Technical Session

Transitioning to Mercury-Free Lighting in Asia-Pacific Countries

19th and 20th June 2023

Geneva, Switzerland

DAY 2

GLOBAL MERCURY PARTNERSHIP

U4E United for Efficiency

Clean Lighting Coalition

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Federal Office for the Environment FOEN

DAY 2

Tuesday

20th June 2023

09:00	Welcome and agenda for the day
09:10	Africa Region Perspectives on Fluorescent Lighting – Life cycle analysis
10:00	Tools and resources for implementation
10:40	Coffee break
11:00	Success Stories: Phasing Out Fluorescent Lamps from EC, India, Indonesia, Nigeria and Pakistan
13:00	Lunch Break
14:30	Global Policy overview and status
15:00	Coffee Break
15:20	Discussion and conclusions *Moderated discussion*

Africa Region Perspectives on Fluorescent Lighting - Life cycle analysis

Roger Baro, Ministry of Environment, Green Economy and Climate Change, Burkina Faso

Christopher Kanema, Environmental Management Agency, Zambia

Africa Region Perspectives on Fluorescent Lighting

Presentation by:

Roger Baro
Vice-president COP-5 Minamata Convention on Mercury
Ministry of Environment, Water and Sanitation
Burkina Faso

Tuesday, 20th June 9:10 AM (CEST)

Table of contents

Current Situation on Lighting in Africa

- No African manufacturing of fluorescent lamps; 100% imports
- Africa is already rapidly moving towards LED lighting because it is highly cost-effective, with **payback periods of 5-11 months**
- New LED lamp assembly and manufacturing is taking place across Africa; businesses are investing in product lines for LED lamps and luminaires:
  - Savenda Electrical in Zambia
  - Sahasra Electronics in Rwanda
  - Tempest LED Lighting in Mozambique
  - Many LED businesses in South Africa, and more
- An excellent opportunity for local business and entrepreneurs to accelerate markets and invest in manufacturing of LED lighting products
- African nations have to deal with toxic mercury in fluorescent lamps at the end of life, creating a big hazardous waste problem

LED Manufacturing in Zambia

Policy Measures Phasing-Out Mercury-lamps (1 of 5)

- Many governments across Africa are moving to phase-out CFLs and LFLs through energy-efficiency policy measures

- 22 countries participate in UNIDO's "Energy Efficient Lighting and Appliances" project, developing harmonised lighting performance standards for SADC and EAC; phasing-out CFLs and LFLs by minimum efficacy requirements
  - Southern Africa Development Community – 16 countries adopted regionally harmonised quality and performance standard HT 109:2021 in June, shifts markets to all LED
  - East African Community – 7 countries - final draft EAS 1064-1:2022 (N.B., Tanzania is part of both SADC and EAC)

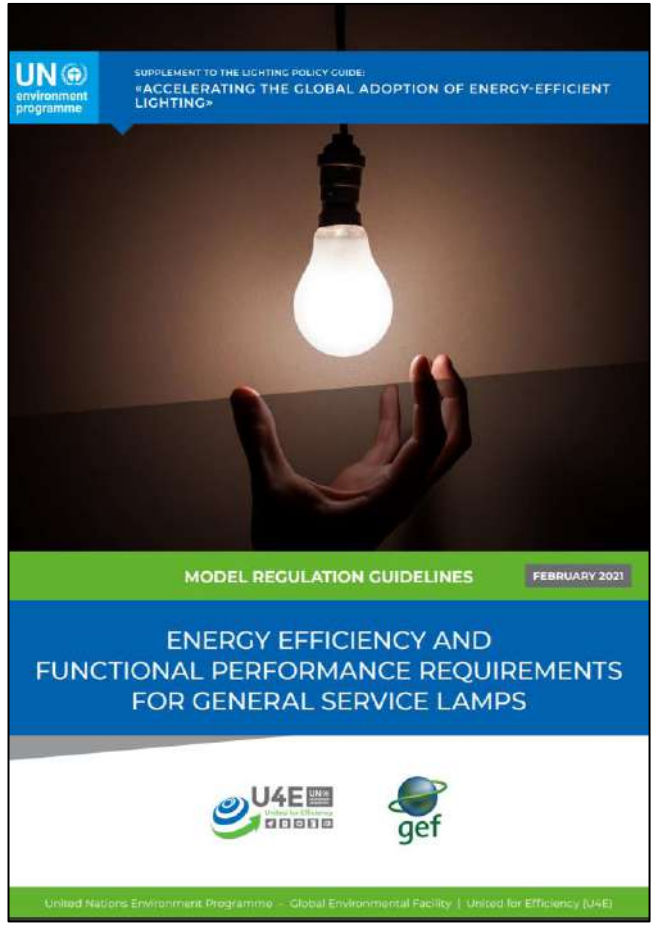
Policy Measures Phasing-Out Mercury-lamps (2 of 5)

