



UNEP
GLOBAL
MERCURY
PARTNERSHIP

Thursday 31 August 2023
14:45 – 16:30 CEST

Transitioning to mercury-free lighting

Virtual event

In collaboration with the Clean Lighting Coalition and the Zero Mercury Working Group with the support of the Government of Switzerland



Agenda

The session will be moderated by **Thomas Groeneveld**, U.S. Environmental Protection Agency, Co-lead of the Partnership Area on Mercury in Products

2:45 pm: Welcoming and Opening remarks and scene-setting

- **Rodges Ankrah**, Environmental Protection Agency of the United States, Chair of the Partnership Advisory Group

2:55 pm: Africa region on the COP5 Lighting amendment

- **Christopher Kanema**, Environmental Management Agency, Zambia

3:10 pm: Pathways to Compliance - case studies on:

- Updates on the EU Restriction of Hazardous Substances in Electrical and Electronic Equipment (RoHS) Directive, **Peter Bennich**, Swedish Energy Agency
- The transition to clean lighting through Minimum Energy Performance Standards (MEPS), **Marcelo Padillan**, Ministry of Energy, Chile
- A snapshot on India lighting market today, **Kishore Kumar**, CLASP India

3:30 pm: Global market assessment report

- **Ana Maria Carreno**, Director, CLASP/Clean Lighting Coalition

3:40 pm: Technical feasibility of LEDs – compatibility and safety

- **Steve Coyne**, Director, Light Naturally

3:50 pm: Waste Management Challenges of end-of-life fluorescent lamps

- **Michael Bender**, Co-founder, Mercury Policy Project, Co-lead of the Partnership Area on Mercury in Products

4:00 pm: Q&A Session

4:30 pm: Closure

COP-5 African Lighting Amendment Video: Farewell to Fluorescents





The African Region's Lighting Amendment to the Minamata Convention on Mercury, Fifth Conference of the Parties (COP5)

Christopher Kanema

Principal Inspector and Head of Pesticides and Toxic Substances, Zambia
Environmental Management Agency

31 August 2023

Why is Africa proposing a New Lighting Amendment for COP5?

- 1. Countries can build on the mercury-free lighting momentum following the COP4 lighting proposal by supporting the phase out all remaining categories of mercury-containing fluorescent lamps** at COP-5. Such a decision will fulfil the renewed goal of expanding and strengthening efforts against toxic mercury pollution globally.
- 2. There are cost-effective mercury-free alternatives readily available for all fluorescent lighting applications**, enabling countries to avoid the unnecessary risk of exposure to toxic mercury. A transition to this mercury-free technology will protect consumers and workers when lamps break in homes, offices, schools, and businesses, and reduce the amount of mercury contamination at waste sites due to improper disposal
- 3. The COP5 Lighting amendment will help to prevent developing countries from becoming dumping grounds for mercury-containing lamps that can NO longer be placed on the domestic market** of the manufacturer and are thereby exported to less regulated markets. A global phase out of fluorescent lamps ensures an equitable transition to LEDs.
- 4. Fluorescent recycling is an ineffective, expensive and dangerous process.** The easiest way to eliminate this source of toxic mercury contamination is to stop installing fluorescent lighting in our offices and homes. Halting the manufacture, import and export of fluorescents eliminates mercury pollution at the source, protecting public and environmental health.
- 5. Each year fluorescent phase-out dates are delayed results in lost mercury, financial, and energy savings.** According to experts: If the Convention adopts a 2027 phase-out date (one-year delay), compared to 2026, the mercury savings would be reduced by 18 metric tonnes. In turn, the world would be burdened with \$109 billion more in electricity bills and 300 million metric tonnes of carbon dioxide will be released to the atmosphere.

Completing Coverage of Fluorescent Lamps at COP5 (slide 1 of 2)

Fluorescent Lamps – all **Compact Fluorescent Lamps**

Fluorescent Lamp	Mercury Content	Wattage	Phase-Out	Status
CFL (both .i & .ni)	> 5mg	≤ 30 Watts	2020	Complete, 2013
CFL.i	≤ 5mg	≤ 30 Watts	2025	Complete, COP4.2
CFL.ni	≤ 5mg	≤ 30 Watts		COP5
CFL (both .i & .ni)		>30 Watts		COP5



CFL.i – integral ballast
(screw or bayonet base)



CFL.ni – non-integral ballast (pin-based)

Completing Coverage of Fluorescent Lamps at COP5 (slide 2 of 2)

Fluorescent Lamps – both **Linear** and **Non-Linear**

Lamp Type	Mercury Content	Wattage	Phase-Out	Status
LFL Triband	> 5mg	< 60 Watts	2020	Complete, 2013
LFL Triband	≤ 5mg	< 60 Watts	[2027] [2030]	COP5
LFL Triband		≥ 60 Watts		COP5
LFL Halophosphate	> 10mg	≤ 40 Watts	2020	Complete, 2013
LFL Halophosphate	≤ 10mg	≤ 40 Watts	[2025] [2027] [2030]	COP5
LFL Halophosphate		> 40 Watts	[2025] [2027] [2030]	COP5
Non-Linear FL		All		COP5



Draft African Lighting Proposal for COP5

Part I: Products subject to Article 4, paragraph 1

Mercury-added products	Date after which the manufacture, import or export of the product shall not be allowed (phase-out date)
Compact fluorescent lamps (CFLs) for general lighting purposes that are > 30 watts	2025
Compact fluorescent lamps with a non-integrated ballast (CFL.ni) for general lighting purposes that are \leq 30 watts with a mercury content not exceeding 5 mg per lamp burner	2025
Linear fluorescent lamps (LFLs) for general lighting purposes: (a) Triband phosphor \geq 60 watts	2026
Non-linear fluorescent lamps (NFLs) (e.g., U-bend and circular) for general lighting purposes, all phosphors and wattages	2026

Make Mercury History.... Complete Coverage of Fluorescent

Compact Fluorescent Lamps	Compact Fluorescent Lamps (CFLS) ≤ 30 Watts and > 5 mg Hg		CFLs > 30 Watts (high wattage CFLs, includes both CFL.i and CFL.ni)
	Integrally Ballasted (CFL.i) ≤ 30 Watts and ≤ 5 mg Hg	Non-integrally Ballasted (CFL.ni) < 30 Watts and ≤ 5 mg Hg	
Fluorescent Lamps	Linear fluorescent, triband phosphor < 60 Watts and > 5 mg Hg		Linear fluorescent, triband phosphor, ≥ 60 watts
	Linear fluorescent, triband phosphor < 60 Watts and ≤ 5 mg Hg		
	Linear fluorescent, halophosphate ≤ 40 Watts and > 10 mg Hg		Linear fluorescent, halophosphate, > 40 watts
	Linear fluorescent, halophosphate ≤ 40 Watts and ≤ 10 mg Hg		
	Non-linear Fluorescent (U-bend, circular), all phosphors and all wattages		
CCFL / EEFL	Lamps of short, medium and long length for displays with various mercury content		CCFL and EEFL not included in the original scope of coverage

Key:

	From original Annex A table (Minamata Convention Text, 2013)
	African Amendment adopted in Bali at COP4 in 2022

	African/EU Amendments, not completed at COP4, continued at COP5
	New (draft) African Amendment for COP5

THANK YOU!



