

Regulatory Guidelines for an Effective Transition to Energy Efficient Lighting

General Service LED and Linear LED Lamps

Intro Presentation for external use

Jan 2022



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The Global Voice of the Lighting Industry

An Association of Associations, representing:

- 9 National and Regional Associations
- Over 5000 lighting manufacturers

Abilux
Associação Brasileira da Indústria de Iluminação



JLMA
Japan Lighting Manufacturers Association



LIGHTINGEUROPE
THE VOICE OF THE LIGHTING INDUSTRY

Lighting Council NEW ZEALAND™

**Middle East
Lighting
Association**

NEMA
National Electrical Manufacturers Association



GLA Focus Areas:

Lighting + well-being

Lighting + healthy buildings

Fewer rules + enforced



Transitioning to Energy Efficient Lighting

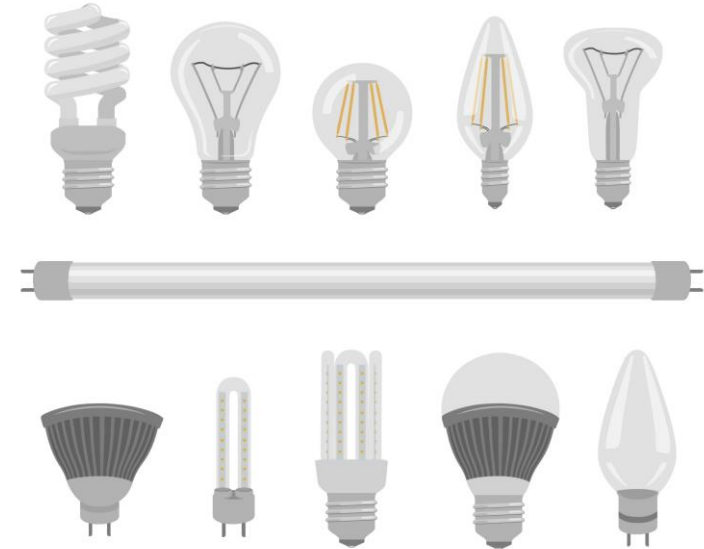
- Climate change is the driving force behind many sustainability programs worldwide.
- Transitioning from conventional to energy efficient lighting is an important option for governments to reduce their CO₂ emissions in a cost-effective way.
- Many governments in Europe, Japan, North America and Australia have accelerated this transition through legislation
- Many emerging economies and developing countries are still at the beginning of this journey



<https://unsplash.com/s/photos/climate-change>

GLA Lighting Regulations perspective

- Several international organisations are involved in developing, or promoting regulatory frameworks to help emerging economies transition to LEDs
- Some are promoting overly-ambitious targets and tiered levels of requirements, resulting in high levels of complexity
- The GLA perspective is that complexity and high energy efficiency levels do not take the adaptive capacity of these countries into account, nor the affordability for consumers
- Their content often overlaps and conflicts with other international regulations on subjects such as safety, substances, photobiological risk groups etc.



There is a need for simple Regulatory Guidelines

The need for simple Regulatory Guidelines

Setting the bar too high leads to:

- Over-stringent regulations, resulting in lamps that are more expensive for the ordinary consumer and a ban of old technologies, encouraging hoarding behaviour and grey imports, delaying the uptake of new technology

Complexity and over-ambitious rules can lead to:

- Up to 4 tiers of energy efficiency levels with high lm/W requirements & 12 different functional parameters, making LED lamps that qualify expensive
- Lengthy testing requirements that are difficult to verify, leading to a high risk they will not be implemented by all
- Problems in countries without test facilities and no experience of enforcement
- A bottleneck delaying the whole transition



Functional Performance Reqs.

1. Colour Rendering Index
2. Max Chromaticity tolerance limits
3. Max Colour maintenance shift
4. Lum intensity distribution omni/beam
5. Min rated life
6. Min Lumen maintenance
7. Max early failure rates
8. Short term flicker perceptibility
9. Max stroboscopic effect values
10. Max photobiological risk group
11. Warranty duration requirements
12. Recyclability requirements
13. Replaceability requirements

4.2 Minimum Energy Performance Standard (MEPS)

Each tubular fluorescent lamp shall meet the requirements in Table 1 for initial efficacy (F_{100}), maintained efficacy (F_M) and minimum CRI.