- In addition, several countries, such as South Africa, Ivory Coast and Namibia, are updating their national lighting regulations, phasing out fluorescent and transitioning to energy-efficient, mercury-free, LED

- Countries like Burkina Faso, Ghana and Nigeria have strategies to support energy-efficiency under their energy policies

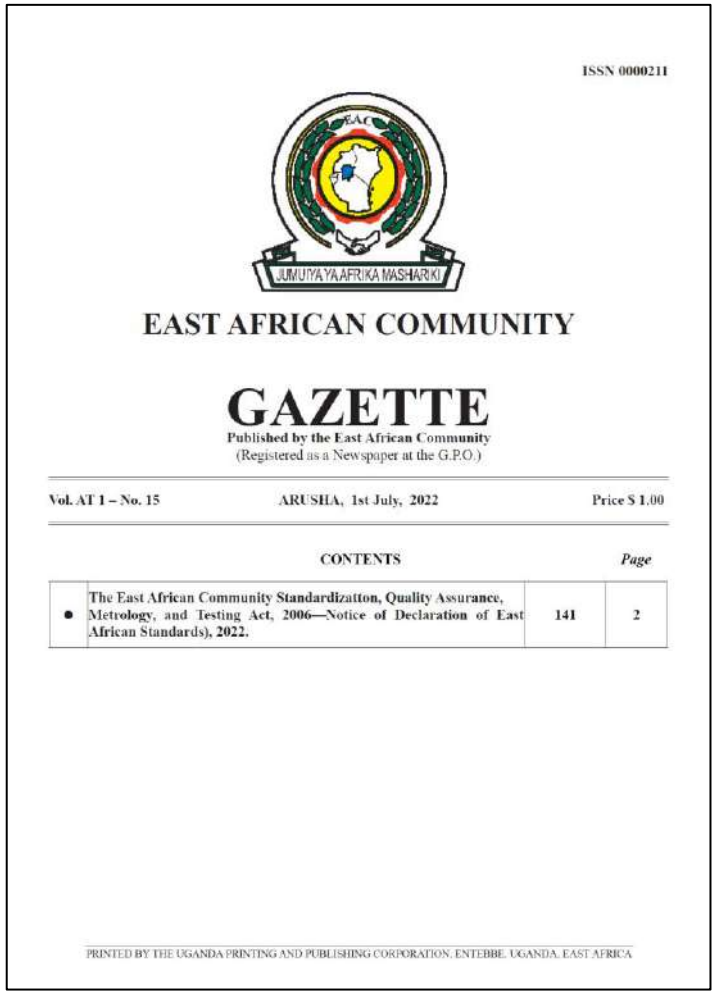
- ECOWAS (15 countries) is working to have regional regulation on energy performance

- Internationally, UNEP's United for Efficiency (U4E) published model lighting regulations that proposes to phase-out all CFLs by January 2023 and all LFLs by January 2025



Policy Measures Phasing-Out Mercury-lamps (3 of 5)

East African Community – New Lighting Regulation



ISSN 0000211

JUMUIYA YA AFRIKA MASHARIKI

EAST AFRICAN COMMUNITY

GAZETTE

Published by the East African Community
(Registered as a Newspaper at the G.P.O.)

Vol. AT 1 – No. 15 ARUSHA, 1st July, 2022 Price S 1.00

CONTENTS Page

•	The East African Community Standardizatton, Quality Assurance, Metrology, and Testing Act, 2006—Notice of Declaration of East African Standards), 2022.	141	2

PRINTED BY THE UGANDA PRINTING AND PUBLISHING CORPORATION, ENTEBBE, UGANDA, EAST AFRICA

- On 1 July 2022, Energy Ministers of 7 East African nations[1] adopted mandatory lighting MEPS for their region
  - EAS 1064-1:2022, Lighting Products - Minimum Energy Performance Standard - Part 1 - Lamps (1st Ed.)
  - EAS 1064-2:2022, Lighting Products - Minimum Energy Performance Standard - Part 2 - Luminaires (1st Ed.)
- Requires full market transition to LED lighting by 2023

6.2.1.1 All lamps covered by this standard shall comply with the minimum luminous efficacy requirement for the entire light source (that is, lamp) set out in Table 1.

