BNCL03: Commercial Lighting Government Standards Evidence Base 2009: Policy Scenario

Version 1.1

This Briefing Note and referenced information is a public consultation document and will be used to inform Government decisions. The information and analysis forms part of the Evidence Base created by Defra's Market Transformation Programme.

1 Introduction

- The Policy Scenario is a projection of what would happen if a defined set of new product-specific and related cross-cutting policies were implemented. The policies in the Policy Scenario have not yet been agreed or funded but represent those policies which are expected to be introduced as well as likely future revisions to existing policies and, in some cases, novel policy options. These policies aim to improve the average efficiency of products in the stock through a variety of mechanisms (e.g. minimum standards, product information and labelling, procurement, incentives) and thus reduce energy consumption and carbon emissions resulting from to these products.

- As product policy is considered within the context of climate change policy, the UK government considers policies with a net UK costs of up to around £20 per tonne of CO_2 saved (compared to the Reference Scenario). The ambition level, at a minimum, matches the Least Life Cycle Cost (LLCC) level to society of increased energy efficiency of products.

- The costs for each policy, where known, are also included, separated out for government, consumer and industry.

- This GSBN covers lamps, ballasts and luminaires used in the commercial sector.

- Commercial lighting covers all internal and external lighting fixed to a building for all commercial (i.e. non domestic) premises including offices, retail units, hotels, public services buildings, industrial units and warehouses.

- The MTP Commercial Lighting models split out lamps by use. While the Non-Domestic Lighting Annexe in 'Product policy analysis and projections 2010' gives data for Commercial lighting at an aggregate level, this GSBN splits out data for each category of use. Lamps are categorised as follows:

  - **'Ambient' lighting**: lighting to give a mood similar to domestic lighting for instance in restaurants, hotels, bars etc.
    Lamps covered: GLS filament, CFL, SSL (solid state lighting - LED or OLED) alternatives for this type of lighting.

  - **'Office' lighting**: Linear fluorescent lighting for general illumination of offices and similar spaces.
    Lamps covered: T12, T5, T8 Hal_B2, T8 Hal_B1, T8 Tri_A, T8 Tri_B1, SSL alternatives for this type of lighting.

    The four categories of T8 equate to various levels of efficiency of lamp (Halophosphate vs Tri-phosphor) and ballast (electronic A, or magnetic B1 or B2); it has been assumed that there are no halophosphate lamps with electronic A class ballasts and no tri-phosphor lamps with magnetic B2 ballasts. All T12 lamps are assumed to be Hal_B2 until changed by the ErP measure on Tertiary Lighting; all T5 are assumed to be Tri_A.

  - **'Industrial' lighting**: High intensity discharge (HID) lighting for industrial, warehousing, retail shed and large scale leisure use.
    Lamps covered: High-pressure sodium, low pressure sodium, high-pressure mercury, metal halide (excluding compact types), SSL alternatives for this type of lighting.

  - **'Display' lighting**: Lamps for accent and display in retail, museums, galleries, offices.
    Lamps covered: Tungsten halogen, compact metal halide, SSL alternatives for this type of lighting.

    The category titles are illustrative only and it is not implied, for example, that all fluorescent lighting is used in offices or that all high-intensity discharge lighting is used in industrial settings.

