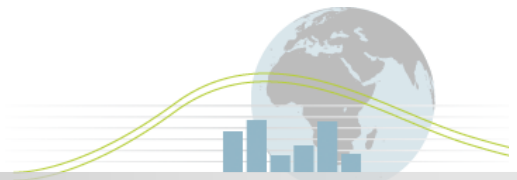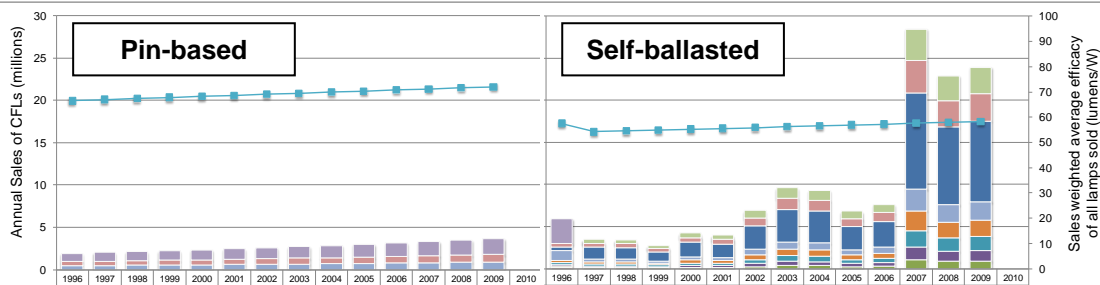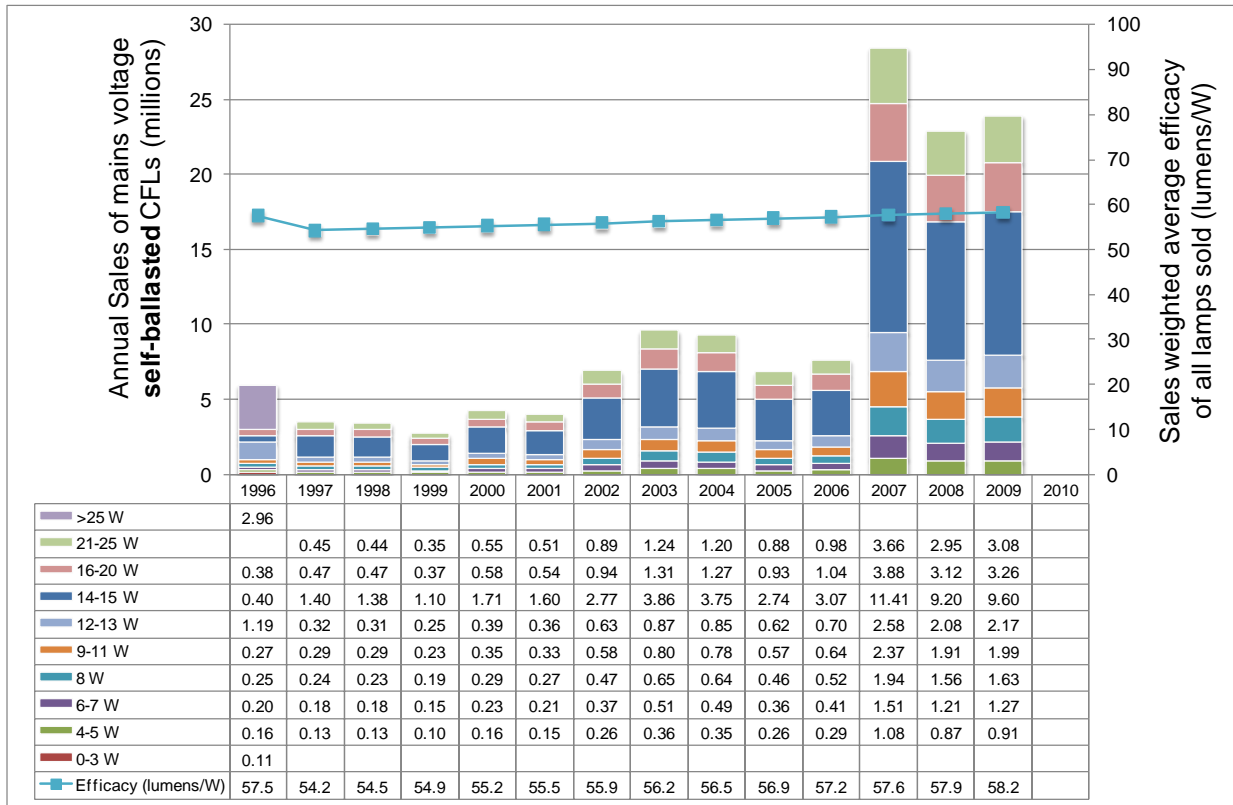|	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
>250 W	0.15	0.16	0.16	0.16	0.17	0.17	0.17	0.18	0.18	0.19	0.19	0.19	0.19	0.20	
201-250 W	0.08	0.08	0.08	0.08	0.08	0.08	0.09	0.09	0.09	0.09	0.09	0.09	0.10	0.10	
151-200 W	0.08	0.08	0.08	0.08	0.08	0.08	0.09	0.09	0.09	0.09	0.09	0.09	0.10	0.10	
101-150 W															
0-100 W															
Efficacy (lumens/W)	18.5	18.6	18.6	18.7	18.7	18.8	18.8	18.9	19.0	19.0	19.1	19.1	19.2	19.2	