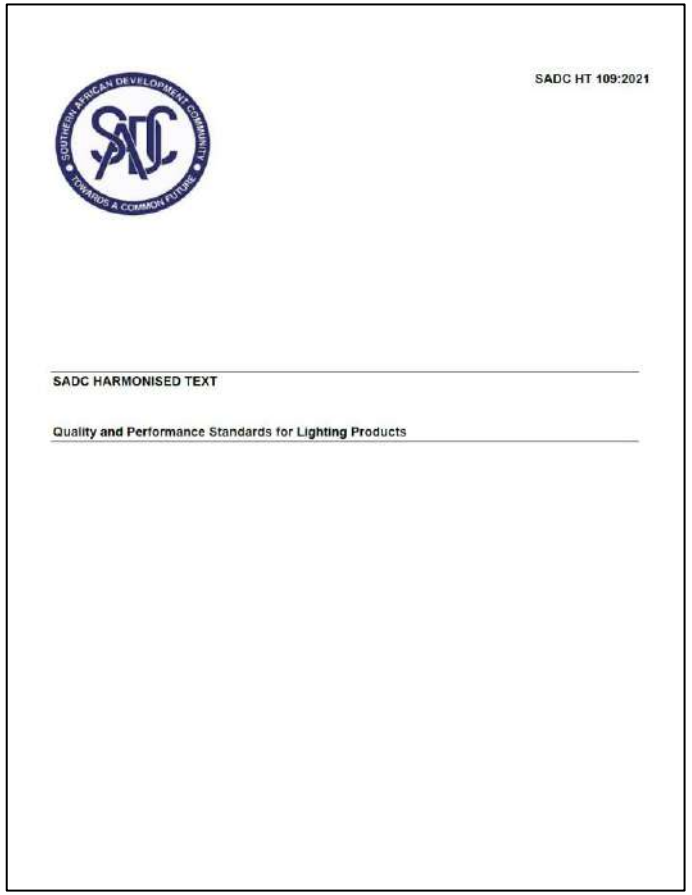
Table 1 — Minimum luminous efficacy of lamps

Type of product	Minimum luminous efficacy (lm/W) Phase 1 – 1 July 2023	Minimum luminous efficacy (lm/W) Phase 2 – 1 January 2025
General service lamps – Non-directional	90	105
General service lamps – Directional	75	85
Tubular lamps	115	130

[1]Seven nations of the EAC: The Democratic Republic of the Congo, the Republics of Burundi, Kenya, Rwanda, South Sudan, Uganda, and the United Republic of Tanzania

Policy Measures Phasing-Out Mercury-lamps (4 of 5)

Southern African Development Community – SADCSTAN


SADC HT 109:2021

SADC HARMONISED TEXT

Quality and Performance Standards for Lighting Products

- On 18 June 2021, the Energy Ministers of the 16 Southern African Development Community[1] adopted a new Harmonised Standard: SADC HT 109:2021
- Similar to East Africa, this standard phases out all conventional lighting, moving the market to LED for lamps and luminaires

4.1 Luminous Efficacy Requirement

All covered lamps and luminaires shall comply with the minimum luminous efficacy requirements for the entire light source (i.e., lamp or luminaire) set out in two phases in Table 1:

Table 1: Minimum luminous efficacy of Lamps and Luminaires

Type of Covered Product*	Minimum luminous efficacy (lm/W)	
	Phase 1	Phase 2
General Service Lamps – Non-Directional	90	105
General Service Lamps – Directional	75	85
Tubular Lamps	115	130
Linear Batten and Troffer Luminaires	105	115
Downlight Luminaires	85	95
High and Low-Bay Luminaires	120	130
Planar (or Panel) Luminaires	85	95
Outdoor / Streetlight Luminaires	105	115

**The scope of coverage of these lamps and luminaires is given in Section 1 of this Standard.*

[1]Sixteen nations of SADC: Angola, Botswana, Comoros, Democratic Republic of Congo, Eswatini, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Tanzania, Zambia and Zimbabwe

Policy Measures Phasing-Out Mercury-lamps (5 of 5)