2 Scenario outputs

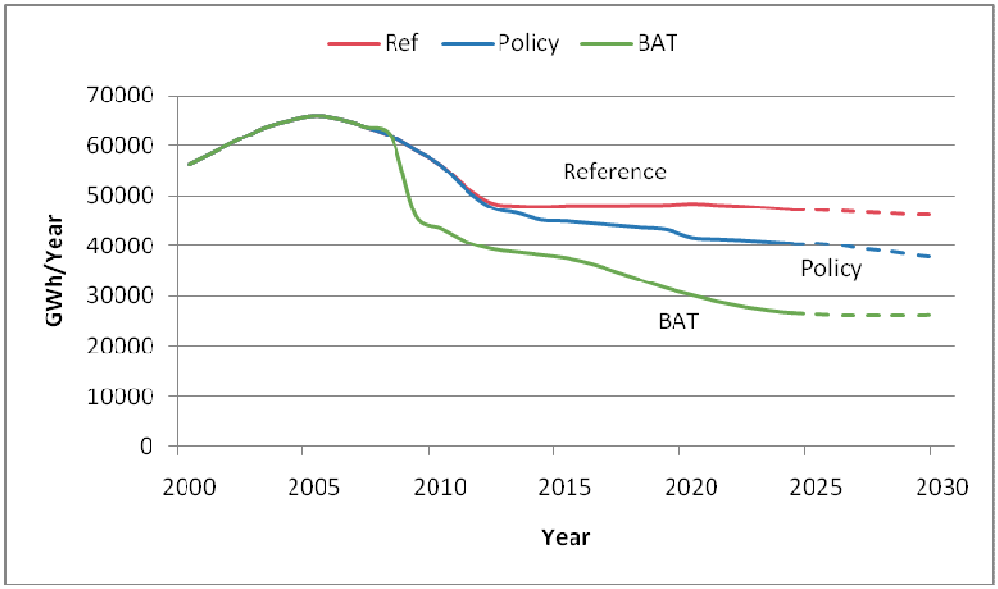

Figure 1: Commercial Lighting energy consumption, 3 scenarios

Table 1 Energy[1] and CO_2 emissions[2] summary data

Energy Consumption (GWh)	2009	2020	2030
Ambient lighting	8,120	3,320	3,480
Office lighting	37,090	32,370	27,980
Industrial lighting	5,070	4,510	4,720
Display lighting	8,750	1,430	1,440
Total	**59,010**	**41,620**	**37,630**

[1] Energy consumption figures for the non-domestic sector in 'Product policy analysis and projections 2010' were scaled down to match DECC projections for overall energy demand (www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx).

MTP data represents the best currently available information based on a bottom-up modelling approach. MTP's data is the basis for detailed energy calculations in 'Product policy analysis and projections 2010'. However, DECC projections indicate that overall energy demand in the non-domestic sector is lower than projected by MTP's detailed models. MTP has assumed that the differences between the DECC overall projections and its detailed bottom-up projections are due to incomplete data on the following inputs for some of its non-domestic products:

- existing product stock;
- existing product efficiency;
- product usage.

The energy consumption figures in these GSBNs have **not** been scaled down, in order to enable constructive stakeholder comment on the MTP input data, and therefore differ from the ones presented in 'Product policy analysis and projections 2010'.

[2] For CO_2 factors, please see MTP Briefing Note BNXS01 Carbon Dioxide Emission Factors for UK Energy Use

Energy Savings (GWh)	**2009**	**2020**	**2030**
Ambient lighting	0	0	0
Office lighting	0	0	1860
Industrial lighting	0	0	0
Display lighting	0	6770	6800
TOTAL	**0**	**6760**	**8670**
CO_2 Emissions ($MtCO_2$)	**2009**	**2020**	**2030**
Ambient lighting	2.85	1.19	1.24
Office lighting	13.02	11.57	10.00
Industrial lighting	1.78	1.61	1.69
Display lighting	3.07	0.51	0.52
TOTAL	**20.71**	**14.87**	**13.45**
CO_2 Emissions Savings ($MtCO_2$)	**2009**	**2020**	**2030**
Ambient lighting	0.00	0.00	0.00
Office lighting	0.00	0.00	0.67
Industrial lighting	0.00	0.00	0.00
Display lighting	0.00	2.42	2.43
TOTAL	**0.00**	**2.42**	**3.10**

Table 2 Summary of costs and benefits[3]

	Average annual energy savings (£m)	Average annual product & policy cost increases (£m)	Net Benefit (2009-2030) (£m)	Cost Effectiveness (traded) (£/tCO_2)
Commercial Lighting	397	111	4,346	-71.8

[3] Refer to BNXS26 'Rationale for Policy Cost Estimates in MTP Policy Briefs' for more details

Table 3 Government Standards

		% Sales across all Commercial Lighting					
	Average lumens/ watt	**≤17 lm/w**	**17 < lm/w ≤35**	**35 < lm/w ≤60**	**60 < lm/w ≤75**	**75 < lm/w ≤100**	**>100 lm/w:**
2009	55.8	40%	0%	14%	0%	35%	11%
2010	58.7	28%	13%	11%	0%	34%	14%
2011	65.9	13%	14%	27%	0%	29%	18%
2012	74.2	0%	16%	32%	0%	26%	27%
2013	75.6	0%	18%	24%	0%	26%	32%
2014	76.2	0%	16%	29%	0%	25%	30%
2015	77.3	0%	14%	30%	0%	28%	28%
2016	78.2	0%	14%	29%	0%	28%	29%
2017	78.7	0%	13%	29%	0%	28%	30%
2018	79.1	0%	13%	30%	0%	27%	30%
2019	80.1	0%	12%	30%	0%	27%	31%
2020	92.3	0%	0%	29%	0%	35%	36%
2021	91.6	0%	0%	33%	0%	28%	39%
2022	91.2	0%	0%	32%	0%	30%	38%
2023	92.7	0%	0%	33%	0%	27%	41%
2024	94.1	0%	0%	32%	0%	26%	42%
2025	94.9	0%	0%	32%	0%	25%	43%
2026	96.9	0%	0%	33%	0%	22%	45%
2027	99.4	0%	0%	33%	0%	20%	47%
2028	101.6	0%	0%	33%	0%	18%	48%
2029	103.8	0%	0%	33%	0%	17%	50%
2030	106.2	0%	0%	33%	0%	16%	51%

The performance levels and timings for each of the policy measures in the policy mix are given below.