Updates on the EU phasing out of fluorescent lighting

Transitioning to Mercury-Free Lighting

Global Mercury Partnership webinar

2023-08-31

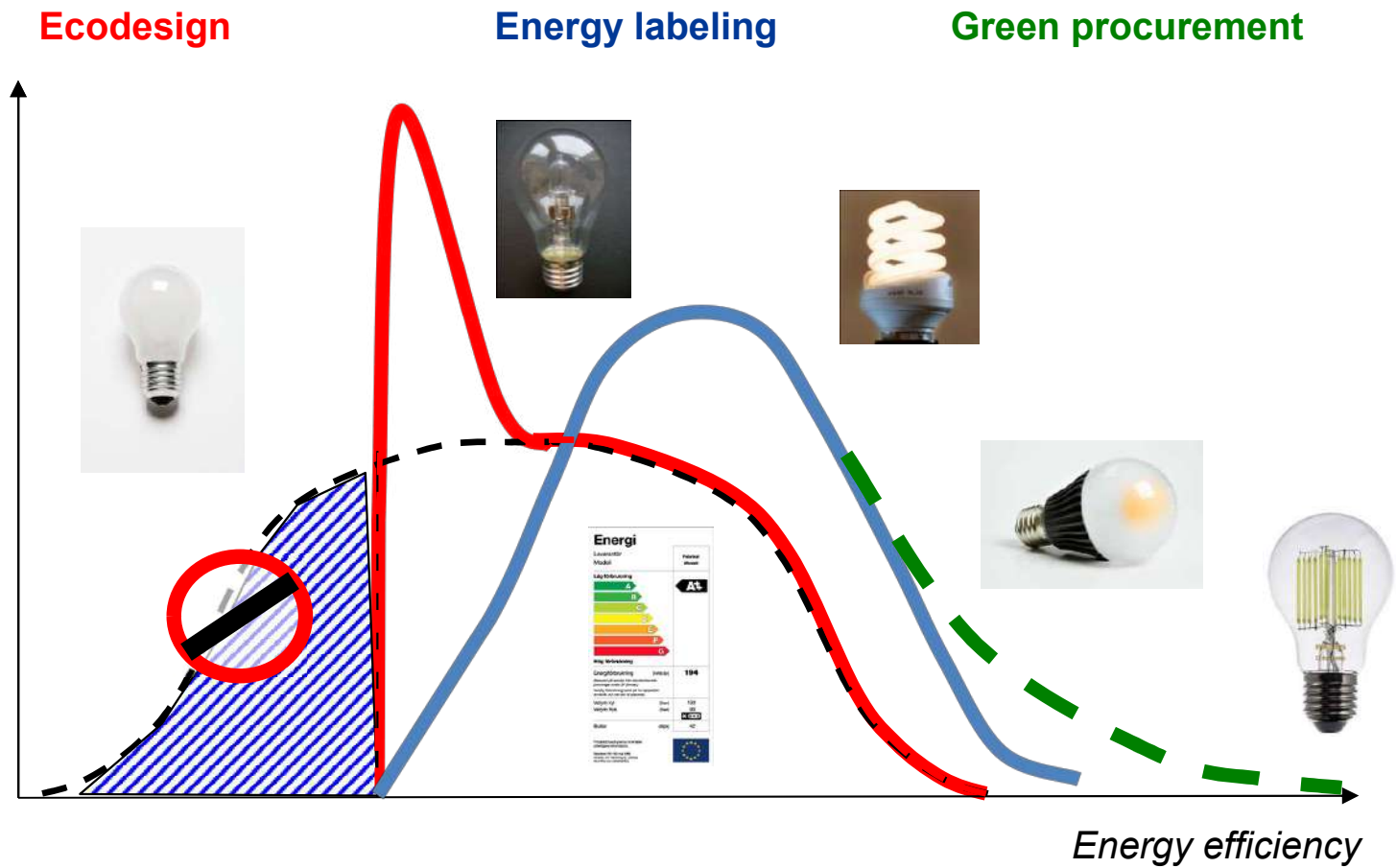
Peter Bennich

The Swedish Energy Agency

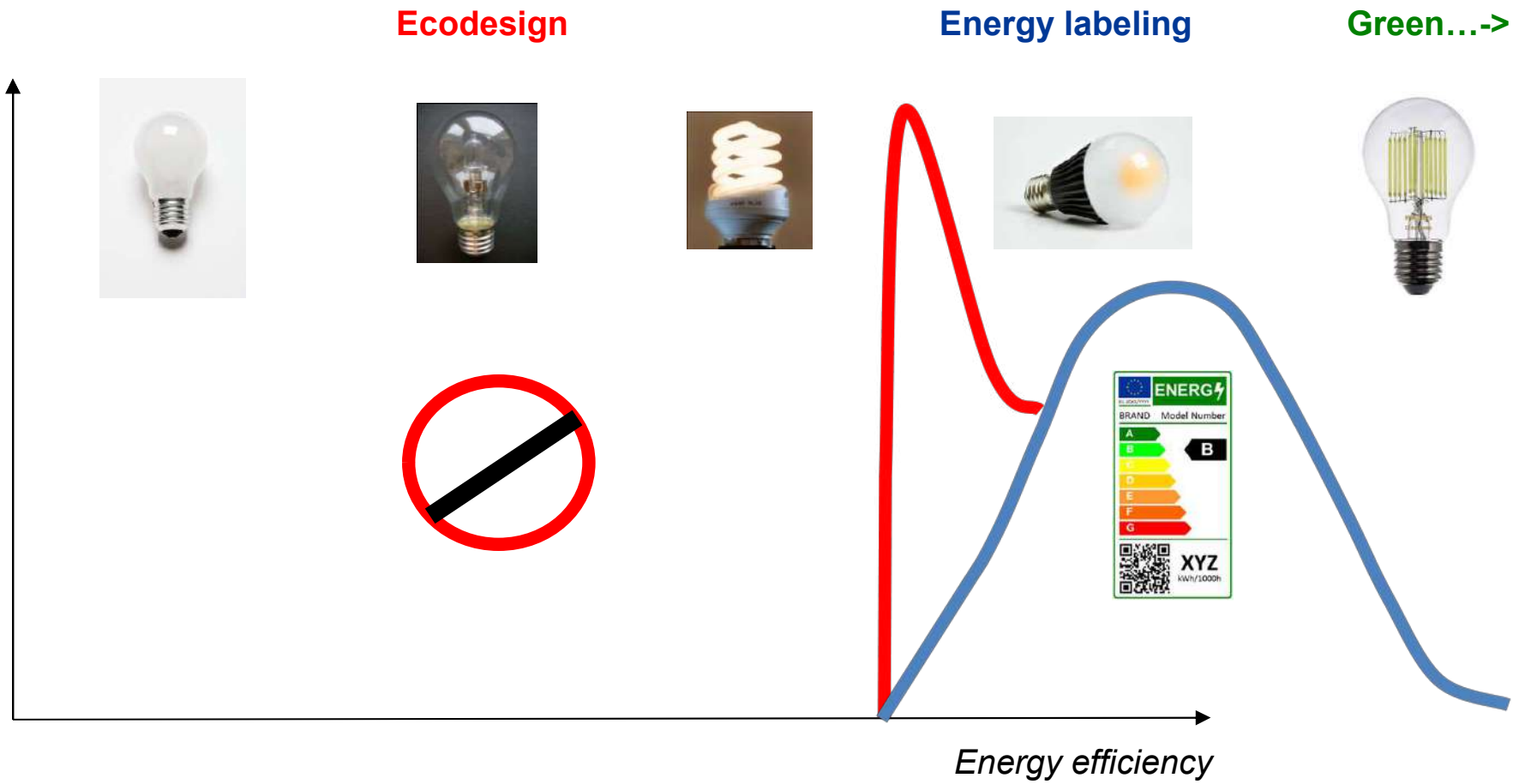
Ecodesign, energy labels and RoHS

- Ecodesign ("MEPS")
 - Base requirements on energy efficiency, resource efficiency and functionality
- Energy labeling ("labels"):
 - Grade the products that complies with ecodesign
- Restriction of Hazardous Substances, RoHS:
 - Default: Hg, Cd, Pb etc are forbidden, but product specific, time-limited exemptions are given if alternative solutions are not available. Revisions on a regular basis.

Lighting – snapshot from 2012



Lighting – snapshot from 1 September 2021



2023: Fluorescent lighting starts to get phased out



Lysrör T8



Lysrör T5



Kompaktlysrör, 2- samt 4-stift



Cirkelformade och kvadratiska lysrör

Ecodesign and RoHS are complementary tools

- EU-27 and the European Economic Area have adopted policy-measures over a decade to keep transforming the European lighting market
- **Ecodesign Regulation**
 - Incandescent: 2009-12; halogen spot lamps: 2015 and halogen non-directional: 2018 [EC No 244/2009](#)
 - Halophosphate fluorescent: 2010-12; [EC No 245/2009](#)
 - CFLi, T2 and T12 Linear Fluorescent: 1 September 2021; [EU No 2019/2020](#)
 - T8 Linear fluorescent in 60 cm, 120 cm and 150 cm: 1 September 2023; [EU No 2019/2020](#)
- **RoHS Directive**
 - CFLni – all base-types (single capped): 24 February 2023; [EU No 2022/276](#) (RoHS)
 - T8, T5 – all lengths and diameters: 24 August 2023; [EU No 2022/284](#) (RoHS)


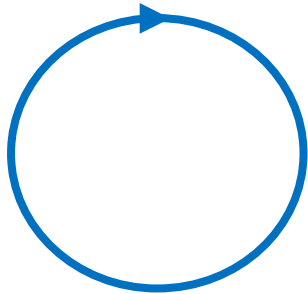
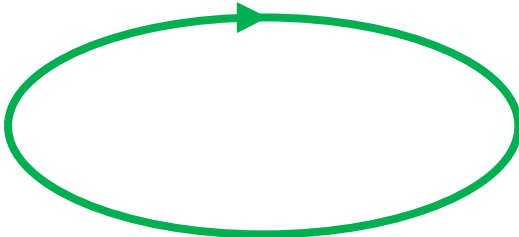


Work at the national level to support the transformation

- Do *your own* intelligence work
 - Tests, market analysis etc to *understand and track* the market transformation
 - Makes you stronger in negotiations
- Constant dialogue with all stakeholders
 - From companies to consumers
 - Companies: What do they fear and what do they want
 - Explain what is going on and why, what to expect and when, and how to adapt
- Pro-active market surveillance and enforcement
 - Keeps up the confidence in the regulations
 - Gives important information about perceived hurdles and/or loopholes, that might be addressed in the next revision

Current discussions goes *beyond* energy efficiency

Business models:

- From Linear 
- Via Circular 
- To an Elliptical economy 

Resource use:

- Energy efficiency ->
- Energy sufficiency ->
- Resource efficiency ->
- **Resource sufficiency**

Thank you

- Jörgen Eriksson, Ileana Hagelin, Ermias Mebreku: Testing Testlab
- Helena Holm: Communication
- Peter Bennich: Policy, International collaboration
- ... and more colleagues to come!

Besök oss på

www.energimyndigheten.se

Prenumerera på nyheter, nyhetsbrev,
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Transition to clean lighting through MEPS

Marcelo Padilla – Sustainable Energy Division.