Key notes on Graph (See notes section 2)

- Projections derived from a range of estimates sought from industry and extrapolation through modelling. Data supplier views the sales values as approximations only for this lamp type within the market for all domestic (household) sector lamps[9]
- Annual market average efficacies calculated on a sales weighted basis using estimated average global efficacies for each lamp type and associated wattage range for 240V lamps

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[9] 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.
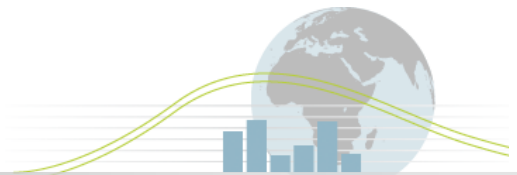
Sales of Low Voltage (12V) by wattage range
Australia

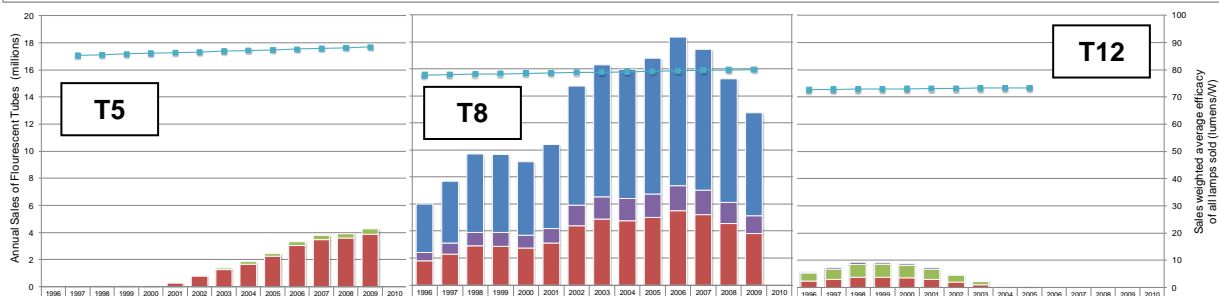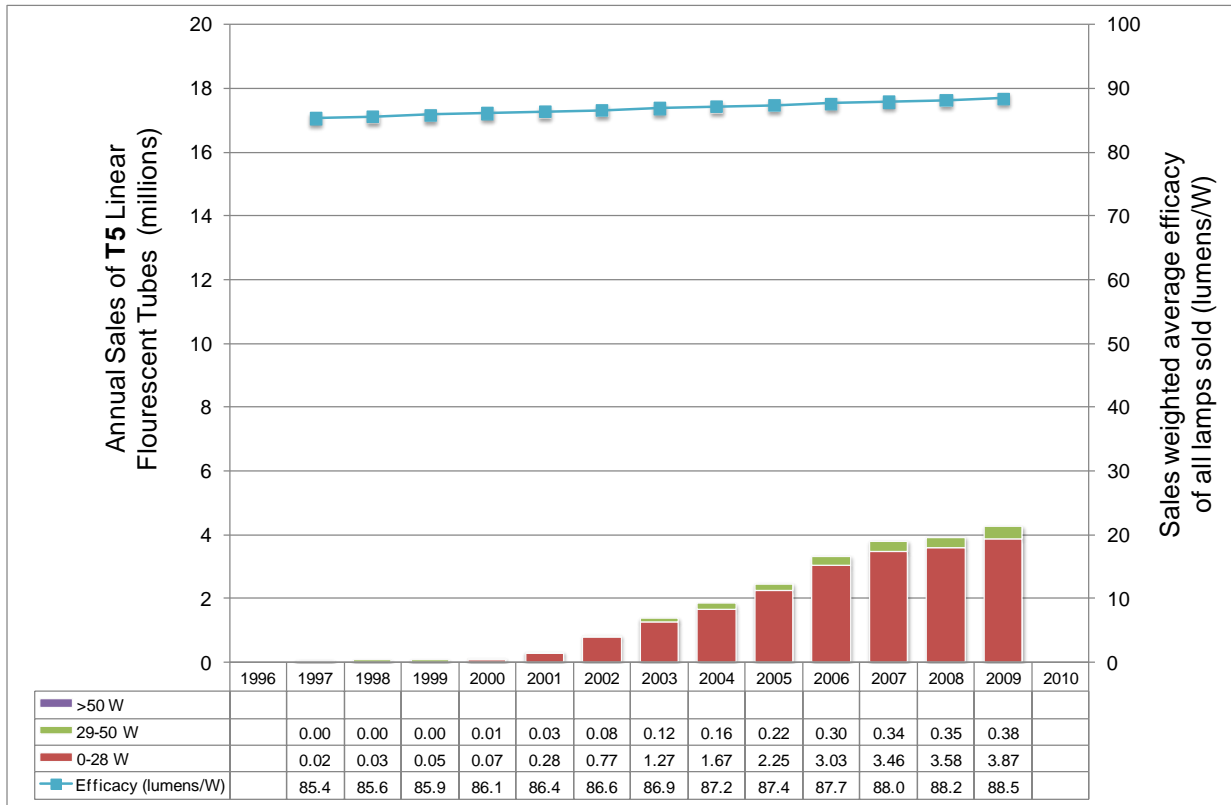|	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
>100 W															
51-100 W															
39-50 W	4.46	5.52	5.42	5.75	6.35	6.36	7.01	8.57	9.65	10.89	11.36	10.04	9.06	12.24	
35-38 W	0.92	1.10	0.99	0.96	1.20	1.26	1.35	1.84	2.03	2.20	2.26	2.05	1.90	2.64	
0-34 W	1.34	1.56	1.34	1.23	1.66	1.80	1.89	2.72	2.96	3.15	3.22	2.96	2.77	3.92	
Efficacy (lumens/W)	17.7	17.8	17.9	17.9	18.0	18.0	18.1	18.1	18.1	18.2	18.3	18.3	18.4	18.4	