F_M may be calculated from test data measured at more or less than 5 000 h as follows:

- a) Where lumen data is not available for 5 000 h, any unadjusted single measurement at more than 5 000 h may be used to confirm the F_M requirements.
- b) Where a lumen measurement is available for over 2 000 h but less than 5 000 h, F_M may be calculated as follows:
 - (i) by linear extrapolation from the F_{100} value through the measured data point to 5 000 h; or
 - (ii) by linear interpolation between a point in the range of 2 000 h to 5000 h and second point in the range 5 000 h to 8 000 h.
- c) Where a lumen measurement is available for over 5 000 h but less than 8 000 h, F_M may be calculated by linear interpolation between a point in the range of 2 000 h to 5 000 h and second point in the range 5 000 h to 8000 h.

Table 1 — Lamp efficacy requirements

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, $F_{100} ≥ 66.0$ and $F_M ≥ 57.5$	$F_{100} ≥ 66.0$ and $F_M ≥ 61.0$	$F_{100} ≥ 74.0$ and $F_M ≥ 70.0$	$F_{100} ≥ 80.0$ and $F_M ≥ 70.0$	$F_{100} ≥ 85.0$ and $F_M ≥ 70.0$
Maintained efficacy	79	79	79	79
Minimum CRI	79	79	79	79

Simplicity prevails!

The need for simple Regulatory Guidelines

Regulations with a scope that is too broad:

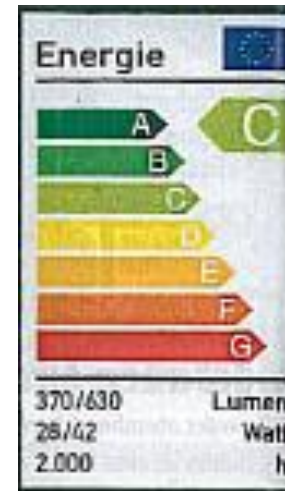
- Dilute the focus on energy efficiency
- Slow down the transition to LED
- Can overlap and conflict with other international standards on subjects like safety, EMC requirements, substances etc.



In the absence of an enforcement framework:

- Misleading claims on lamp performance, or local certification go undetected
- 'Golden samples' used for initial certification to show that products meet local regulations, can be substituted for inferior unsafe products with lower specs and prices on arrival, due to a lack of verification

Legislation that cannot be enforced has no impact



The reason for GLA Regulatory Guidelines

- GLA firmly believes that **simple, practical, balanced**, and **well enforced** regulations are the only feasible path to implement a fast transition to energy efficient LED lighting in developing countries
- There is a real, currently unmet, need for simpler regulatory guidelines that are easy and fast to implement
- GLA has therefore released its own set of Regulatory Guidelines for general service and linear LED lamps, which are easy to implement and enforce.
- These rules are based on decades of lighting industry insights and consumer/professional market experience



A simple, practical, balanced approach
Easy to verify and enforce

GLA Regulatory Guidelines

Enabling a fast, effective transition to energy efficient lighting

- Aimed at regulatory authorities in developing and emerging economies, considering national legislation and associated regulations to accelerate the transition to energy efficient lighting
 - not intended for governments that already have effective lighting regulations & policy processes for energy efficient lighting products
- Designed to drive energy savings, enabling affordability and effective market enforcement, to protect consumers and encourage fair competition
- A simple, practical and balanced approach, based on GLA members' decades of experience in consumer and professional lighting markets
- Only 7 essential requirements to be regulated, covering the key elements needed for a smooth transition to energy efficient lighting of assured product quality



A simple, practical, balanced approach!

Contents GLA Regulatory Guidelines

GLA Regulatory Guidelines include all the key elements needed for regulations: definitions, scope, performance requirements, information requirements, applicable test methods and compliance criteria:

- Energy efficiency and basic functional performance requirements to assure product (light) quality and robustness
- Product information reporting and labelling requirements for consumers to make informed choices
- How to demonstrate compliance with requirements and set up market surveillance and enforcement

The above parameters have been carefully chosen to place maximum focus on speeding up the market transition to energy efficient LED lighting

A simple, practical, balanced approach!