Ministerio de
Energía



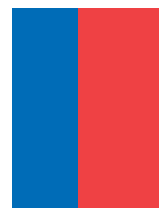
31 August 2023

Gobierno de Chile

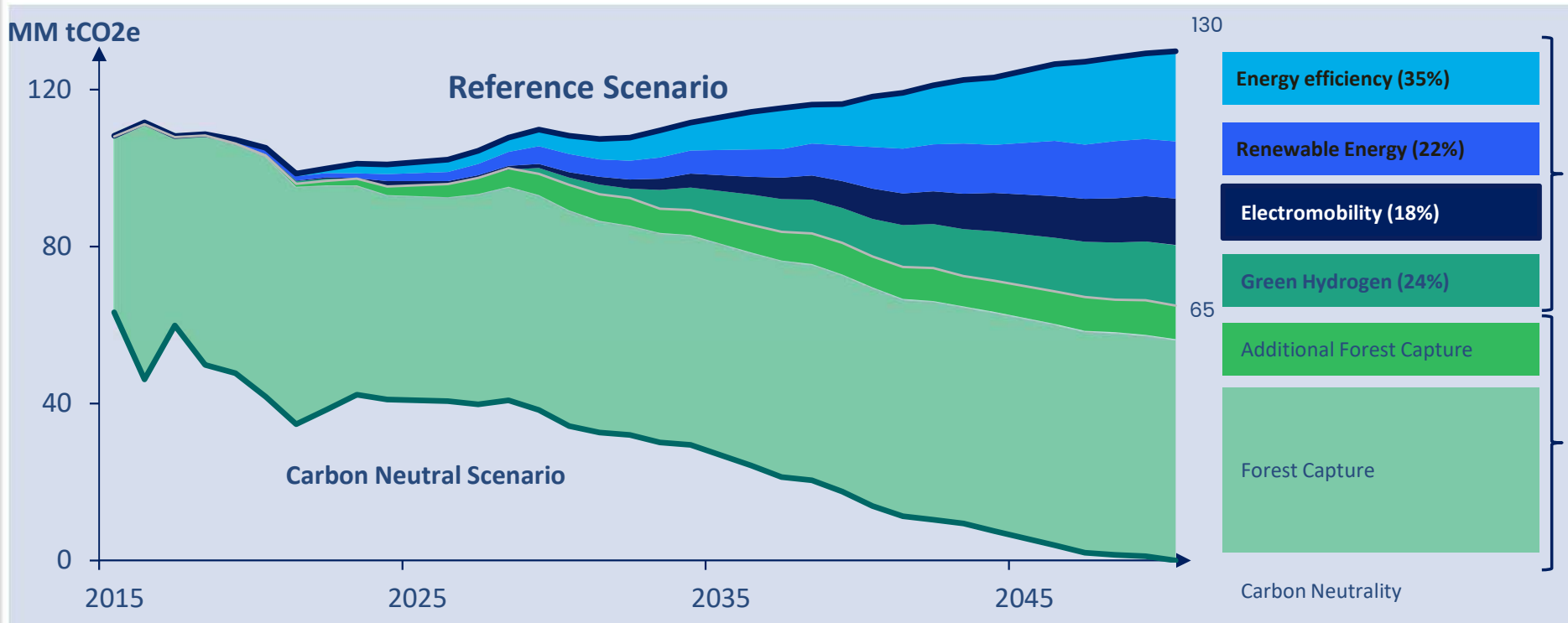
Chilean Energy Policy 2050

Chile's goal is to be
carbon neutral by 2050





CARBON NEUTRALITY PLAN





Lighting MEPS

2011

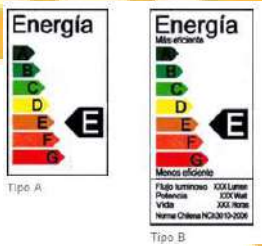
2014/2015: implementation

2021-2025: implementation

2020: update



2007



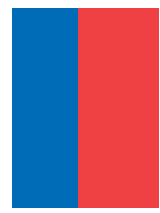
2010



2013

1st MEPS





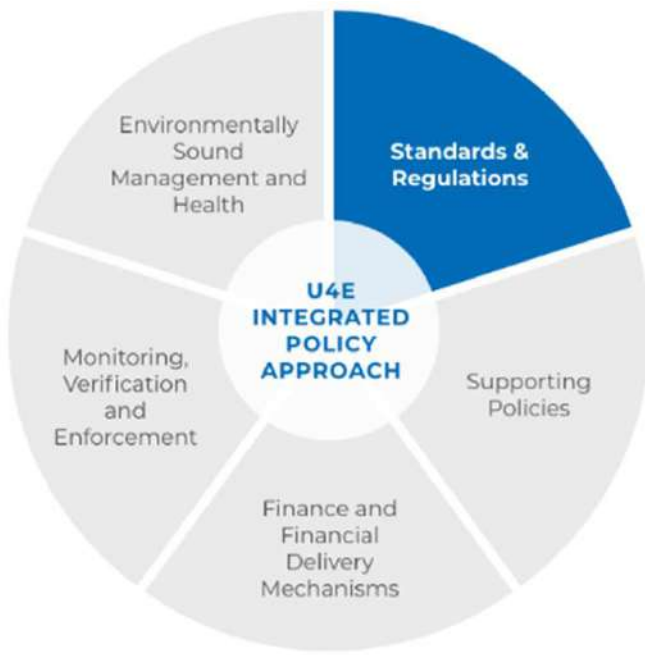
Standard & Regulations

Supporting Policies

Finance and Financial Delivery Mechanisms

Monitoring, Verification and Enforcement

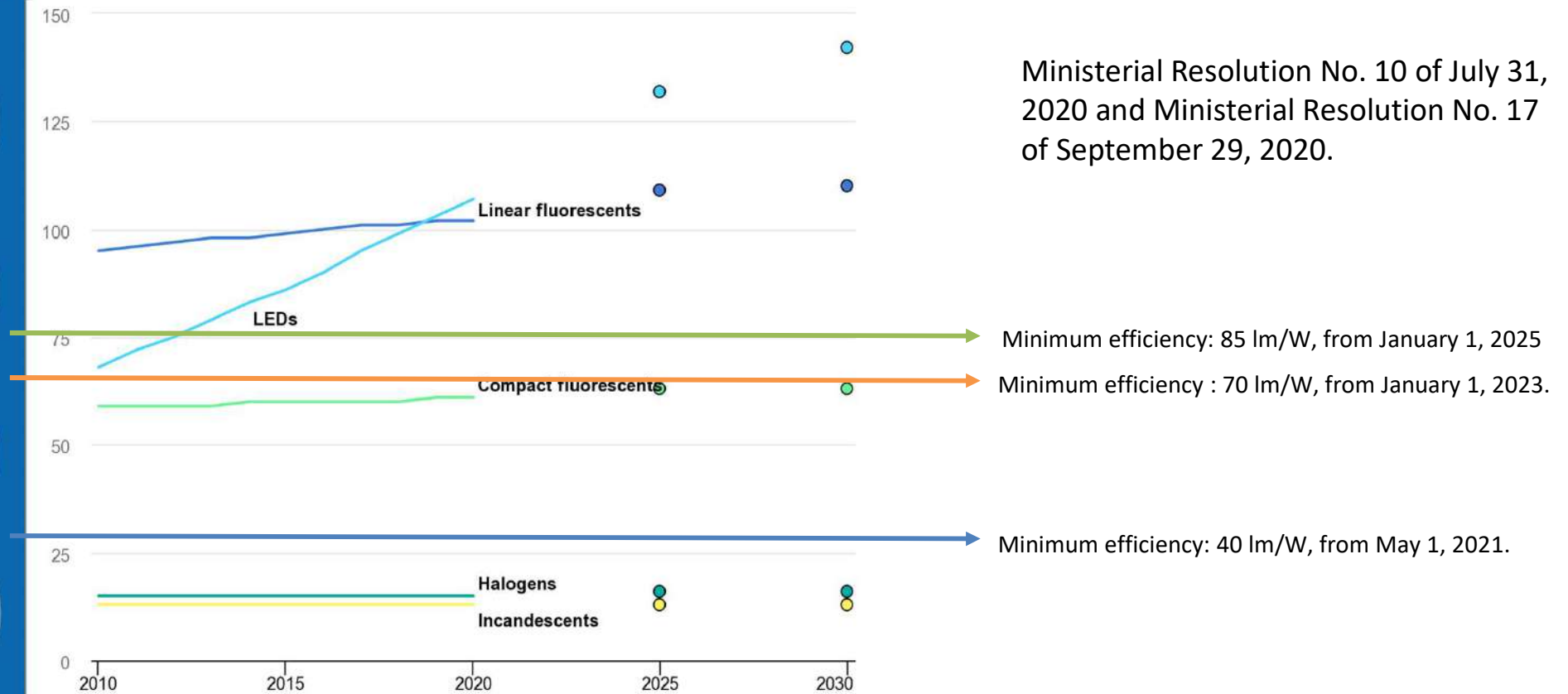
Environmentally Sound Management and Health



Lawrence Berkeley National Laboratory



Lighting MEPS: 2025 goals



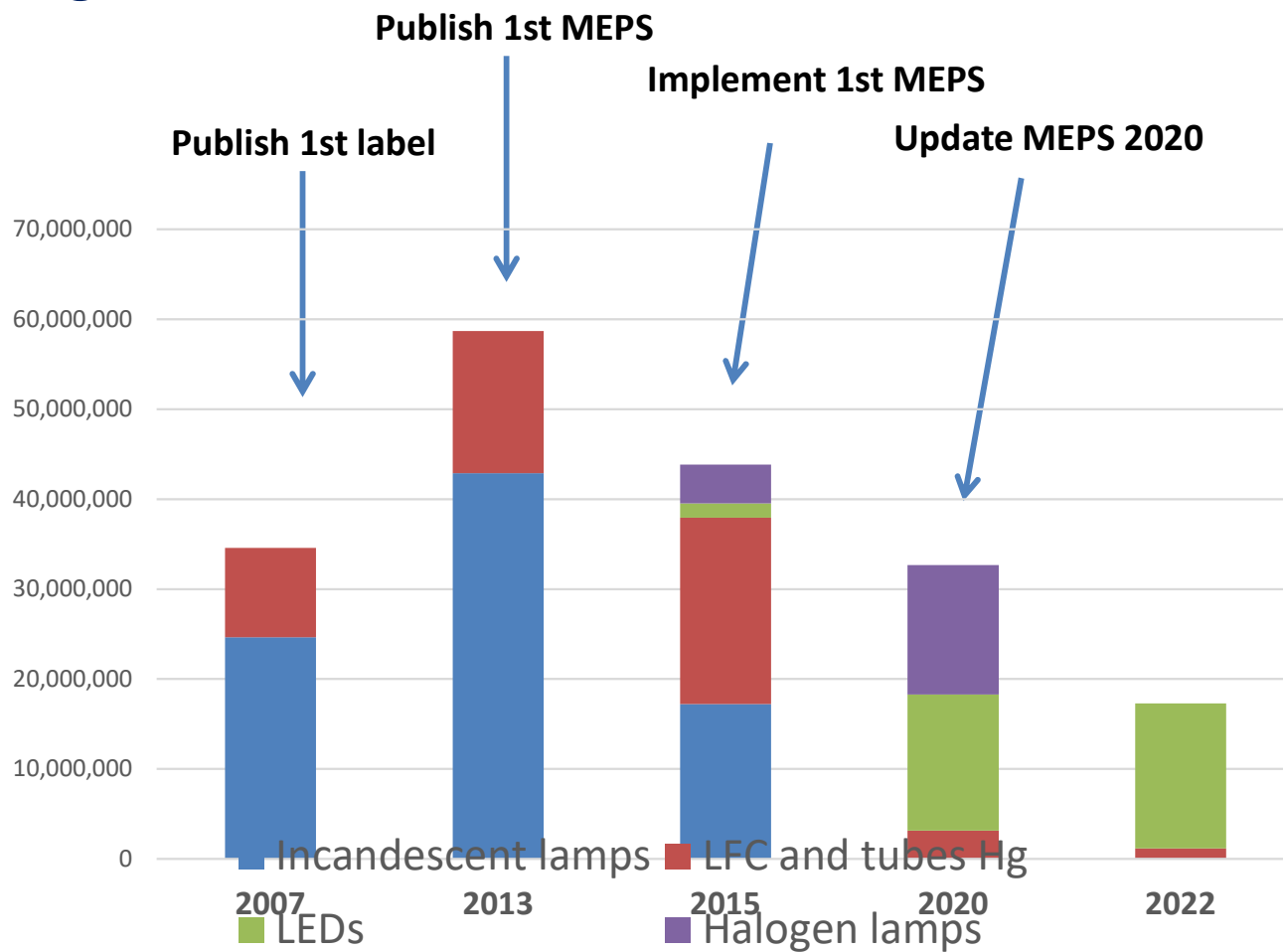
Ministerial Resolution No. 10 of July 31, 2020 and Ministerial Resolution No. 17 of September 29, 2020.

Minimum efficiency: 85 lm/W, from January 1, 2025

Minimum efficiency : 70 lm/W, from January 1, 2023.

Minimum efficiency: 40 lm/W, from May 1, 2021.

Lighting MEPS





Conclusions

- Energy performance standards work well. They are the most cost-effective tool for advancing energy efficiency.
- Political support is key. The technical aspects are well known, but it is necessary to move beyond the purely technical aspects.
- The support of international organizations, in our case, made it possible to move faster on the strategy of eliminating inefficient lighting products.
- The road is long and sometimes complicated, but the results in the long term are clear, and we must continue to move forward.