Key notes on Graph (See notes section 2)

- Annual sales values based on import data, a range of assumptions sought from industry, and extrapolation through modelling. Data supplier views the sales values provided as a robust representation of the market for all domestic (household) sector lamps[10]

- Annual market average efficacies calculated on a sales weighted basis using estimated average global efficacies for each lamp type and associated wattage range for 12V lamps

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[10] *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.*
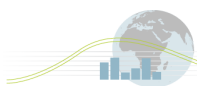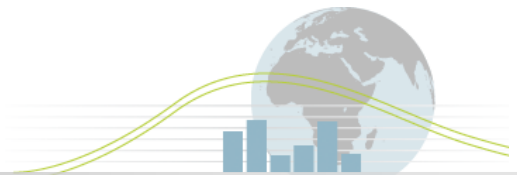
Sales of Pin Based CFL lamps by wattage range Australia

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
>25 W	0.97	1.02	1.07	1.12	1.18	1.24	1.30	1.37	1.43	1.51	1.58	1.66	1.74	1.83	
21-25 W															
16-20 W	0.49	0.51	0.53	0.56	0.59	0.62	0.65	0.68	0.72	0.75	0.79	0.83	0.87	0.91	
14-15 W															
12-13 W	0.49	0.51	0.53	0.56	0.59	0.62	0.65	0.68	0.72	0.75	0.79	0.83	0.87	0.91	
9-11 W															
8 W															
6-7 W															
4-5 W															
0-3 W															
Efficacy (lumens/W)	66.6	67.0	67.4	67.8	68.3	68.7	69.1	69.5	69.9	70.3	70.7	71.2	71.6	72.0	

Key notes on Graph (See notes section 2)

- Projections derived from a range of estimates sought from industry and extrapolation through modelling. Data supplier views the sales values as approximations only for this lamp type within the market for all domestic (household) sector lamps[11]

- Annual market average efficacies calculated on a sales weighted basis using estimated average global efficacies for each lamp type and associated wattage range for 240V lamps

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[11] *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.*