- ECA Scheme
  - 2010: Incentives to install LEDs for general lighting
- Building Regulations (Part L) Revision (and equivalent in Scotland and Northern Ireland)
  - 2010: New overall standards for lighting in new and replacement installations
- ErP measure on Directional Lighting

- 2013: All mains halogen reflector lamp sales to equivalent of energy label C class; all low voltage halogen reflector lamp sales to equivalent of energy-label B class (i.e. infrared versions of the current lamps)

- Energy related Product (ErP) measure on Directional Lighting – Revision
  - 2020: All directional lamp sales to equivalent of energy-class A
- Energy related Product (ErP) measure on Tertiary Lighting - Revision
  - 2025: all fluorescent strip lighting replaced by LEDs
  -

3 Future potential policy & measures

Table 4 Future potential policies & measures, Policy Scenario

Policy name	Period in force	Description	Impact	Cost	Justification
ECA Scheme	2010 - 2012	ECAs are kept under review like all tax reliefs. Future revisions are a matter for HM Treasury and are made in light of developments in technologies on the market. Assumptions and estimates for the future of the ECA scheme for Commercial Lighting have been made by MTP experts based on their understanding of developments in technology, particularly regarding induction motors, permanent magnet motors and variable speed drives	Aligns with introduction of ErP measures. Stimulates the top end of the market post introduction of ErP.		

Policy name	Period in force	Description	Impact	Cost	Justification
Building Regulations; Part L (in England and Wales and equivalent in Scotland and Northern Ireland) Based on Proposed non-domestic building services compliance guide: 2010 edition	2010- 2015	Revisions to Building Regulations are expected in 2010. It is expected that minimum average initial efficacy will be set as follows: General lighting in office areas – 55 luminaire lumens/W for both existing and new buildings; General lighting in spaces other than office areas – 55 lamp lumens/W Display lighting – 22 lamp lumens/W	As presently modelled around 6% of the market affected. It is expected to primarily impact on display lighting and will probably have more impact than the ErP measure on Directional Lighting for non-domestic applications. MTP technical experts accept that the impact, as presently modelled may be too low, and this assumption will be reviewed in future modelling updates.	Average extra cost per fitting of £14 – some variability due to different lamp types being changed	This projection is based on 'Proposed non-domestic building services compliance guide: 2010 edition'. This document is being consulted upon by the Department of Communities & Local Government in 2009.
Energy related Product (ErP) measure on Directional Lighting	2010-2018	In the Commercial sector there is a potential impact on tungsten halogen lamps and the possibility of removing of R7 & G9 luminaires.	Up to 5.6% of the market affected. This policy is likely to overlap with the requirements of revised Building Regulations after 2010.	Extra cost of IR halogen lamp is £0.37 compared to ordinary halogen	Significant savings can be made with readily available new technology (infrared versions of halogen lamps)

Policy name	Period in force	Description	Impact	Cost	Justification
ErP measure on Tertiary Lighting - Revision	2018-2025	For commercial lighting it is assumed that luminaires for fluorescent strip lighting will be removed from the market by 2025.	67.7% of the market affected.	From 2025, assumed that extra cost of LED luminaire would be £14.24 compared to fluorescent equivalent	By 2020 it is expected that solid-state lighting will be both more efficient than fluorescent lighting and more cost effective. This policy revision proposal would drive the market towards best practice.
Energy related Product (ErP) measure on Directional Lighting - Revision	Post 2018	A revision of the measure is expected to require all directional lamps to be the equivalent of energy label A class efficiency by 2020. This assumes that some LED lamp equivalents will be developed in the next decade.	Up to 5.1% of the market affected; the non-domestic market may find it cost effective to move towards this technology quicker than, for example, the domestic market.	By 2020, extra cost of LED would be £0.80	By 2016 it is expected that solid-state lighting will be both more efficient than IR halogen lighting and cost effective. This policy revision proposal would drive the market towards best practice.
Policies contributing towards trends in the Policy scenario					
- Carbon Reduction Commitment - ELC/CELMA 'Lighting System Legislation' Initiative - Forward Commitment Procurement Model - Update of energy label		The impacts of these measures have not been quantified in the Policy Scenario, though it is understood that they are likely to contribute to the observed energy consumption pattern.			