Efectividad de la política de etiquetados y MEPS en contexto

Reporte DES N°13, 4to Trimestre 2022

Tabla 8. Ahorros de energía por programas

N°	Programa [Ahorros en Tcal]	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
4.1	Calefacción (actualización OGUC 2007)	66	133	178	247	289	336	393	453	496	553	617	669	707	744
4.2	Reacondicionamiento viviendas vulnerables	1	17	31	52	78	103	134	163	196	234	255	273	304	327
4.3.1	Etiquetado/MEPS refrigeradores	3	12	27	62	98	152	195	239	288	325	366	416	462	519
4.3.2	Etiquetado/MEPS lámparas residenciales	224	357	414	521	611	490	533	661	1.513	2.111	2.849	3.279	4.232	5.894
4.3.3	Etiquetado vehículos livianos					8	30	49	81	114	151	185	212	261	
4.3.4	Etiquetado vehículos medianos									17	45	74	95	115	
4.4	Con Buena Energía						10	22	55	73	77	84	82	76	
4.5	Calificación de viviendas					9	45	66	98	113	131	146	154	164	
4.6	Sistemas Solares Térmicos de ACS			1	11	39	75	92	109	145	181	205	231	253	281

Ahorro cuantificado total: 9.108 Tcal

Ahorro cuantificado MEPS y etiquetas: 6.413 Tcal

⇔ **70% de los ahorros cuantificados.**

N°	Programa [Ahorros en Tcal]	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
4.7	Centros de acopio leña							28	51	79	102	159	177	177	193
4.8	Agencia de Sostenibilidad Energética	0	0	0	0	4	10	31	34	92	746	565	431	682	611
4.8.1	Sello de EE					0	0	0	0	0	586	344	218	127	65
4.8.2	Sistemas de Gestión de Energía					2	5	25	25	73	121	161	167	168	168
4.8.3	Ponle Energía Tu PyME					0	0	0	0	0	0	0	0	0	4
4.8.4	Certificación de Ahorros de Proyectos Energéticos					0	0	0	0	0	12	9	11	7	1
4.8.5	Incorporación de Dispositivos Aerodinámicos					0	0	0	4	0	0	0	0	0	0
4.8.6	Cambia Tu Camión					1	0	0	0	0	0	0	0	0	0
4.8.7	Giro Limpio / Conducción Eficiente /Pruebas Tecnológicas					0	0	0	0	0	0	0	0	352	352
4.8.8	Concurso Inversión Energética Local					0	0	0	0	0	0	0	0	1	6
4.8.9	Programa Eficiencia Energética Edificios Públicos					1	6	6	5	19	19	31	20	14	4
4.8.10	Casa Solar					0	0	0	0	0	0	0	0	0	6
4.8.11	Alumbrado Público Masivo /Arica / Valparaíso					0	0	0	0	1	7	19	14	11	4
	Total	294	519	651	894	1.119	1.182	1.480	1.824	2.989	4.495	5.344	5.881	7.278	9.108



India Lighting Market and Energy Efficiency Policies –

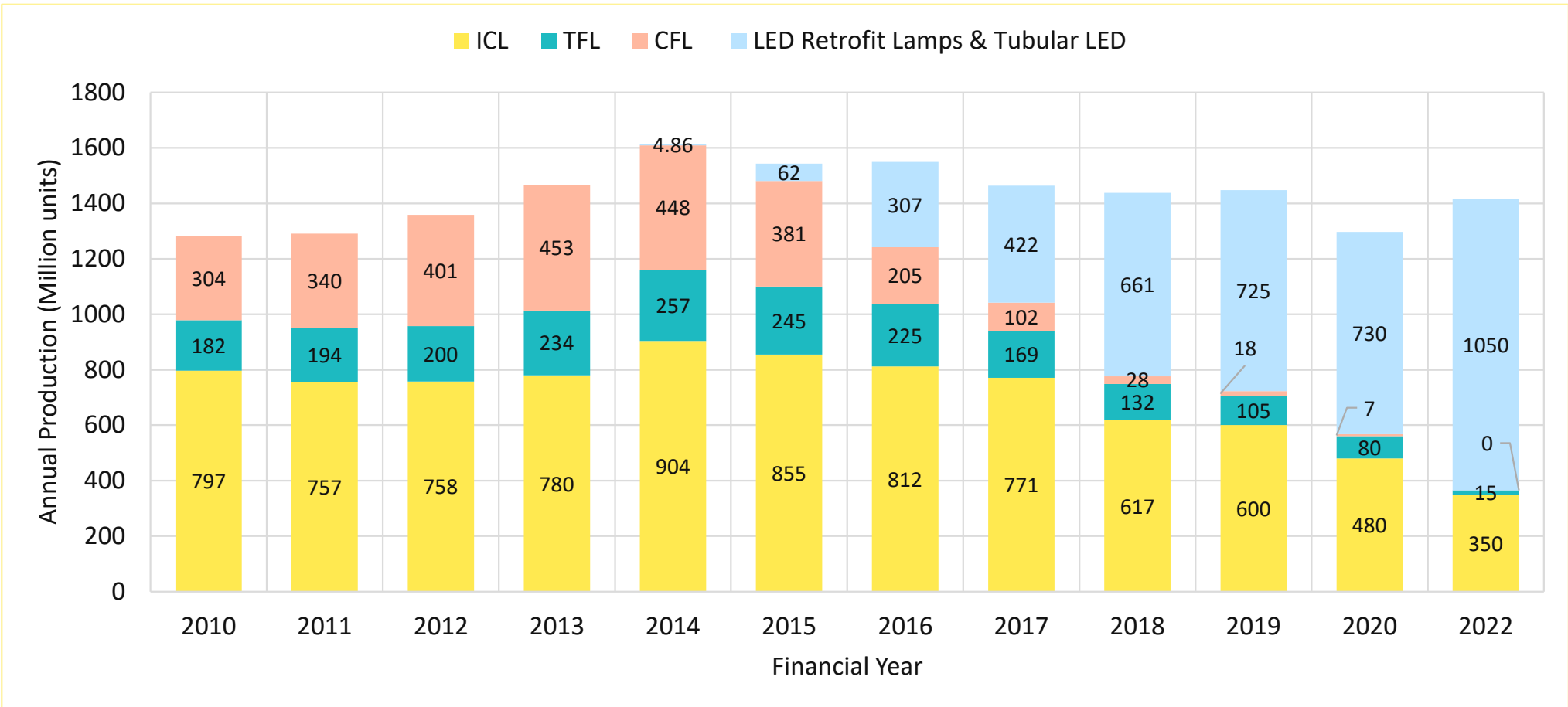
Kishore Kumar

31 August 2023



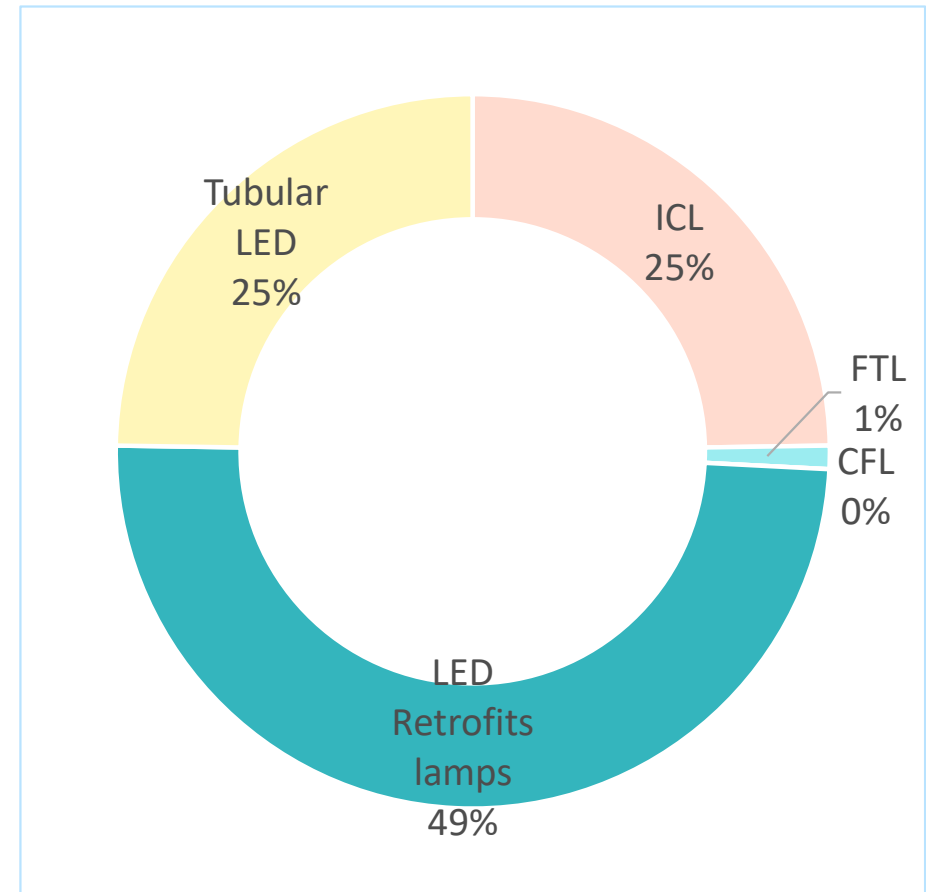
- India Lighting market shifted towards LED technologies and moving away from Fluorescent lamps and tube lights.
- As per Lighting Industry, due to this shift India reduced the annual energy consumption in lighting to 13%, earlier it was 18%.

Lighting Market



Lighting Market Share by Technologies

- In 2022-23, India produced 1.4 billion lamps and tube lights.
- Majority of lighting market share is dominated by LED technology-
 - LED lamps and tube lights contributes to 74% share.
 - Followed by conventional lighting –incandescent lamp (25%), **FTL (1%) and CFL (0%)**



Source-ELCOMA

Energy Efficiency Policies- Lighting (TFL)

Tubular Fluorescent Lamps

- Bureau of Energy Efficiency (BEE) launched the Standards and Labelling program for Tubular florescent lamps (TFL) in **2006** as a **voluntary initiative**, and the program became mandatory in the year **2009**.

Scope

The tubular fluorescent lamp for general lighting services covers all wattages with nominal dimension starting from **1100 mm** and **upto 1500 mm** as covered in **IS 2418 (Part I and II)**.

Energy Efficiency levels

Star Levels	Luminous Efficacy (Lumen/Watt)
	0100 hrs of operation
1	≥65 and <75
2	≥75 and <85
3	≥85 and <95
4	≥95 and <110
5	≥110

Sample Star label



Sample TFL with Star label



Energy Efficiency Policies- Lighting (LED lamps)

LED Lamps

- To promote and support lighting transition, BEE launched labelling program of self-ballasted LED lamp in **2015** and became mandatory in the year **2018**.

Scope

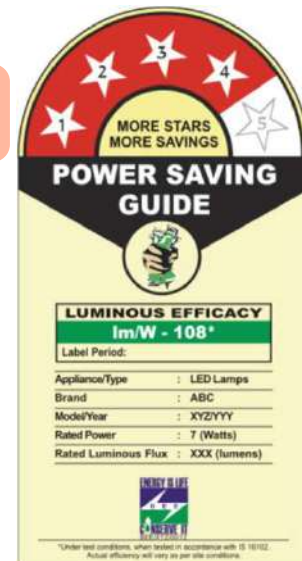
The self-ballasted LED lamps for general lighting services having rated power from **3 watts to 35 watts**.

Indian Standard- **16102 (part 2):2020**.