Sales of Self-Ballasted CFL lamps by wattage range Australia

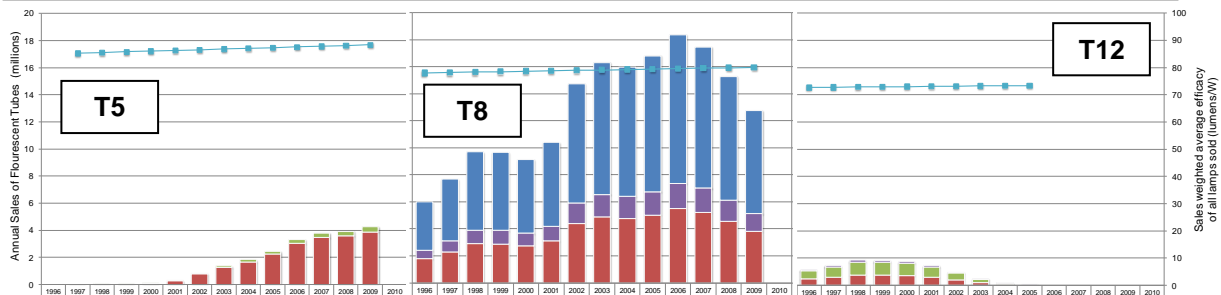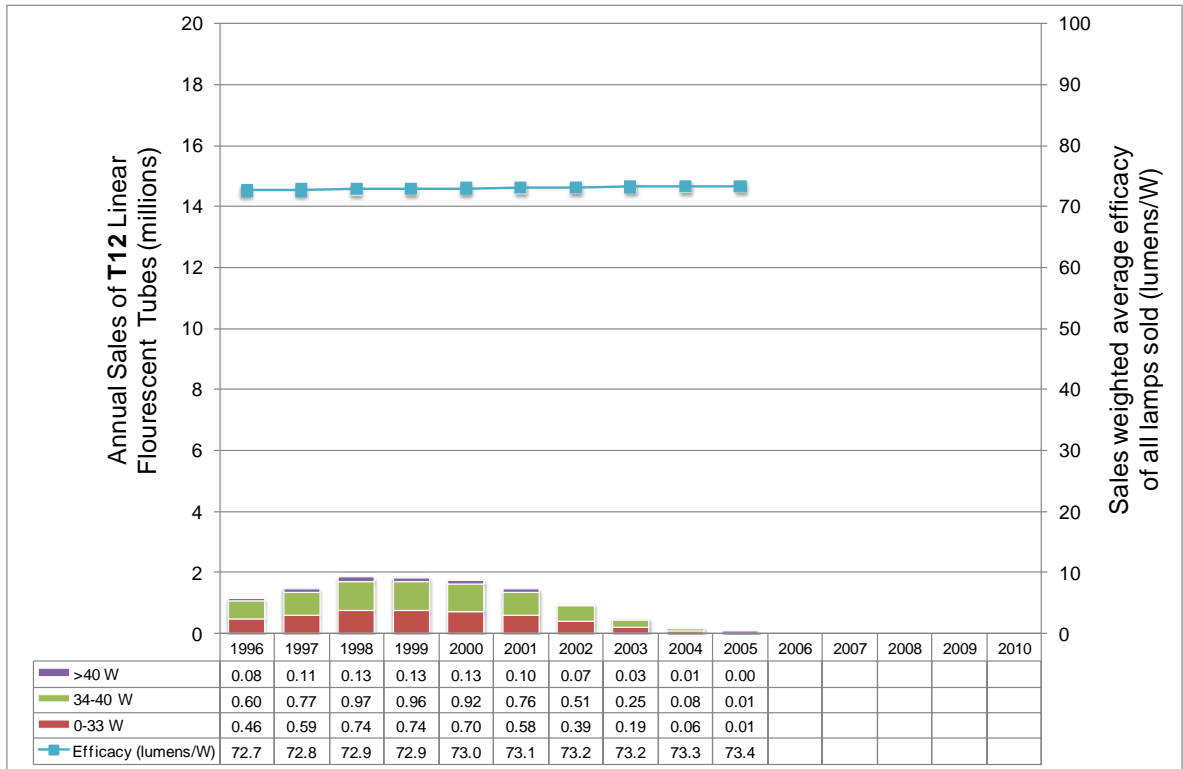|	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
>25 W	2.96														
21-25 W		0.45	0.44	0.35	0.55	0.51	0.89	1.24	1.20	0.88	0.98	3.66	2.95	3.08	
16-20 W	0.38	0.47	0.47	0.37	0.58	0.54	0.94	1.31	1.27	0.93	1.04	3.88	3.12	3.26	
14-15 W	0.40	1.40	1.38	1.10	1.71	1.60	2.77	3.86	3.75	2.74	3.07	11.41	9.20	9.60	
12-13 W	1.19	0.32	0.31	0.25	0.39	0.36	0.63	0.87	0.85	0.62	0.70	2.58	2.08	2.17	
9-11 W	0.27	0.29	0.29	0.23	0.35	0.33	0.58	0.80	0.78	0.57	0.64	2.37	1.91	1.99	
8 W	0.25	0.24	0.23	0.19	0.29	0.27	0.47	0.65	0.64	0.46	0.52	1.94	1.56	1.63	
6-7 W	0.20	0.18	0.18	0.15	0.23	0.21	0.37	0.51	0.49	0.36	0.41	1.51	1.21	1.27	
4-5 W	0.16	0.13	0.13	0.10	0.16	0.15	0.26	0.36	0.35	0.26	0.29	1.08	0.87	0.91	
0-3 W	0.11														
Efficacy (lumens/W)	57.5	54.2	54.5	54.9	55.2	55.5	55.9	56.2	56.5	56.9	57.2	57.6	57.9	58.2	

Key notes on Graph (See notes section 2)

- Annual sales values based on import data, a range of assumptions sought from industry, and extrapolation through modelling. Data supplier views the sales values provided as a robust representation of the market for all domestic (household) sector lamps[12]

- Annual market average efficacies calculated on a sales weighted basis using estimated average global efficacies for each lamp type and associated wattage range for 240V lamps

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[12] *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.*

Sales of T5 Linear Fluorescent Tubes by wattage range Australia

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
>50 W															
29-50 W		0.00	0.00	0.00	0.01	0.03	0.08	0.12	0.16	0.22	0.30	0.34	0.35	0.38	
0-28 W		0.02	0.03	0.05	0.07	0.28	0.77	1.27	1.67	2.25	3.03	3.46	3.58	3.87	
Efficacy (lumens/W)		85.4	85.6	85.9	86.1	86.4	86.6	86.9	87.2	87.4	87.7	88.0	88.2	88.5	

Key notes on Graph (See notes section 2)

- Annual sales values based on import data, a range of assumptions sought from industry, and extrapolation through modelling. Data supplier views the sales values provided as a robust representation of the market for all domestic (household) sector lamps[13]

- Annual market average efficacies calculated on a sales weighted basis using estimated average global efficacies for each lamp type and associated wattage range for 240V lamps

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[13] *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.*