Policy timeline

- The following policy timeline identifies when policies come into effect in the Policy Scenario, including expected future revisions

Policy name	Current specification in force	2009	2010	2011	2012	2013	2014	2015	2016-2020	2021-2025	2026-2030
ECA Scheme	2008; Kept under review										
Building Regulations (Part L) – Revision	2006		To enter into force								
ErP measure on Directional Lighting			Expected to enter into force[4]								
ErP measure on Directional Lighting - Revision									Revision expected		
ErP measure on Tertiary Lighting - Revision	2009								Revision expected		

[4] As at time of writing

4 Efficiency

4.1 Summary

- The base efficiency metric used in the Government standards is lamp luminous efficacy measured in lumens per watt. This is a measure of the amount of light emitted by the lamp (in lumens) for the amount of electrical power consumed (rated wattage in watts). The sales-weighted average efficacy of the total new lamp sales is presented.

- For simplicity the efficiency of the ballast (lamp control gear) is not accounted for in this metric although it has been fully accounted for in the model as a whole.

- The efficiency metrics quoted below correspond to values that are relevant to the average wattage of each lamp type. Lamp efficiency is dependent on wattage so efficiency of lamps of lower wattage than the mean wattage will be lower than the figures quoted and for lamps of higher wattage efficiency will be higher.

- In Tables 5-8 zero sales of some lamp types are expected in some years – these are shaded in the tables below.

Table 5 Ambient Lighting - Efficiency Metrics

	Average lumens/Watt			
	Sales weighted average	**CFL**	**GLS**	**SSL**
2007	18.4	60.0	11.0	48
2010	25.0	60.0	11.0	101
2020	60.0	60.0	11.0	163
2030	60.0	60.0	11.0	163

Table 6 Office Lighting - Efficiency Metrics

	Average lumens/watt							
	Sales weighted average	**T5**	**T8_Halophosphate_B2**	**T8_Halophosphate_B1**	**T8_Triphosphor_A**	**T8_Triphosphor_B1**	**T12**	**SSL**
2007	89.6	104.0	82.7	81.4	95.5	95.1	76.7	48
2010	97.5	104.2	82.7	81.4	95.7	94.7	76.7	101
2020	101.6	104.3	82.7	81.4	95.7	94.7	89.0	163
2030	134.2	104.3	82.7	81.4	95.7	94.8	89.0	163

Table7 Industrial Lighting - Efficiency Metrics

	Average lumens/watt					
	Sales weighted average	High Pressure Mercury	High Pressure Sodium	Low Pressure Sodium	Metal Halide	SSL
2007	87.2	54.6	100.0	154.8	82.6	48
2010	92.7	54.6	105.6	154.8	83.2	101
2020	106.3	54.6	122.5	154.8	95.4	163
2030	106.2	54.6	122.5	154.8	95.4	163

Table 8 Display Lighting - Efficiency Metrics[5]

	Average lumens/watt			
	Sales weighted average	Tungsten Halogen	Compact Metal Halide	SSL
2007	24.1	17.0	87.0	48
2010	27.2	17.5	86.1	101
2020	117.9	23.3	85.8	163
2030	108.6	23.3	85.8	163

[5] There is a 'spike' in the market average efficacy level between 2020-2030 caused by the assumptions used to split the lamp population between LED and Compact Metal Halides in the Policy scenario. These assumptions may be revised in future modelling updates.

Table 9 Average efficiency metric for Commercial Lighting based on distribution of sales

		% Sales across all Commercial Lighting					
	Average lumens/watt	≤17 lm/w	17 < lm/w ≤35	35 < lm/w ≤60	60 < lm/w ≤75	75 < lm/w ≤100	>100 lm/w:
2009	55.8	40%	0%	14%	0%	35%	11%
2010	58.7	28%	13%	11%	0%	34%	14%
2011	65.9	13%	14%	27%	0%	29%	18%
2012	74.2	0%	16%	32%	0%	26%	27%
2013	75.6	0%	18%	24%	0%	26%	32%
2014	76.2	0%	16%	29%	0%	25%	30%
2015	77.3	0%	14%	30%	0%	28%	28%
2016	78.2	0%	14%	29%	0%	28%	29%
2017	78.7	0%	13%	29%	0%	28%	30%
2018	79.1	0%	13%	30%	0%	27%	30%
2019	80.1	0%	12%	30%	0%	27%	31%
2020	92.3	0%	0%	29%	0%	35%	36%
2021	91.6	0%	0%	33%	0%	28%	39%
2022	91.2	0%	0%	32%	0%	30%	38%
2023	92.7	0%	0%	33%	0%	27%	41%
2024	94.1	0%	0%	32%	0%	26%	42%
2025	94.9	0%	0%	32%	0%	25%	43%
2026	96.9	0%	0%	33%	0%	22%	45%
2027	99.4	0%	0%	33%	0%	20%	47%
2028	101.6	0%	0%	33%	0%	18%	48%
2029	103.8	0%	0%	33%	0%	17%	50%
2030	106.2	0%	0%	33%	0%	16%	51%