GLA Regulatory Guidelines

Enabling a fast, effective transition to LED lighting

A recommended set of guidelines:

- based on international IEC, ISO, CIE standards
- Internationally agreed limits and compliance criteria
- Only 7 requirements to be regulated

A starting point for use by regulatory authorities:

- in developing and emerging economies, considering national legislation & regs for energy-efficient LED lamps
- or those that have a legislative framework but have not yet developed regulations for energy-efficient LED lamps
 - not intended for governments that already have effective lighting regulations & policy processes for energy efficient lighting products

Promoting easy implementation and stimulating affordable and effective market enforcement, protecting consumers & encouraging fair competition

GLA Regulatory Guidelines: Gen. Service/Linear LED Lamps

Energy Efficiency Requirements

1. Luminous efficacy
2. Standby power
3. Fundamental power factor

Functional Performance Reqs.

4. Colour rendering index
5. 1000-hour early failure test
6. Short term flicker perceptibility

7. Information obligation only

- Rated power
- Rated initial luminous flux
- Colour temperature
- Dimmability statement
- Exempted products mark

GLA Regulatory Guidelines

Scope: General Service LED & Linear LED Lamps

General Service LED Lamps

- All types, shapes and finishes in incandescent, halogen, fluorescent and LED technologies
- one or more input voltages of alternating current, between 50 and 300 V, & 50 Hz or 60 Hz frequency
- Screw base types: E10, E11, E12, E14, E17, E26 or E27
- Bayonet base types: B15d or B22d
- Pin base types: GU10 or GZ10
- or other base types connectable to above lamp base sockets, with commercially available passive adaptors



Main Exclusions

GSL Lamps <60 Lm & > 3300 Lm
Lamps where primary purpose is not illumination
For full list, see the document

Linear LED lamps

- Double capped linear LED lamps of all sizes
- Connected directly to a power supply, or using electromagnetic control gear
- With G5, G13, Fa6, Fa8, R17d
- or alternative base types connectable to these bases with commercially available passive adaptors

Main Exclusions

LED lamps < 400 Lm
Linear HF ballast compatible LED lamps
Lamps where primary purpose is not illumination
For full list, see the document



GSL LED Lamps Recommendations

Energy Efficiency, Standby Power & Power Factor



Luminous Efficacy

Rated luminous flux (lm)	Lum efficacy η_{base} (lm/W)
$60 \leq \Phi_v < 600$	70
$600 \leq \Phi_v < 1200$	80
$1200 \leq \Phi_v \leq 3300$	90

Depending on lamp characteristics, the required luminous efficacy values shall be adjusted by the following correction factors (C):

Lamp characteristics	Correction factor	C
Directional lamps	C1	0,15
Tuneable lamps	C2	
-Tuneable-white lamps		0,1
-Colour-tuneable lamps		0,2
CRI ≥ 90 Ra	C3	0,1

Where applicable, the correction factors are additive as follows:

$$\eta_{corrected} = \eta_{base} (1 - (C1 + C2 + C3))$$

Standby Power

Limit: $\leq 0.5W$

This requirement applies to LED lamps awaiting a remotely initiated trigger to return to a state with light emission. Non-lighting parts are switched off, or their power consumption is minimized, following manufacturer's instructions

Fundamental Power Factor

(Also called Displacement Factor or $\cos \phi_1$)

Rated Input Power P in W	Fundamental power factor
$P \leq 2W$	Not applicable
$2W < P \leq 5W$	≥ 0.4
$5W < P \leq 25W$	≥ 0.7
$P > 25W$	≥ 0.9

Linear LED Lamps Recommendations

Energy Efficiency, Standby Power & Power Factor



Luminous Efficacy

Limit: ≥ 100 lm/W

Depending on lamp characteristics, the required luminous efficacy values shall be adjusted by the following correction factors (C):

Lamp characteristics	Correction factor	C
Tuneable Lamps	C1	
-Tuneable-white lamps		0,1
-Colour-tuneable lamps		0,2
CRI ≥ 90 Ra	C2	0,1
CCT ≤ 3500 K	C3	0,1

Where applicable, the correction factors are additive as follows:

$$\eta_{\text{corrected}} = \eta_{\text{base}} (1 - (C1 + C2 + C3))$$

Standby Power

Limit: ≤ 0.5 W

This requirement applies to LED lamps awaiting a remotely initiated trigger to return to a state with light emission. Non-lighting parts are switched off, or their power consumption is minimized, following manufacturer's instructions

Fundamental Power Factor

(Also called Displacement Factor or $\text{Cos } \phi_1$)

This requirement only applies to linear LED lamps directly connected to an electrical supply.