Energy Efficiency levels

Star rating	1st July 2023 - 30th June 2026
	Luminous Efficacy (Lumen/Watt)
1	≥90 and <105
2	≥105 and <120
3	≥120 and <135
4	≥135 and <150
5	≥150

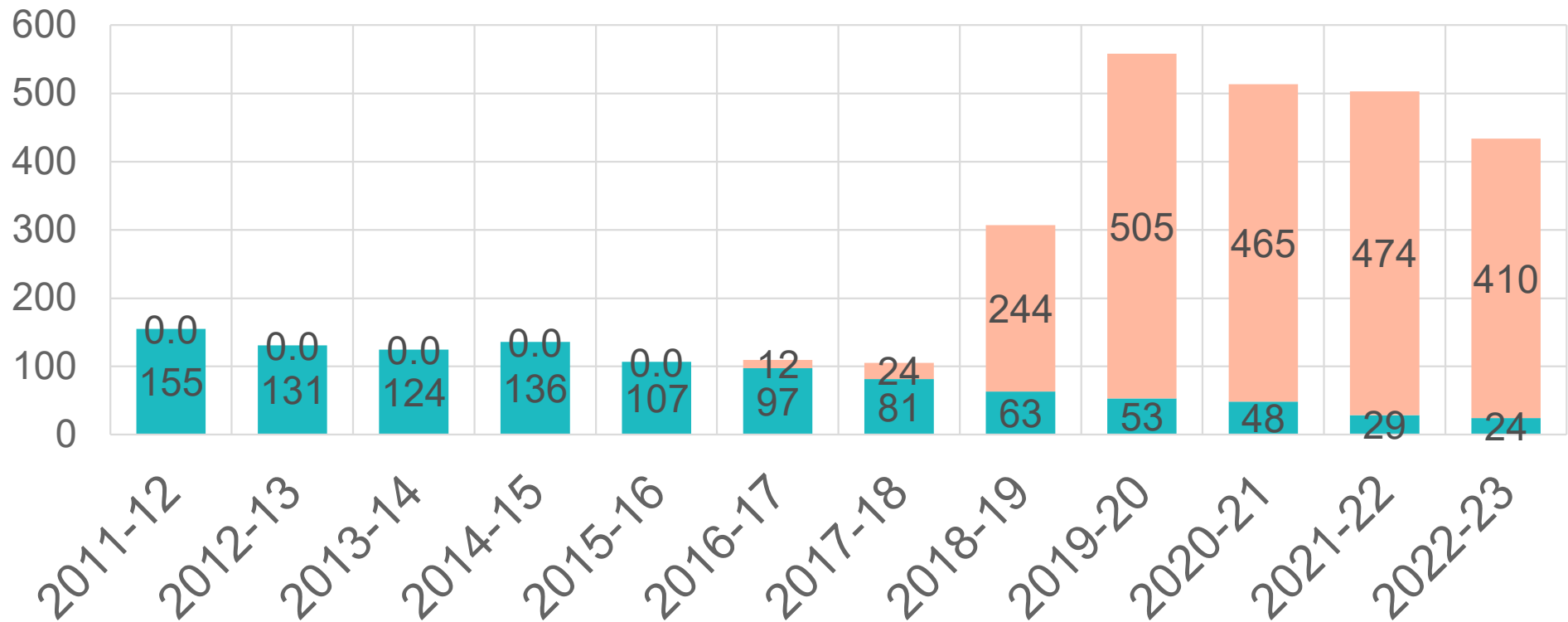
Sample Star Labeled LED lamps



Sample Star label

TFLs and LED Lamps productions- BEE Registration

TFL LED Lamps



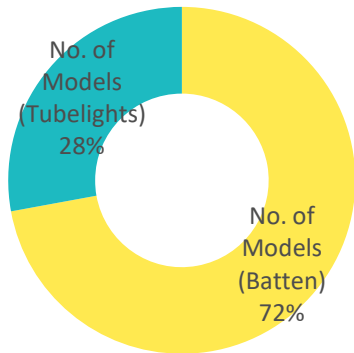
Energy Efficiency Policies- LED Tube Lights

LED Tube lights

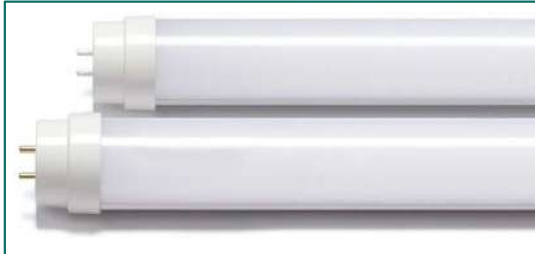
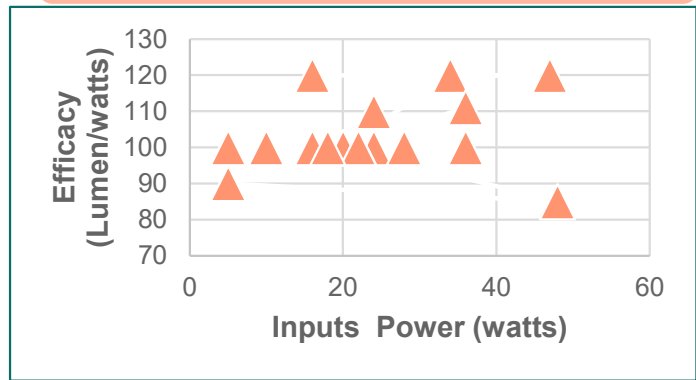
- BEE is planning to launch the energy efficiency policies for LED tubelights or batten in 2024 and move away from Tubular Fluorescent lamps.
- As part of this, the market assessment study is underway

❖ Highlights of Market Assessment, India produced **350 million** LED tubelights and Batten in 2022.

Models Available in LED tubelights (%)



LED Tubelight -Efficacy



Sample LED tubelights

An aerial night view of Tokyo, Japan, with the illuminated Tokyo Tower on the left and the snow-capped Mount Fuji in the background under a twilight sky. The city lights create a dense pattern of white and yellow dots against the dark buildings.

An Assessment of the Global Lighting Market

31st August 2023

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Lighting Policies, Initiatives and Manufacturing 05

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Assessment Goals

- **CLiC sought to understand:**
 - Whether the economics supported a global phase-out of fluorescents
 - Local/ domestic lighting manufacturing and assembly







Assessment Methodology

- Engaged partner organizations in **65 countries** across Africa, Latin America, South East Asia and Arab countries
- Gathered over **400 models** of both mercury-containing fluorescent tubes and linear LED
 - Linear tube lamps: T12, T8, T5
 - Compact Fluorescent Lamps, non integrally ballasted (CFL.ni, 4pin and 2pin)



Understanding the Global Linear Lamp Market

Lightbulb Type	Lightbulb that Contains Mercury	LED Retrofit Bulb (Mercury-Free)
<p>Linear Tubular Lightbulb</p>	<p>Linear Fluorescent Lamps (LFL)</p> <p>T5 5/8" diameter</p> <p>T8 1" diameter</p> <p>T12 1.5" diameter</p> 	<p>Linear LED Lamps</p> 
<p>Pin-Based Compact Lamps</p>	<p>Compact Fluorescent Lamp non-integrally ballasted (CFLni)</p> 	<p>Pin-Based LED Retrofit Lamps</p> 

Mercury-Free Momentum: Global Policy Action to End Toxic Lighting

North America

Canada proposed a [Mercury Regulation](#) to phase out CFLs and LFLs.

USA

Adopted

- California: [AB2208](#)
- Vermont: [ACT120](#)
- Oregon: [HB2351](#)
- Colorado: [HB23-1161](#)
- Hawaii: [HB192 HD2](#)
- Rhode Island: [H.5550](#)
- Maine: [HP1160](#)

Introduced

- Illinois: [HB2363](#)
- Maryland: [HB 1021](#)
- Massachusetts: [H.777](#) and [S.538](#)
- Nevada: [AB 144](#)
- New Mexico: [HB 185](#)
- Washington: [HB 1185](#)



■ Countries With Clean Lighting Policy Activity
 ■ Countries That Have Ratified the Convention

Latin America & the Caribbean

Brazil is revising efficiency labels and issuing a ban on CFLs; Ministry of Mines and Energy intends to set efficiency standards that only LEDs can meet.

Chile published [resolution](#) that will phase out CFLs by 2024.

Europe

European Union (EU-27) and European Economic Area previously phased out some CFLs and LFLs through [Ecodesign](#); the revised Restriction of Hazardous Substances (RoHS) Directive bans the placement of nearly all [LFLs](#) and [CFLs](#) on the market in 2023.

United Kingdom (UK) is aligned with Ecodesign requirements; the government is reviewing RoHS and has [proposed](#) to increase the minimum efficiency standards for lighting.

Switzerland harmonized lighting policies with with EU-27 and EEA.

Asia-Pacific

Bangladesh is developing its first lighting efficiency standards, with a goal of transitioning to all LEDs.

China is developing world-leading LED efficiency standards.

Pakistan released a decree to ban CFLs from 1 July 2023 - 2 years earlier than the COP4 decision.