Table 10 Average efficiency metric for Ambient Lighting based on distribution of sales

		% Sales across Ambient Commercial Lighting					
	Average lumens/watt	**≤17 lm/w**	**17 < lm/w ≤35**	**35 < lm/w ≤60**	**60 < lm/w ≤75**	**75 < lm/w ≤100**	**>100 lm/w:**
2009	27.6	66%	0%	34%	0%	0%	0%
2010	25.0	71%	0%	29%	0%	0%	0%
2011	44.3	32%	0%	68%	0%	0%	0%
2012 - 2030	60.0	0%	0%	100%	0%	0%	0%

Table 11 Average efficiency metric for Office Lighting based on distribution of sales

		% Sales across Office Commercial Lighting					
	Average lumens/watt	≤17 lm/w	17 < lm/w ≤35	35 < lm/w ≤60	60 < lm/w ≤75	75 < lm/w ≤100	>100 lm/w:
2009	93.0	0%	0%	0%	0%	75%	25%
2010	97.5	0%	0%	0%	0%	70%	30%
2011	98.5	0%	0%	0%	0%	59%	41%
2012	100.0	0%	0%	0%	0%	46%	54%
2013	100.5	0%	0%	0%	0%	40%	60%
2014	100.4	0%	0%	0%	0%	42%	58%
2015	100.1	0%	0%	0%	0%	47%	53%
2016	100.2	0%	0%	0%	0%	45%	55%
2017	100.4	0%	0%	0%	0%	44%	56%
2018	100.9	0%	0%	0%	0%	43%	57%
2019	101.2	0%	0%	0%	0%	43%	57%
2020	101.6	0%	0%	0%	0%	45%	55%
2021	108.1	0%	0%	0%	0%	34%	66%
2022	107.6	0%	0%	0%	0%	35%	65%
2023	109.4	0%	0%	0%	0%	32%	68%
2024	111.1	0%	0%	0%	0%	29%	71%
2025	112.0	0%	0%	0%	0%	29%	71%
2026	117.2	0%	0%	0%	0%	23%	77%
2027	122.3	0%	0%	0%	0%	19%	81%
2028	126.4	0%	0%	0%	0%	16%	84%
2029	130.3	0%	0%	0%	0%	14%	86%
2030	134.2	0%	0%	0%	0%	12%	88%

Table 12 Average efficiency metric for Industrial Lighting based on distribution of sales

		% Sales across Industrial Commercial Lighting					
	Average lumens/watt	≤17 lm/w	17 < lm/w ≤35	35 < lm/w ≤60	60 < lm/w ≤75	75 < lm/w ≤100	>100 lm/w:
2009	89.5	0%	0%	6%	0%	90%	4%
2010	92.7	0%	0%	4%	0%	84%	12%
2011	96.2	0%	0%	3%	0%	77%	21%
2012	100.8	0%	0%	2%	0%	61%	37%
2013	101.5	0%	0%	1%	0%	63%	36%
2014	102.3	0%	0%	1%	0%	63%	36%
2015	103.1	0%	0%	1%	0%	63%	36%
2016	104.6	0%	0%	0%	0%	65%	35%
2017	106.1	0%	0%	0%	0%	65%	35%
2018	106.1	0%	0%	0%	0%	65%	35%
2019	106.1	0%	0%	0%	0%	64%	36%
2020	106.3	0%	0%	0%	0%	64%	36%
2021	106.1	0%	0%	0%	0%	65%	35%
2022	106.0	0%	0%	0%	0%	65%	35%
2023	106.0	0%	0%	0%	0%	65%	35%
2024	106.0	0%	0%	0%	0%	65%	35%
2025	106.2	0%	0%	0%	0%	64%	36%
2026	106.0	0%	0%	0%	0%	65%	35%
2027	106.0	0%	0%	0%	0%	65%	35%
2028	106.0	0%	0%	0%	0%	65%	35%
2029	106.1	0%	0%	0%	0%	65%	35%
2030	106.2	0%	0%	0%	0%	64%	36%