Sales of T8 Linear Fluorescent Tubes by wattage range Australia
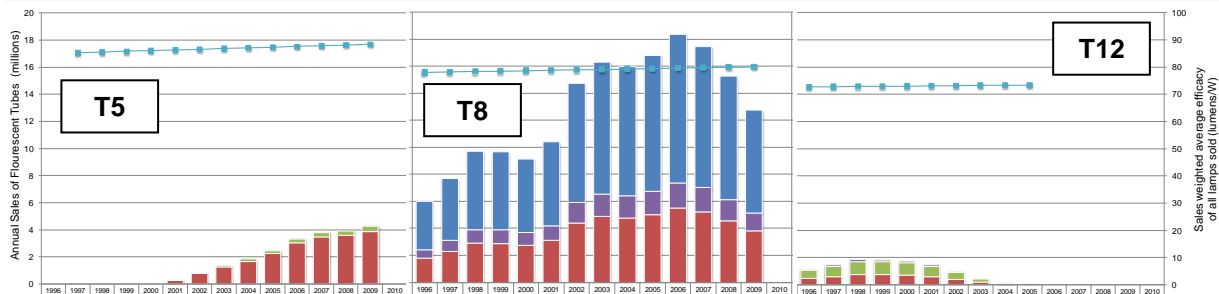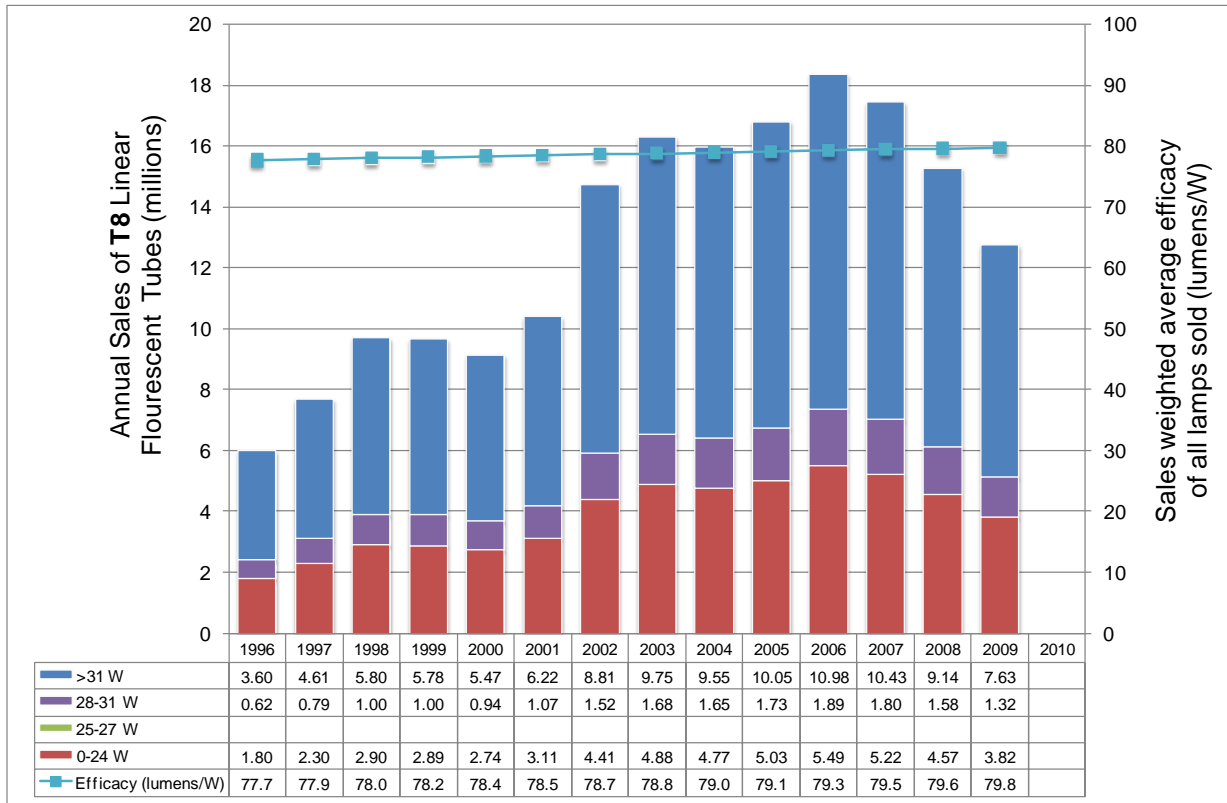
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
>31 W	3.60	4.61	5.80	5.78	5.47	6.22	8.81	9.75	9.55	10.05	10.98	10.43	9.14	7.63	
28-31 W	0.62	0.79	1.00	1.00	0.94	1.07	1.52	1.68	1.65	1.73	1.89	1.80	1.58	1.32	
25-27 W															
0-24 W	1.80	2.30	2.90	2.89	2.74	3.11	4.41	4.88	4.77	5.03	5.49	5.22	4.57	3.82	
Efficacy (lumens/W)	77.7	77.9	78.0	78.2	78.4	78.5	78.7	78.8	79.0	79.1	79.3	79.5	79.6	79.8	

Key notes on Graph (See notes section 2)

- Annual sales values based on import data, a range of assumptions sought from industry, and extrapolation through modelling. Data supplier views the sales values provided as a robust representation of the market for all domestic (household) sector lamps[14]

- Annual market average efficacies calculated on a sales weighted basis using estimated average global efficacies for each lamp type and associated wattage range for 240V lamps

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[14] *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.*

Sales of T12 Linear Fluorescent Tubes by wattage range Australia

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
>40 W	0.08	0.11	0.13	0.13	0.13	0.10	0.07	0.03	0.01	0.00					
34-40 W	0.60	0.77	0.97	0.96	0.92	0.76	0.51	0.25	0.08	0.01					
0-33 W	0.46	0.59	0.74	0.74	0.70	0.58	0.39	0.19	0.06	0.01					
Efficacy (lumens/W)	72.7	72.8	72.9	72.9	73.0	73.1	73.2	73.2	73.3	73.4					