Rated Input Power P in W	Fundamental power factor
$P \leq 2$ W	Not applicable
2 W $< P \leq 5$ W	≥ 0.4
5 W $< P \leq 25$ W	≥ 0.7
$P > 25$ W	≥ 0.9

Functional Performance Recommendations

General Service and Linear LED lamps

Phenomena	Level
Colour Rendering Index CRI	<p>≥ 80 Ra</p> <p>Not applicable for LED lamps designed, marketed and labelled exclusively for outdoor and industrial applications or other applications where a CRI-Ra < 80 is allowed</p>
1000 hour early failure test	<p>LED lamps must operate for 150 min on and 30 minutes off for 400 cycles</p>
Short term flicker perceptibility* (PstLM)	<p>≤ 1.0 at full load and a sinusoidal input voltage</p>



* General service LED lamps & Linear LED lamps directly connected to electrical supply

No mercury requirement, as there is none in LED lamps
GLA Regulatory Guidelines are for LED lamps only

Product Info Recommendations

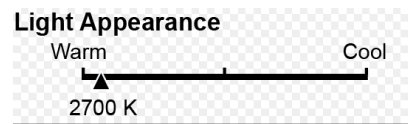
General Service and Linear LED lamps



Required on packaging and other product info

General Service LED lamps

- Rated power in Watts
- Rated initial luminous flux in lumens
- Rated efficacy in lumens per Watt (lm/W)
- Statement on whether it is dimmable or not, and if so, info on dimmer compatibility
- Rated correlated colour temperature (CCT) in Kelvin with a sliding scale*:



*does not apply for tuneable-white lamps or colour-tuneable lamps

Linear LED lamps

- Rated power in Watts
- Rated initial luminous flux in lumens
- Rated correlated colour temperature (CCT) in Kelvin

Optional GSL lumen equivalency statement

- For packaging or marcom material gen. service lamps
- Incandescent wattage equivalency [W] – shall be ranked according to the table below, showing minimum initial luminous flux required to claim a specific incandescent lamp wattage equivalency

Incandescent wattage equivalency in W	Minimum initial luminous flux in lm	
	230V mains power	120V mains power
15	120	150
25	200	250
40	400	450
60	700	800
75	950	1100
100	1400	1600
150	2200	2500
200	3000	3400

Market Surveillance

GLA Regulatory Guidelines:

- The local regulator sets up a program to check for product compliance and market monitoring for non-compliance
- This should include a challenge process for non-conformities
- Various suggestions of how to organise this effectively
- Communication processes with manufacturers & importers, possible imposition of fines and bans
- Market surveillance programs to be evenly applied between imported and locally produced products
- An example market surveillance procedure is given

Annex C

Example market surveillance procedure

In the context of verifying compliance of a product model with the requirements laid down in clause 3, the government authorities may apply the following procedure:

- 1) The government authorities shall validate a sample of the same model from the same manufacturer, randomly selected.
- 2) The model shall be considered to comply with the applicable requirements:
 - a) if the values in the test report, and where appropriate the values used to establish those values that are calculated, are not more favourable for the manufacturer or importer than the respective results of the measurements; and
 - b) if, when government authorities test the sample of models, all measured average parameters and the values calculated from these measurement(s) are within the respective verification tolerances of clause 3.
- 3) If the results referred to in points 2) a) and 2) b) are not achieved, the model shall be considered not to comply with this regulation.
- 4) If a decision of non-compliance is taken according to point 2) against a manufacturer or importer, the government authority may inform other government authorities in the region within one month of the decision being taken to help protect against the widespread sale of the same model.

Government authorities shall use the measurement and calculation methods set out in clause 3.

Government authorities shall only apply those verification tolerances set out in clause 3 of this regulation, and the procedure described in this Annex, points 1 through 4. No other tolerances, such as those set out in harmonised standards or in any other measurement method, shall be applied.

For more information

The Global Voice of the Lighting Industry

The Global Lighting Association is a grouping of national and regional lighting associations representing over 5,000 lighting manufacturers and US \$75 billion annual sales

<https://www.globallightingassociation.org/>