Table 13 Average efficiency metric for Display Lighting based on distribution of sales[6]

		% Sales across Display Commercial Lighting					
	Average lumens/watt	≤17 lm/w	17 < lm/w ≤35	35 < lm/w ≤60	60 < lm/w ≤75	75 < lm/w ≤100	>100 lm/w:
2009	25.7	87%	0%	0%	0%	13%	0%
2010	27.2	0%	86%	0%	0%	12%	2%
2011	29.4	0%	84%	0%	0%	14%	2%
2012	31.3	0%	82%	0%	0%	15%	3%
2013	33.5	0%	80%	0%	0%	16%	4%
2014	39.1	0%	78%	0%	0%	18%	5%
2015	42.6	0%	75%	0%	0%	19%	6%
2016	44.7	0%	73%	0%	0%	21%	6%
2017	47.2	0%	70%	0%	0%	23%	7%
2018	49.8	0%	67%	0%	0%	24%	8%
2019	52.6	0%	65%	0%	0%	26%	9%
2020	117.9	0%	0%	0%	0%	58%	42%
2021	100.6	0%	0%	0%	0%	81%	19%
2022	99.1	0%	0%	0%	0%	83%	17%
2023	105.8	0%	0%	0%	0%	74%	26%
2024	107.4	0%	0%	0%	0%	72%	28%
2025	110.2	0%	0%	0%	0%	68%	32%
2026	106.3	0%	0%	0%	0%	74%	26%
2027	105.7	0%	0%	0%	0%	74%	26%
2028	106.3	0%	0%	0%	0%	73%	27%
2029	107.8	0%	0%	0%	0%	72%	28%
2030	108.6	0%	0%	0%	0%	70%	30%

[6] The 'spike' in the market average efficacy level between 2020-2030 is caused by the assumptions used to split the lamp population between LED and Compact Metal Halides in the Policy scenario. These assumptions may be revised in future modelling updates.

4.2 Data sources – efficiency

Table 14 Efficiency data sources

Year	Lamp Type	Reference	Reference date	Author	Justification	Confidence in sources (High/Low)
2009-2030	All	Various manufacturers catalogues	Various years	Various. e.g. Philips, SLI-Sylvania (Thorn), GE, Osram	Lumen and rated wattage values are published for each lamp type. These are used to produce efficiency data from stock and average wattage data.	High confidence in efficiency data. Less confidence in exact product mix year on year.
2009- 2030	All except SSL	UK Electricity and Light Data	1999	BRE Non-domestic energy efficiency model NDEEM	Lamp wattage spread given in survey. Survey results covered significant number of non-domestic installations in UK.	High (except T12, T8 lamps, Compact Metal Halide which is low)
2009- 2030	SSL	Technical expert opinion based on Multi-Year Program Plan FY'08-FY'13, Solid-State Lighting Research and Development, US DOE 2008	2008	Navigant Consulting et al for US Department Of Energy	Technical expert opinion, based on best available data	Low – projections of the ultimate efficiency of fast-developing technologies so far into the future are necessarily of low confidence

Note: Historic data sources are included in BNCL02: Commercial Lighting Government Standards Evidence Base 2009: Reference Scenario

4.3 Methodology & key assumptions – efficiency & sales weighting

- Methodology & key assumptions for historic data are included in BNCL02: Commercial Lighting Government Standards Evidence Base 2009: Reference Scenario

4.3.1 Future data

Table 15 Extrapolation & background calculations – efficiency

Year	Lamp Type	Methodology & assumptions
2009 - 2030	Ambient lighting, Industrial lighting	Unaffected by policy scenario assumptions. Many of these lamps are already positively influenced by Energy-related product policy in the Reference Scenario.
2009-2030	Office lighting	Efficiency of individual fluorescent lamp types unaffected. Percentage sales split post 2025 based on removal of all fluorescent luminaires from market. Lamp sales reduced by around 7% per annum as fittings are replaced by normal refurbishment cycle.
2011 - 2030	Display lighting	Tungsten halogen percentage sales split changed as lamp types are removed from the market. Zero sales of halogen lamps assumed from 2020 so efficiency of display lighting only impacted by compact metal halide and solid-state lighting after this date. US DOE estimates of SSL efficiency have been used.