Key notes on Graph (See notes section 2)

- Annual sales values based on import data, a range of assumptions sought from industry, and extrapolation through modelling. Data supplier views the sales values provided as a robust representation of the market for all domestic (household) sector lamps[15]

- Annual market average efficacies calculated on a sales weighted basis using estimated average global efficacies for each lamp type and associated wattage range for 240V lamps

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[15] *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.*
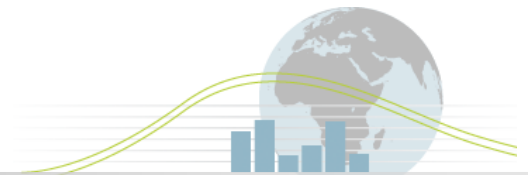
Sales of LED lamps by wattage range
Australia

No data on the sales of dedicated or retrofit LED lamps in Australia was available to the Annex at the time of publication.
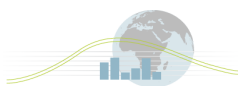
Major Policy Interventions (See notes Section 3)

Policies for lighting fall primarily fall into 3 categories in Australia:

1) **Mandatory MEPS:** as summarised above and described in notes section 1

2) **Building codes/standards requirements:** A number of building codes within Australia specify minimum lighting levels (for new commercial buildings), and in a number of cases, maximum power allowances (new residential and commercial buildings). In 2011, large commercial spaces will require their lighting energy performance to be disclosed at the point of sale or lease. Mercury vapour lamps are also being phased out from road lighting installations.

3) **Actions driven by carbon credits:** In a number of states, the energy regulatory authorities have given mandatory efficiency targets to electricity suppliers. In a number of cases, these suppliers have initiated CFL give away schemes (often through third parties) with the CFLs intended to replace incandescent lamps. These schemes were particularly active in the mid 2000's with millions of lamps being distributed. However, following revisions to the "savings" that could be allocated to such schemes, and the announcement of the incandescent phase-out regime, CFL give aways have been discontinued or heavily curtailed.

Cultural Issues (See Notes Section 4)

The only major cultural issues specific to Australia are:

1) **Low Voltage Halogen Reflector Lamps:** Australia has a very high usage of low voltage (12V) halogen reflector lamps for general illumination in households, and this is increasing. At present there appears to me no like for like replacements providing the same lumen output and not encountering problems with heat dissipation/and or the need to replace transformers.

2) **Dimming:** For historical reasons, Australia has a predominance of "two wire" dimming systems that require a continual trickle bypass current to operate the dimmer circuitry. This makes them unsuitable for many CFLs and therefore halogen replacements may be more common than elsewhere.

Notes on data

Section 1: Notes on Phase out regulations

1.1 Overview[16]

The Australian Announcement of the "phase-out of inefficient lighting" was made on 20th February 2007 (fluorescent tubes have been regulated since 2004)

From 1 February 2009 there has been an import restriction for general lighting service (GLS) incandescent lamps implemented through National (Commonwealth) Regulation[17].

Commencing 1 November 2009, certain general purpose incandescent lamps (tungsten filament and tungsten halogen) were required to comply with Minimum Energy Performance Standards (MEPS) that are set out in AS/NZS 4934.2-2008. Test procedures for incandescent lamps are set out in AS/NZS 4934.1-2008. The timeline for lamps being subject to MEPS is as follows:

Lamp Types	Sales Restriction From
• Fluorescent Tubes[18]	October 2004
• Tungsten incandescent GLS lamps • ELV halogen non reflector • CFLs with integrated ballasts	November 2009
• >40W Candle, fancy round and decorative lamps • Mains voltage halogen non-reflector (note a 5% relaxed requirement for these lamps 2010-12) • ELV halogen reflector	October 2010 – January 2011
• Mains voltage reflector lamps including halogen (PAR, ER, R, etc) • >25W Candle fancy round and decorative lamps	October 2012
• Pilot lamps 25W and below	To be determined

The definitions of Lamp Types in the above table can be found in the summary of Part 2 of the Australia / New Zealand Standard[19]. These include tungsten filament and tungsten halogen lamps with varying voltages, wattages, shapes and lamp caps, used for general purpose lighting. MEPs are also being applied to self-ballasted Compact Fluorescent Lamps (CFLs).

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[16] http://www.energyrating.gov.au/incand-lamps2.html

[17] www.comlaw.gov.au/ComLaw/Legislation/LegislativeInstrument1.nsf/all/whatsnew/BB0DBAECC2194AACCA2575190081B85F?OpenDocument

[18] Note that the graphic refers to incandescent, halogen and CFLs with integral ballast only, *not* fluorescent tubes.

[19] www.energyrating.gov.au/incand-lamps1.html#part2standard
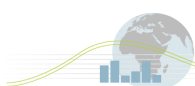
MEPS for incandescent lamps are set out as minimum Efficacy (in lumens per Watt). The required minimum initial lamp efficacy (in lm/W) is given by the formula:

2.8 x ln (L) - 4.0

where ln (L) is the natural logarithm of the measured initial luminous flux (in lumens)

(note that a 5% relaxation on this efficacy requirement for halogen lamps has been given for the years 2010-2012)

There are also requirements for Lumen Maintenance (minimum of 80% measured at 75% of rated lamp life) and Minimum Lamp Life (median lamp life of at least 2000 hours). The methods for measurement of efficacy, lumen maintenance and lamp life are set out in AS/NZS 4934.1.