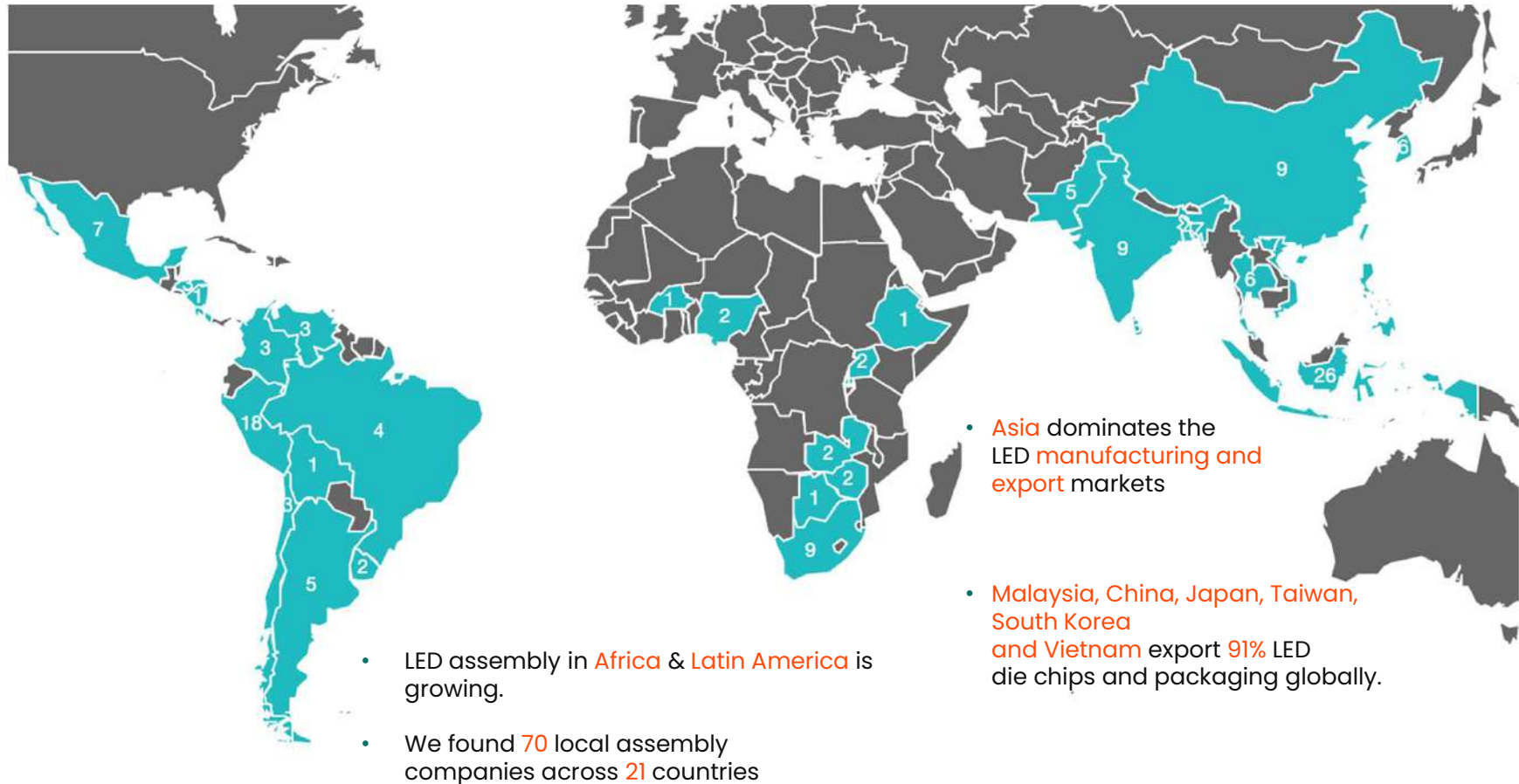
Africa

Southern Africa Development Community (SADC) and the East African Community (EAC) adopted lighting efficiency standards that accelerate the region's transition to high efficiency lamps; together, the standards cover 23 countries.

South Africa passed a [new efficiency standards](#) that will effectively transition its market from CFLs to LEDs.

Nigeria approved lighting efficiency standards only met by LEDs ; policy enforcement will begin in the coming months; ECOWAS states expressed interest in adopting these as the regional standard.

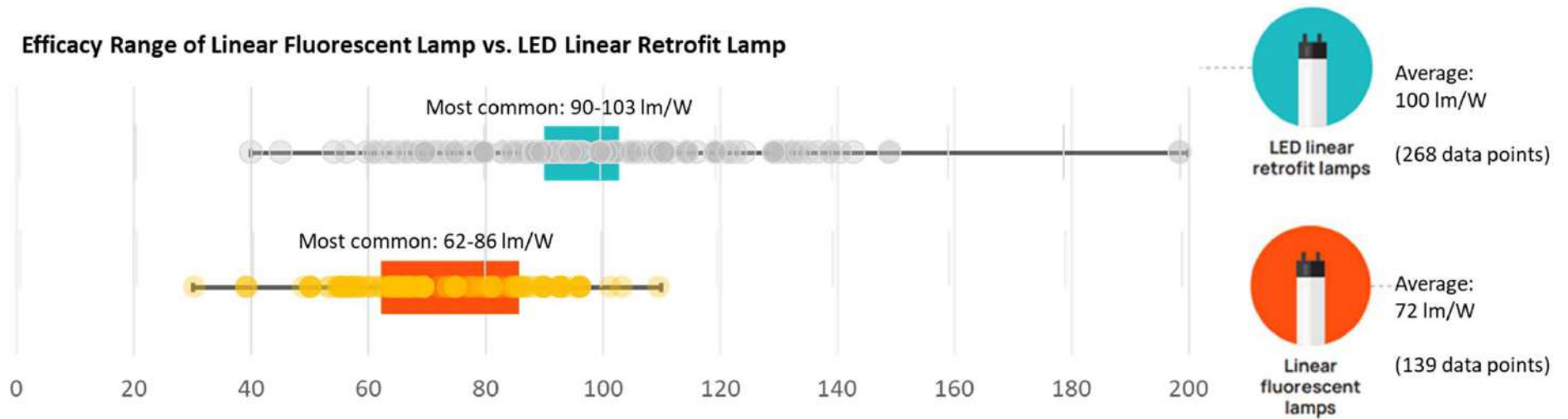
LED Manufacturing and Assembly in the Global South



Efficacy Snapshot

The average efficacy of the LED tubes is markedly higher than that of the fluorescent pairs: **100lm/W** against **72lm/W**.

Efficacy Range of Linear Fluorescent Lamp vs. LED Linear Retrofit Lamp



Payback Periods

LEDS PAYBACK FOR THEMSELVES QUICKLY!

	Region	T8	T12
	Africa	2.9	0.9
	Asia Pacific	4.1	7.0
	Latin America	2.9	5.1
Country	Region	T8	T12
Angola	Africa	0.3	
Gabon	Africa	1.4	
Madagascar	Africa	instantaneous	Instantaneous
Uganda	Africa	6.0	
China	Asia Pacific	1.8	11.2
Pakistan	Asia Pacific	instantaneous	Instantaneous
Sri Lanka	Asia Pacific	7.6	6.7
Singapore	Asia Pacific	0.6	
Colombia	Latin America	4.3	Instantaneous
Mexico	Latin America	5.2	7.0
Paraguay	Latin America	4.0	5.1
Guatemala	Latin America	1.1	1.2



National Example, Pakistan - T8 and T12

Item - T8	Linear Fluorescent Lamp	Equivalent LED Retrofit
Lifetime (hours)	8,000	16,000
Lamp price (PKR)	650	900
Power (W)	36	16
Electricity use (kWh/yr)	118	53
Electricity cost (PKR/yr)	2,720	1,209
4-year lifecycle cost (PKR)	12,131	5,736
Payback period (months)		2.8

Item - T12	Linear Fluorescent Lamp	Equivalent LED Retrofit
Lifetime (hours)	20,000	20,000
Lamp price(PKR)	750	450
Power (W)	40	20
Electricity use (kWh/yr)	131	66
Electricity cost (PKR/yr)	3,022	1,511
10-year lifecycle cost (PKR)	31,565	16,411
Payback period (months)		instant

- Payback period of **2.8 months** for T8 and **instant** for T12
- Cost-effectiveness has driven the market transition to LED
- Government has aligned effort to phase-out less efficient lighting technologies
- For T8, consumers can **spend an extra 250 Rupees** today and **save 6,395 Rupees on lighting cost (25x return)**
- For T12, consumers can **purchase cheaper products priced 300 Rupees lower** today and **immediately save 15,648 Rupees (instant return)**
- LED option is **50% less costly than** mercury-based fluorescent lamp

Regional Benefits of Phasing-out LFLs in 2025



Region	Mercury Avoided From Lamps and Power Stations (metric tonnes)	CO2 Avoided (million tonnes)	Electricity Bill Savings (billion USD)
Asia Pacific	156	2,820	1,141
Latin America	12	190	137
Africa	7	190	51

Cost of Delay

Cumulative Benefits of a Global Phase-out of Linear Fluorescent Lamps (2025–2050)

Savings	2025	2027	2030
Mercury	183 tonnes (74 tonnes from lamps, 109 tonnes from coal firing in power plants)	149 tonnes (60 tonnes from lamps, 89 tonnes from coal firing in power plants)	124 tonnes (42 tonnes from lamps, 82 tonnes from coal firing in power plants)
Financial	US\$ 1.33 trillion	US\$ 1.10 trillion	US\$ 0.78 trillion
CO2	3.2 GT	2.6 GT	1.9 GT
Energy	9,300 TWh	7,720 TWh	7,310 TWh

Thank you!

Ana-Maria Carreño

Deputy Director

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31 August 2023

Safety and Compatibility

Steve Coyne

What about Compatibility Issues? – Ballast Compatibility

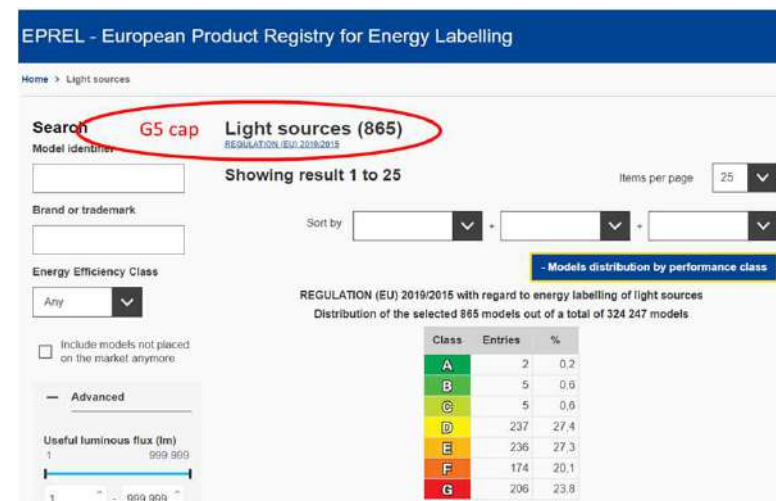
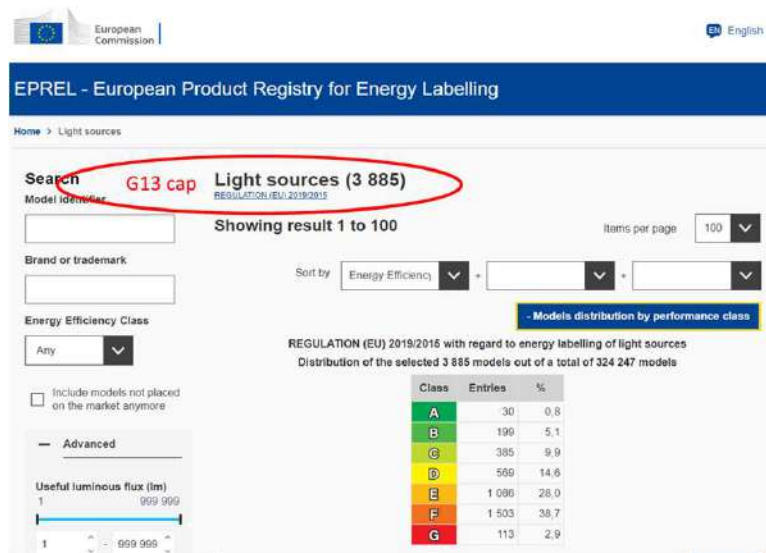
- Goal: Keep the same (fluorescent) luminaire, but just change the lamp to LED
- Magnetic ballasts – 100% compatible with LED
- Mains voltage – 100% compatible with LED
- Electronic ballasts – 91-93% compatible with LED
- Magnetic ballasts are the majority of the installed stock globally, but particularly in non-OECD countries
- Keeping the magnetic ballast in the circuit will contribute to system losses, but still more efficient than fluorescent

Lamp Size	Percentage of T5 & T8 in EU Stock	Ballast Type	Percentage of stock by ballast type	Estimated EU Stock of total T5 & T8	Compatibility, Low - High Estimate	Overall EU Stock Compatibility
T5	30%	HF/ECC	100% of T5	30%	79% - 80%	23.7% - 24%
T8	70%	EM/CGG	70% of T8	49%	100%*	49%
		HF/ECC	30% of T8	21%	89% - 97%	18.7% - 20.4%
EU Total:	100%			100%		91.4% - 93.4%