4.4 Data issues – efficiency

Table 16 Data issues – efficiency

Issue/risk	Approach taken/rationale
Impacts and timing of these policies are the best estimates by technical expert and are subject to change	Best estimate of likely impacts used until more reliable information is available

4.5 Confidence level – efficiency

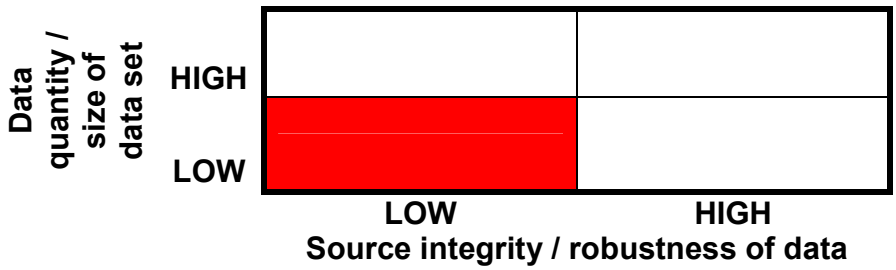

Figure 2 Confidence indicator for efficiency data

- Impacts based on MTP technical experts' opinion

5 Cost

5.1 Summary

All costs given in summary tables below are in current prices (£2009), and are not discounted.

The tables below show the marginal price difference between the higher efficiency lamps and luminaires which the specified policies below are assumed to encourage (replacement lamps), and the lower efficiency lamps and luminaires which they are replacing (original lamps). As not every policy affects every type of domestic lamp, only the cost data for the affected lamps are given below. Equally, as the policies will impact the market during different periods of time, data for a selection of representative years is given for each policy.

Policy 1: Energy related Product (ErP) measure on Tertiary Lighting- Revision

	Original fitting	**Replacement fitting**	
Energy class / £ excluding VAT	**T5 or T8 luminaire**	**SSL luminaire**	**Price Difference**
2020	NA	NA	NA
2030	£80/ £70	£90	£14.10 sales weighted

Policy 2: Energy related Product (ErP) measure on Directional Lighting[7]

	Original lamp	**Replacement lamp**	
Energy class / £ excluding VAT	**Mains halogen reflector**	**Mains halogen with infrared coating**	**Price Difference**
2009	NA	NA	NA

[7] The model assumes that the Directional ErP Implementing Measure will be introduced in 2013. As these lamps are short-lived and used for long hours all the original lamps would be replaced within 2013.

	Original lamp	Replacement lamp	
Energy class / £ excluding VAT	**Mains halogen reflector**	**Mains halogen with infrared coating**	**Price Difference**
2013	£1.62	£2.49	£0.87
2015	NA	NA	NA

Policy 3: Energy related Product (ErP) measure on Directional Lighting - Revision

	Original lamp	Replacement lamp	
Energy class / £ excluding VAT	**Mains halogen with infrared coating**	**Solid-state directional lamp**	**Price Difference**
2015	NA	NA	NA
2020	£1.62[8]	£2.49	£0.87
2030	NA	NA	NA

Policy 4: Enhanced Capital Allowance Scheme

	Original	Replacement	
Energy class / £ excluding VAT	**Average non-compliant luminaire**	**Average compliant luminaire**	**Price Difference**
2009 - 2030	£81	£111	£30

[8] It is assumed that the cost of an IR halogen lamp will have reduced between 2013 and 2020 but, in the absence of further evidence, cost reductions are not assumed thereafter. Most lamps would be replaced in 2020 or 2021.

Policy 5: Building Regulations (Part L) - Revision

	Original lamp	Replacement lamp	
Energy class / £ excluding VAT	**Mains reflector tungsten halogen**	**Compact metal halide**	**Price Difference**
2009	NA	NA	NA
2010-2030	£1.92	£16.02	£14.10

5.2 Data sources – cost

Table 17 Cost data sources

Year	Lamp Type	Reference	Reference date	Author	Justification	Confidence in sources (High/Low)
2009	Tungsten halogen, Display SSL	www.litebulbs.co.uk	March 2009	Litebulbs.co.uk	Typical of prices on market (2009)	Low – costs vary across suppliers and with number of lamps purchased
2010 - 2030	Infrared Halogen technologies and LED prices	Expert assumption	March 2009	MTP Technical Expert	Assumed prices of new infrared technology will reduce with sales volume to a level slightly higher than old technology price by the time the relevant policy comes into force. After this time, a constant price differential is assumed, in the absence of further evidence	Low – although similar trends have been observed with other new technologies, the detail of the downward trend is an estimate.

Year	Lamp Type	Reference	Reference date	Author	Justification	Confidence in sources (High/Low)
2009-2030	Fluorescent luminaire cost data	Based on data from confidential industry source.	2009	MTP Technical Expert based on fluorescent luminaire price data from confidential industry source.	Technical expert has assumed that a £10 price premium for solid-state lighting over current top price would be acceptable to the market	Low – although similar trends have been observed with other new technologies, the price premium for solid-state lighting is an estimate.