1.2 Summary of Relevant Standards for Incandescent Lamps[20]

Test procedures and regulatory standards for tungsten filament and tungsten halogen lamps are published by Standards Australia. The following parts are relevant:

- AS/NZS 4934.1 Incandescent lamps for general lighting service - Test methods - Energy performance.
- AS/NZS 4934.2 Incandescent lamps for general lighting services - MEPS requirements.

1.2.1 AS/NZS 4934.1 Incandescent lamps for general lighting service - Test methods - Energy performance

The test methods used to determine lamp efficacy, lumen maintenance and lifetime are generally based on CIE and IEC methods.

Scope: AS/NZS 4934.1 specifies test methods for the energy performance of tungsten filament and tungsten halogen lamps used in general lighting services. It applies to both non-reflector and reflector lamps of all voltages.

1.2.2 AS/NZS 4934.2 Incandescent lamps for general lighting services - MEPS requirements.

Scope: this standard specifies requirements for Minimum Energy Performance Standards (MEPS) and other requirements for incandescent lamps both tungsten filament and tungsten halogen. The scope is as follows:

- GLS (general lamp service):
  (a) Shapes: A50-A65, PS50-PS65, M50-M65, T50-T65 (as generally outlined in IEC 60630) or E50-E65.
  (b) Caps: E14, E26, E27, B15 or B22d.
  (c) Nominal voltage ≥220 V.
  (d) Nominal wattage <150 W.
  (e) Not including coloured lamps, reflector lamps or crown-reflector lamps or lamps with a halogen gas fill..

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[20] http://www.energyrating.gov.au/incand-lamps1.html

- ELV (extra low voltage) halogen non-reflector:
  - (a) Tungsten halogen lamp burner.
  - (b) Shapes: single-ended capsule, non-reflector.
  - (c) Caps: bi-pin.
  - (d) Nominal voltage: 5-14 V inclusive.
  - (e) Not including coloured lamps, reflector lamps or crown-reflector lamps.
- Candle:
  - (a) Shapes: candle or B (as generally outlined in IEC 60630) including twisted and bent tip candle.
  - (b) Caps: E14, E26, E27, B15 or B22d.
  - (c) Nominal voltage >220 V.
  - (d) Not including coloured lamps, reflector lamps or crown-reflector lamps.
- Fancy round:
  - (a) Shapes: round, P (as generally outlined in IEC 60630), G or globe.
  - (b) Caps: E14, E26, E27, B15 or B22d.
  - (c) Nominal voltage >220 V.
  - (d) Not including coloured lamps, reflector lamps or crown-reflector lamps.
- Decorative lamps:
  - (a) Shapes: decorative shapes.
  - (b) Caps: E14, E26, E27, B15 or B22d.
  - (c) Nominal voltage >220 V.
  - (d) Not including coloured lamps, reflector lamps or crown-reflector lamps..
- Mains voltage halogen non-reflector:
  - (a) Tungsten halogen lamp burner, non-reflector.
  - (b) Shapes: single-ended.
  - (c) Caps: E14, E26, E27, B15 or B22d.
  - (d) Nominal voltage >220 V.
  - (e) Not including coloured lamps, reflector lamps or crown-reflector lamps.
- ELV halogen reflector:
  - (a) Shapes: MR 11-16.
  - (b) Caps: Bi-pin.
  - (c) Nominal voltage: 5-24 V (inclusive).
  - (d) Not including coloured lamps
- Mains voltage reflector (including halogen):
  - (a) Tungsten filament or tungsten halogen lamp burner, with reflector.
  - (b) Shapes: PAR, ER, R, RE, XR, YR, ZR or MR 11-16.
  - (c) Caps: E14, E26, E27, B15, B22d or GU10.
  - (d) Nominal voltage >220 V.
  - (e) Not including coloured lamps.

The standard does not cover safety requirements. These are covered separately in the AS/NZS 60432 series of Standards. It does not apply to appliance lamps, special purpose lamps and automotive lamps.

The standard sets out MEPS as minimum Efficacy (in lumens per Watt or lm/W) according to the formula:

2.8 x ln(L) - 4.0

where ln (L) is the natural logarithm of the measured initial luminous flux (in lumens)

(note that a 5% relaxation on this efficacy requirement for halogen lamps has been given for the years 2010-2012)

1.3 Summary of Relevant Standards for CFLs[21]

From 1 November 2009, self-ballasted compact fluorescent lamps (CFLs) were required to comply with Minimum Energy Performance Standards (MEPS) which are set out in AS/NZS

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[21] http://www.energyrating.gov.au/cfl.html

4847.2. This standard specifies MEPS requirements and related attributes for self-ballasted CFLs with integrated means for controlling starting and stable operation that are intended for domestic and similar general lighting purposes. It applies to self-ballasted lamps of all voltages and wattages irrespective of the type of lamp cap. Test procedures are set out in AS/NZS 4847.1.

The intention of MEPS for CFLs is to improve the performance of CFLs to ensure that they remain a viable alternative for inefficient incandescent lamps.