Ballast Count	T5 Ballasts	Combined Total	Philips / Signify						OSRAM / EDVANCE						SYLVANIA				
			MAG	MAG	MAG	MAG	MAG	MAG	Substitute	Substitute	Substitute	Substitute	Substitute	Substitute	T5/EC	T8/EC	T5/EC	T8/EC	
11	OSRAM GF-T5 2x31 4x2 Lamps 2																		
12	OSRAM GF-T5 2x31 4x2 Lamps 4																		
13	OSRAM GF-T5 2x31 4x2 Lamps 1																		
14	OSRAM GF-T5 2x31 4x2 Lamps 1																		
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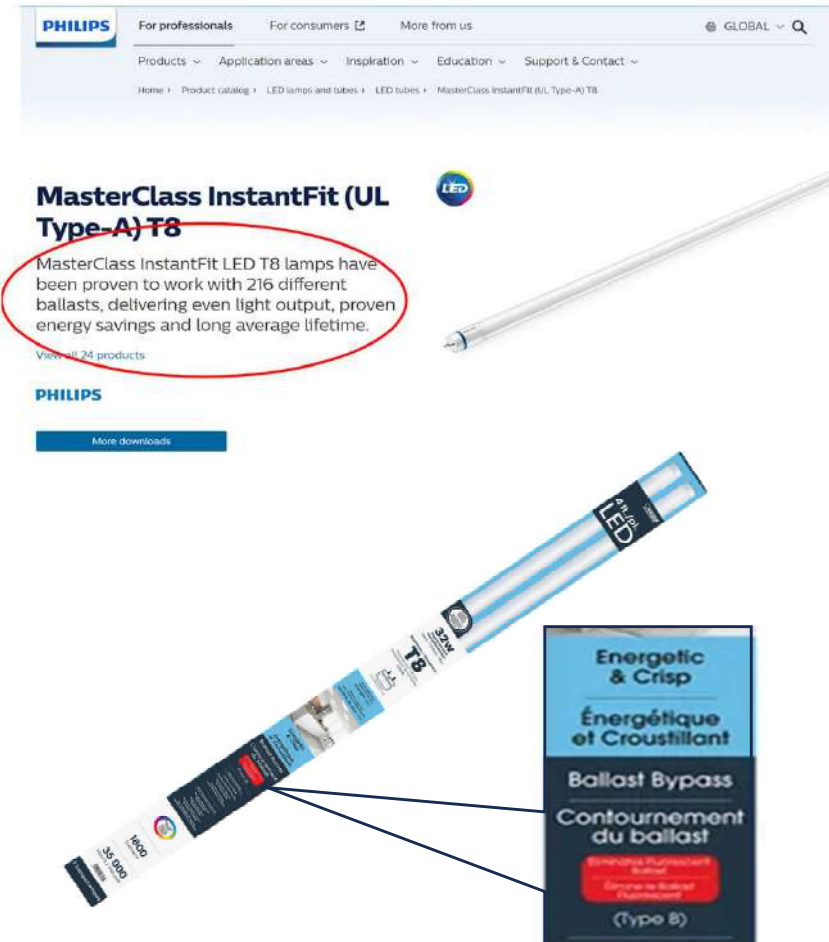
What LED tubes are available?

- There are literally **tens of thousands** of mercury-free LED retrofit lamps
- TLED are available in all different diameters, lengths, ballast types (magnetic and electronic), colour temperatures, colour rendering, light output, etc.
- For the small percentage (6-9%) of fixture types where LED tubes are not compatible, these can be replaced or have the ballast by-passed to use a mains-voltage LED tube so the **fixture does not need to be replaced**



What types of LED tubes are available?

- The IEC has defined 2 groups of LED tubes.
 - Double-capped **retrofit** LED lamp tubular LED lamp which can be used as a replacement for double-capped fluorescent lamps without requiring any internal modification in the luminaire and which, after installation, maintains the same level of safety of the replaced lamp in the luminaire.
(Note: replacement of the glow starter with the LED replacement starter is not considered a modification of the luminaire)
 - Double-capped **conversion** LED lamp double-capped LED lamp which can be used as a replacement for another type of lamp with modification to the luminaire
(For example: the fluorescent lamp ballast has been bypassed or removed from the luminaire)



Are there different types of double-capped LED retrofit tubes?

- Yes, there are different types of LED retrofit tubes based on the type of fluorescent lamp ballast they are to operate with.
 - **LED retrofit tube for electromagnetic ballast**
Known as conventional control gear, (CCG), operates at mains frequency (50 or 60 Hz)
 - **LED retrofit tube for electronic ballast**
Known as electronic control gear, (ECG), operates at high frequency (> 10 kHz)
 - **Universal LED retrofit tube**
Operates on both CCG and ECG

Which ballast type do I have?

- This can be easily determined, without accessing the ballast.

OSRAM Ballast Discriminator ELECTRONIC & MAGNETIC BALLAST CHECKER

The ideal tool to determine your retrofit opportunities

NEW



The must have gadget.
Hurry while stocks last!

This handheld device can quickly and easily distinguish between magnetic and electronic ballasts!

No Ladder required.
Just point and press!

Simply aim the OSRAM Ballast Discriminator at any lamp, H10, LED, HAL, FLUORO, CFL, and at the press of a button, easily determine the type of the ballast currently installed.

Batteries and safety lanyard included.

INSTRUCTIONS

1. Point the Discriminator at Light Fixture.
2. Press and Hold button until LED on the Discriminator illuminates.

*No ladder required!



UNIQUE CODE:
OSRDBallastDiscriminator

EAN: 4055482044698

GREEN LIGHT Ballast is ELECTRONIC

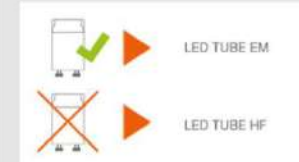
ORANGE LIGHT Ballast is MAGNETIC

FIND THE RIGHT TECHNOLOGY: EM OR HF

Are you wondering which technology you need for your luminaire with T8 fluorescent lamp – an EM lamp or an HF lamp? Our insider tip reveals two easy ways to find out.

STARTER TEST

Check whether the luminaire you want to fit the new lamp in has a starter. If it does, you need an **LED TUBE T8 EM** for operation on a CCG. If not, use an ECG-compatible version, either **LED TUBE T8 HF** or **UNIVERSAL**.



CAMERA TEST

If the luminaire still has a working T8 lamp, take a look at it through a digital camera (such as the one on your smartphone or tablet). If the light flickers, you need an **LED TUBE T8 EM** for operation on a CCG. Otherwise use an ECG-compatible version, either **LED TUBE T8 HF** or **UNIVERSAL**. For the test, we recommend a maximum distance from the digital camera to the light of 30 cm.



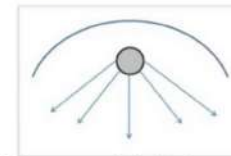
Source: asset-13148207_ledvance-lamp_ban_brochuere_06_2023-en.pdf

Any other Compatibility Issues?

– Light Emission Pattern

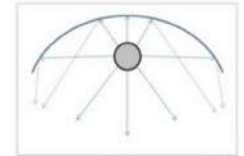
- A lumen intensity distribution (LID) below compares a fluorescent luminaire with one fluorescent lamp and two LED retrofit lamps in a typical office fixture.

LED Tube Retrofit



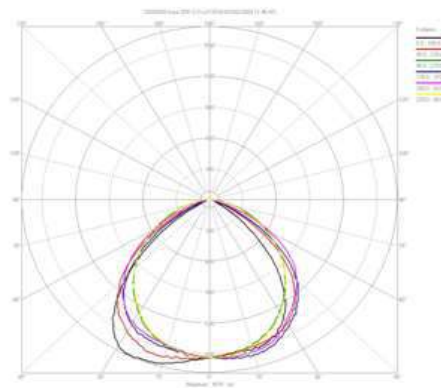
LED lamps emit light downward, so no reflectance in the fitting

Linear Fluorescent Tube

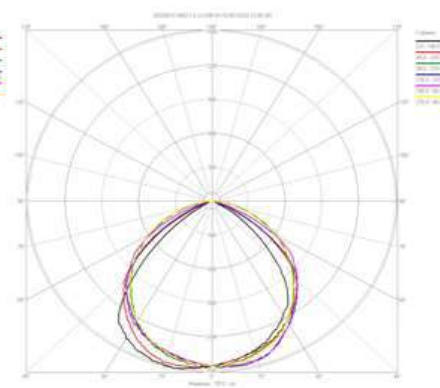


Fluorescent tubes emit light all around, requiring a reflector

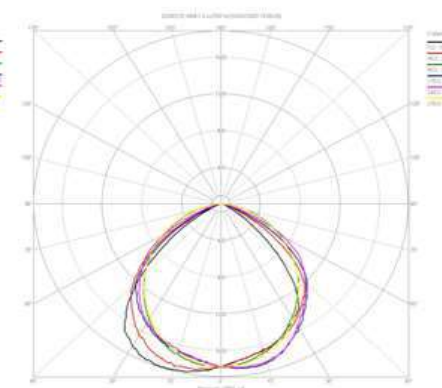
- The light distribution pattern from the fixture is virtually identical for both lamp types.
- This helps to explain why the market is satisfied with the performance of LED retrofit tubes



T8 Fluorescent Lamp (3201-1-3)



T8 LED Lamp (3402-1-2)



T8 LED Lamp (3404-1-2)

Are LED retrofit tubes safe to use?

Yes. IEC has safety standards for LED Lamps and Tubes

Suppliers use these standards to ensure safety

100s of millions of LED tubes are in use today

“100% safe installation”

The right tube, right now

Our portfolio of LED tubes is now available with a range of options in High and Ultra Output.

Save on energy costs

LED tubes are up to 65% more efficient than TL-D lamps, so you can save on energy costs without compromising on light quality.

Long-lasting and reliable

With a lifetime of 50,000 hours they outshine TL-D lamps by 25,000 hours for lower maintenance and operation costs.

High quality of light

Our LED tubes won't flicker or cause glare. The 100% instant light has a high level of consistency and uniformity and offers a choice of colour temperatures.

NEW Ultra output, ultra efficient

Choose Ultra Output for ultra efficiency of 148 lm/W and exceptional light quality. Philips has a long history of ground-breaking innovation in lighting technologies. Our Ultra Output LED tubes are specially designed for demanding applications that require a high light output to comply with ergonomic norms. In fact they raise the bar in lighting efficiency and comfort by meeting all office, supermarket and healthcare standards.

A green choice

LED tubes are a mercury-free alternative to traditional fluorescent tubes, a responsible choice that can also contribute towards your green credentials.

100% safe installation

LED tubes are the fastest and easiest way to upgrade existing luminaires to LED technology. Installation is 100% safe and 0% hassle with a simple lamp-for-lamp replacement.