5.3 Methodology & key assumptions – cost

5.3.1 Future analysis

Table 18 Extrapolation & background calculations – cost

Year	Methodology & assumptions
2010 - 2020	Tungsten Halogen directional lamps affected by Policy scenario in this period: S-shaped trend line used for halogen lamps with linear portion showing £0.50 year on year price reduction per lamp. Lower reductions assumed for first two years as the technology is new and is not yet 'required' by future legislation. Final price shows increase of about 20% over current technology as the manufacturing costs are higher. Final price differential for halogen replacements for GLS is much higher (+60%) as the lamp manufacture is more complex.
2020-2030	. Once the relevant policy comes into force, the price differential between old and replacement lamp types are assumed to be constant in the absence of other evidence at this time.
2009-2030	Where the enhanced lamp or luminaire types are existing technology, current price premiums have been used. Internet prices of lamps have been used as an indicator of maximum price premiums expected for new lamps. Bulk purchases may allow commercial users to purchase enhanced lamps at lower price premiums.

5.4 Data issues – cost

Table 19 Data issues – cost

Issue/risk	Approach taken/rationale
Predicted price of new technology lamps (e.g. directional SSL or infrared halogen) may be too low	Most lamp types have reduced in price with time as the market matures. The longer lifetime of the newer, more efficient lamps may help to hold their price higher.
Solid-state lighting technology may allow the development of completely new forms of lighting solution that would be very difficult to quantify in the simple manner used in this analysis.	MTP expert has taken a simple approach similar to historical transformations to make a first estimate of 'acceptable' costs for market transformations of this type.
Once the relevant policy comes into force it is assumed that the cost differential between technologies remains the same; whereas in reality it is probable that as the market size for the higher efficiency lamps and luminaires increases, the cost of new technology will decrease.	There was no evidence available on what the reduction of cost would be so a conservative approach of a constant price differential was adopted.

5.5 Confidence level – cost

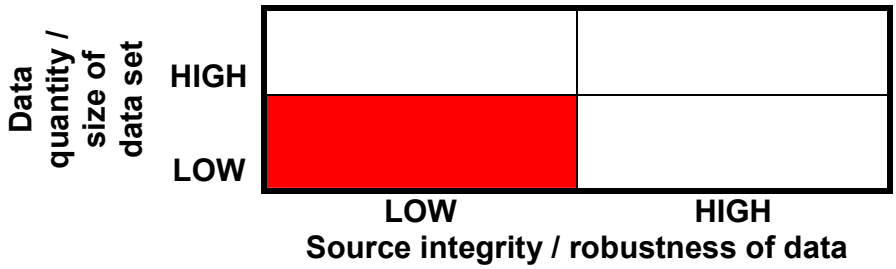

Figure 3 Confidence indicator for cost data

- The cost of each lamp varies from supplier to supplier so an indicative price, and price projection, has been chosen by the MTP technical expert.

6 Other issues

- There are recognised health impacts that can result from the use of CFLs for people with pre-existing light-sensitive disorders, estimated as affecting an absolute maximum of 0.05% of the population, and those with some specific visual impairments. These have been taken into account when future sales/stock of each lamp type used was estimated. Alternative light sources (e.g. efficient halogens and UV filtered fluorescent tubes) remain available.

- Solid-state lighting is a new and rapidly developing technology so estimates about when particular lamp replacements will be available and cost-effective are uncertain.

Related MTP information

- BNCL01: Commercial Lighting Government Standards Evidence Base 2009: Key Inputs
- BNCL02: Commercial Lighting Government Standards Evidence Base 2009: Reference Scenario
- BNCL04: Commercial Lighting Government Standards Evidence Base 2009: Best Available Technology Scenario
- BNCL KO01: Commercial Lighting Government Standards Evidence Base 2009: Key Outputs

Changes from Version 1.0

- Data tables updated since Commercial Lighting was re-modelled in early 2010, following stakeholder feedback on the 'Saving Energy Through Better Products and Appliances' document. As a result of this feedback, higher usage hours and lower stock data for all sectors have been used as inputs in the models.
- Minor changes to GSBN template.

Consultation and further information

Stakeholders are encouraged to review this document and provide suggestions that may improve the quality of information provided, email **info@mtprog.com** quoting the document reference, or call the MTP enquiry line on +44 (0) 845 600 8951.

For further information on related issues visit **http://efficient-products.defra.gov.uk**