As part of the overall MEPS requirements, there are performance specifications for the following CFL attributes:

- Starting time
- Run-up time
- Luminous flux, efficacy and lumen maintenance
- Power, power factor and harmonics
- Premature lamp failure rate
- Low temperature starting
- Switching withstand
- Lamp life
- Colour attributes
- Mercury content

1.3.1 Performance Requirements

- In order to conform to MEPS, the standard states that CFLs must comply with one of the following:
- "Local" MEPS
- Model certification with the Efficient Lighting Initiative (ELI). More information available from www.efficientlighting.net
- Model certification with the Energy Savings Trust (EST) version 5 or version 6. More information available from www.energysavingtrust.org.uk

For full requirements please refer to AS/NZS 4847.2 Self Ballasted Lamps for General Lighting Services – Part 2 MEPS requirements.

1.4 Summary of Relevant Standards for Fluorescent Tubes[22]

From 1 October 2004, linear fluorescent lamps manufactured in or imported into Australia were required to comply with Minimum Energy Performance (MEPS) requirements which are set out in AS/NZS 4782.2-2004. The scope of linear fluorescent lamps MEPS covers FD and FDH lamps ranging from 550mm to 1500mm in length (inclusive) and having a nominal lamp power of 16 Watts or more. The intention of MEPS is to improve end-use energy efficiency by eliminating lower efficiency fluorescent lamps from the market and to encourage the sale and purchase of higher efficiency fluorescent lamps.

The Minimum Energy Performance Standards (MEPS) for linear fluorescent lamps in AS/NZS 4782.2-2004 are set out as *minimum luminous efficacy* in *lumens per Watt* for

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[22] http://www.energyrating.gov.au/lamps1.html

various lamp sizes. There are also requirements for minimum **_Colour Rendering Index and Maximum Mercury Content_**. The test methods for measurement luminous efficacy are set out in AS/NZS 4782.1 and AS/NZS 4782.3.

Exclusions: MEPS in AS/NZS 4782.2-2004 does not apply to lamps that are clearly not intended for general illumination, specifically:

b. lamps with a dominant colour or with an output that is predominantly outside the visible spectrum;
c. lamps for colour matching and that have a colour rendering index greater than 90 and a colour appearance approximating to a point on the black body locus;
d. lamps that are specifically for use in an industrial or agricultural process;
e. lamps for medical applications; or
f. lamps that have been given written exemption by the relevant regulatory authority on the grounds that they are for a specific purpose other than general illumination and are clearly distinguishable from lamps for general illumination.

1.4.1 MEPS Levels

When measured in accordance with AS/NZS 4782.1 the initial efficacy (at 100 hours) and the maintained efficacy (at 5000 hours) shall exceed the values specified in the table below. Lamps shall also have a Colour Rendering Index which exceeds the value in the table below.

Lamp nominal length L (mm) mandatory	550 ≤ L < 700	700 ≤ L < 1150	1150 ≤ L < 1350	1350 ≤ L < 1500
Lamp typical power (watts) (informative)	16 - 24	17 - 40	28 - 50	35 - 80
Initial efficacy / Maintained efficacy	$F_{100} \geq 66.0$ and $F_M \geq 57.5$	$F_{100} \geq 74.0$ and $F_M \geq 61.0$	$F_{100} \geq 80.0$ and $F_M \geq 70.0$	$F_{100} \geq 85.0$ and $F_M \geq 70.0$
Minimum CRI	79	79	79	79

The maximum quantity of mercury present in fluorescent lamps shall not exceed 15 mg. The quantity of mercury present is determined in accordance with the relevant Clauses of AS/NZS 4782.3.
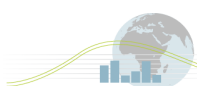
Section 2: Notes on Sales and efficacy of all lamps, total light output and sales by product type

2.1 Data Source

Data supplied by Beletich Associates on behalf of the Australian Government's Department of Climate Change. Annual sales values based on import data, a range of assumptions sought from industry, and extrapolation through modelling. Data supplier views the sales values provided as a robust representation of the market for all domestic (household) sector lamps[23].

The exception to the above statement are the sales values for double ended halogen lamps and Pin-based CFLs. These values have limited empirical support and are based on manufacturers estimations and modelling. However, sales of these lamp types are low and consequently have limited impact on the overall market.

2.2 Manipulations of Data Supplied

Sales data used as 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.

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[23] *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.*
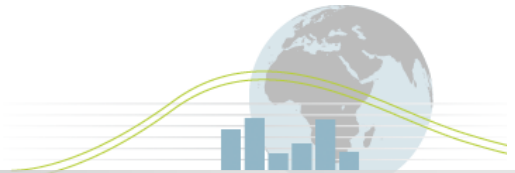
Lifetimes used for all calculations based on estimated average global lamp life for each lamp type and associated wattage range for 230V lamps.

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
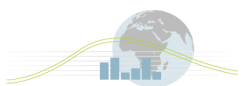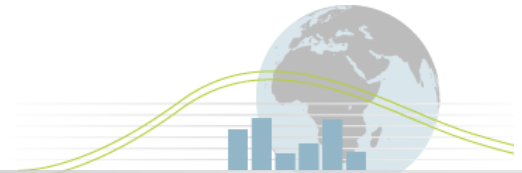
Section 3: Notes on Policy Interventions
No Additional Notes

Section 4: Notes on Cultural Issues
No additional Notes