IEC 62560:2011 - IEC safety standard for self-ballasted LED lamps for general lighting services

IEC 62776:2014 – IEC safety standard for linear LED retrofit tubes

IEC 63220:202x – LED Light sources – Safety requirements

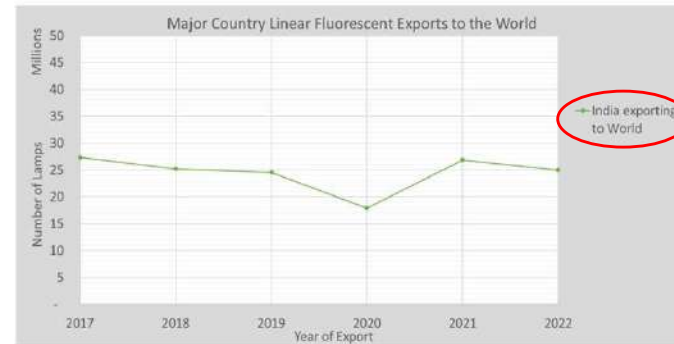
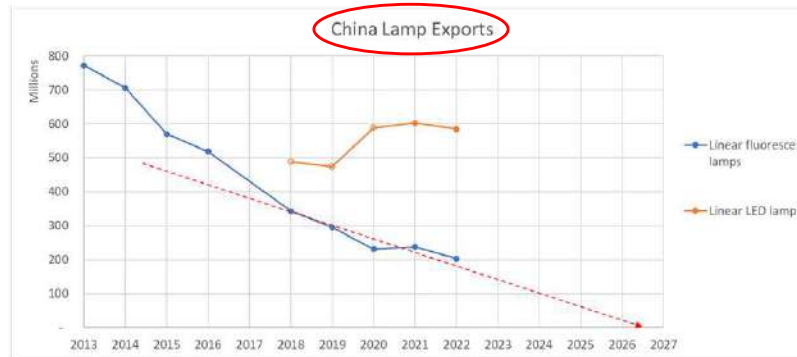
➔ (combines and updates IEC 62560 & IEC 62776)

Who is transitioning to LED tubes – Export & Sales

Minamata Convention sets the date after which the manufacture, import or export of specified mercury containing products shall not be allowed (phase-out date).

So installed linear fluorescent lamps can continue to operate until failure.

Median life of Linear fluorescent lamp is 15,000 to 25,000 hours which at 3,000 hours use per year is a 5 to 8.3 (average 6.65) year changeover by natural attrition.



Who is transitioning to LED tubes – Export & Sales

European Commission: RoHS Directive 2022/284 update

Already **Banned** for sale and import in EU!

- 25 Feb 2023 – CFLni & circular T5 fluorescent lamps
- 25 Aug 2023 – Linear T5 & T8 FL fluorescent lamps



European Commission | English

Energy, Climate change, Environment

Environment

Home > News > Clean and circular electronics: Commission ends use of mercury in lamps as mercury-free alternatives prevail

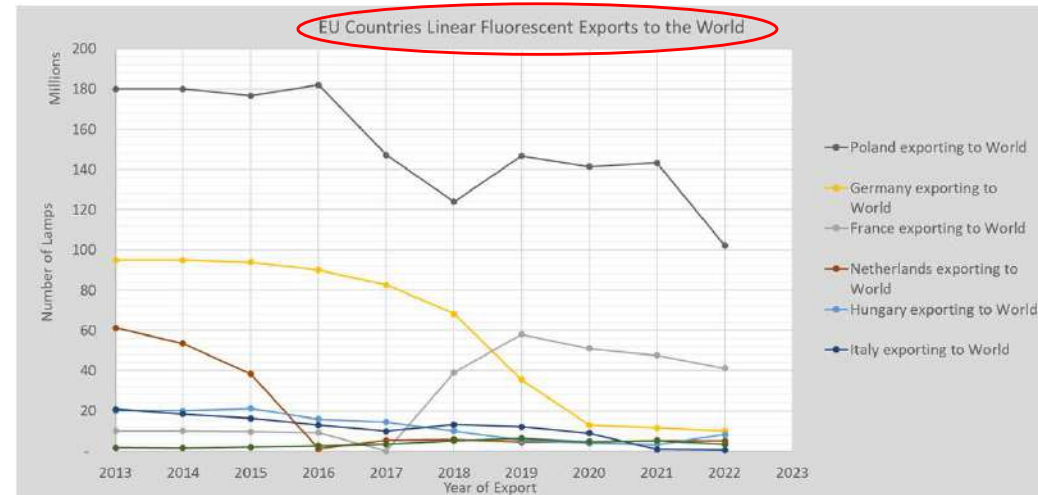
NEWS ARTICLE | 16 December 2021 | Directorate-General for Environment

Clean and circular electronics: Commission ends use of mercury in lamps as mercury-free alternatives prevail

European Commission: Proposed Amdt 2017/852

- Mercury-added product restrictions

Mercury-added products	Date from which the export, import and manufacturing are prohibited
'4a. Triband phosphor lamps for general lighting purposes that are not included in entry 4, point (a).	31 December 2027
4b. Halophosphate phosphor lamps for general lighting purposes that are not included in entry 4, point (b).	31 December 2025
4c. Non-linear triband phosphor lamps.	31 December 2027
4d. Non-linear halophosphate phosphor lamps.	31 December 2025



Thank you





Waste Management Challenges of End-of-Life Fluorescent Lamps

Transitioning to
Mercury-Free
Lighting—

Global Mercury
Partnership Webinar



31 August 2023

Michael T. Bender
--Director, Mercury Policy
Project

--Global Co-coordinator
Zero Mercury Working Group

--Co-lead, Product Partnership

mercurypolicy@gmail.com

**Mercury
Policy Project**

Mercury-added lamp management challenges



- Many mercury lamp release pathways
- Lamps are fragile to handle and pose a risk to workers throughout life cycle
- Compared to the value of the product, relatively high cost for lamp processing
- Low or negative value of recovered material from hazardous lamp waste, are often more costly to manage
- Lack of hazardous waste management infrastructure
- As a result, lamp recycling lags globally

Global Fluorescent Recycling Rates Lag



- 20% of lamps are recycled in Organization for Economic Co-operation & Development (OECD) countries
- 5% in developing countries and
- 0% in the least-developed countries
- Where there is no advance disposal fee or Extended Producer Responsibility, rates of recycling are low
- This is because disposal costs are not included in product purchase

National lamp recycling rates

- Nationally, a small proportion of lamps are recycled:
 - 4% China
 - 9% Japan
 - 28% South Korea
 - 23% in the USA (USEPA 2021e)
 - 11% in Brazil ([Viana et al., 2022](#))
 - 10% Japan([JFS, 2004](#); [Lee et al., 2014](#))
 - 7% Canada ([Zhang et al., 2016](#))
- In Europe, with the WEEE directive for Extended Producer Responsibility (EPR):
 - Less than 40% EU wide

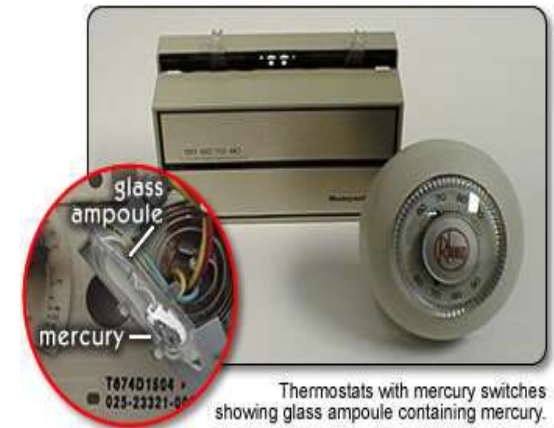


Cost of recycling Hg lamps at permitted facilities

Continent	Est. price per CFL recycled	Est. price per tube recycled	Recycling/disposal method
Central America	1.00 USD	1.25 USD	In country ES disposal
Australia	1.76 USD per kilo	Charge by kilo	Recycled into new product
North America	0.90 USD; usually priced by pound or kilo	0.52 USD; different price for crushed lamps	Recycled into new product; In country ES disposal; Stored
Africa	1.5 USD	2.00 USD	Exported for ES disposal
Europe	2.00/3.00 USD (2007 data)	1.90/2.60 USD (2007 data)	Recycled into new product

Cost comparison of recycling CFL versus mercury thermostat (USA example)

- Mercury amount in one thermostat (4 grams) about same as in 400-500 compact fluorescent lamps (5 milligrams)
- US EPA estimates recycling cost of CFL at 0.50 USD
- US Thermostat Recycling Corporation charges 25 USD recycling fee per container of 100 thermostats, or cost per thermostat at 0.25 USD
- Bottom line: 1600 times more expensive to recycle mercury in a CFL than a thermostat
- <https://www.lamprecycle.org/wp-content/uploads/2014/02/Recycling-Household-CFLs.-10-08.pdf>;
<https://files.dep.state.pa.us/waste/bureau%20of%20waste%20management/wastemgtportalfiles/SolidWaste/HazardousWaste/Universal/trc.pdf>



Mercury content of products/devices

Compact fluorescent lamp	5 milligrams or less
Linear fluorescent lamp	5-10 milligrams
thermometer	500 milligrams
thermostat	4 grams
Sphygmomanometers	50-140 grams
Flow meters	5,000 grams
Barometers	400-620 grams
Manometers	30-75 grams
Pyrometers	5-10 grams
Hydrometers	<1 gram
Psychrometers	<1 gram
Relays	.005->1 gram
Tilt switches	0.5-5 grams
Float switches	0.1-70 grams
Flame sensors	>1 gram

MAP Waste Collection Priorities: Least cost to collect most mercury

- Elemental (liquid) mercury from labs, dental clinics, etc.
- Mercury-added product discards from health care
- Mercury-added switches, relays, pesticides
- Mercury-added street lighting
- Large quantities of linear lamps via reverse distribution systems (ie large office buildings)
- Drum top crushers, mainly for volume reduction of linear tubes, with personal protective equipment and used outdoors

Summary

- Many mercury release pathways for broken lamps
- Lamp breakage presents an exposure risk especially to pregnant women, children, workers/waste pickers
- Without advance disposal fees, ESM & disposal of fluorescent lamps is often cost prohibitive
- Many countries lack hazardous waste infrastructure for environmentally sound collection, storage, transportation, processing and/or disposal
- Managing elemental mercury, other higher mercury added products much more cost effective
- Many, many source reduction benefits from “turning off the mercury tap” in lighting



Thank you



For more information, email: mercurypolicy@gmail.com

**Mercury
Policy Project**






UNEP
GLOBAL
MERCURY
PARTNERSHIP

Thursday 31 August 2023
14:45 – 16:30 CEST

Time for the Q&A Session!

 Use the “**Chat**” to ask technical questions or share views (select the option to “everyone” if you wish to send a chat to all attendees, including panelists).





UNEP
GLOBAL
MERCURY
PARTNERSHIP

Thursday 31 August 2023
14:45 – 16:30 CEST

Closure

Transitioning to mercury-free lighting

Virtual event

In collaboration with the Clean Lighting Coalition and the Zero Mercury Working Group with the support of the Government of Switzerland