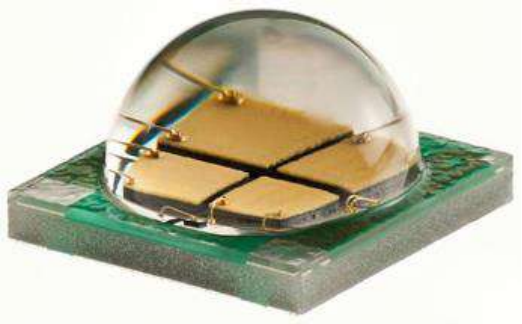
South Africa Case study

- In May 2023, South Africa finalized on new compulsory specifications that will effectively ban sales of regular fluorescent and incandescent light bulbs for general household use
- These new regulations will advance the safety, performance, and energy efficiency of lightbulbs sold in South Africa by eliminating inefficient and environmentally damaging lighting products.
- The LED tube is less expensive than the linear fluorescent lamp on a first-cost basis, so the payback period is instantaneous. Furthermore, the LED lamp consumes half as much power as the fluorescent tube – so electricity bills are halved over the lamp lifetime.
- Switching from fluorescent to an LED retrofit tube will save approximately ZAR 450 over the lifetime of the LED lamp.

Are Mercury-free LED Lamps Cost-Effective ? 1/4

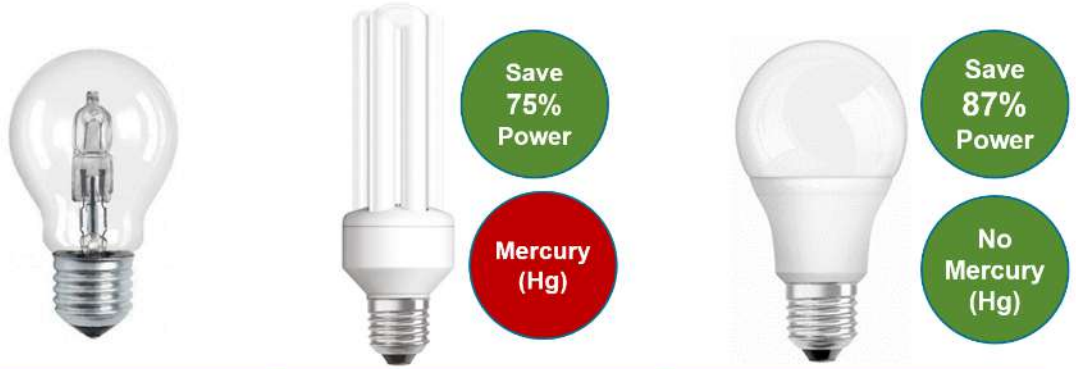
In Africa, LED is found in all Lighting Applications

- **Residential** - household lighting, indoor & outdoor
- **Commercial** – hallway, offices, meeting rooms, architectural, retail / shop, parking, area
- **Industrial** – high-bay, low-bay, process lighting
- **Municipal / Outdoor** – street lighting, walkway, floodlighting, stadium



Are Mercury-free LED Lamps Cost-Effective ? 2/4
❖ Compared to CFLs

- **Yes**, LED lamps are highly cost effective
- Cost-effectiveness is driving the market transition
- In South Africa, payback period is 1-2 months
- Other countries – similar payback periods: Kenya, Madagascar, Uganda, Zambia….
- Least life-cycle cost, LED is:
  - **85% less expensive than halogen**
  - **50% less expensive than CFL**

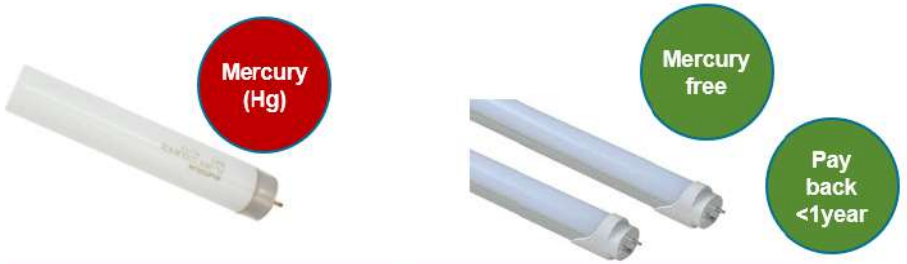


Item	Halogen	CFL	LED
Life	2000 hrs (2 yrs)	6000 hrs (6 yrs)	15000 hrs (15 yrs)
Price each*	21.99 Rand	29.99 Rand	29.99 Rand
Power	60 W	15 W	8 W
Use (3hr/day)*	65.7 kWh/yr	16.4 kWh/yr	8.8 kWh/yr
Elec cost.*	82.10 Rand/yr	20.50 Rand/yr	11.00 Rand/yr
10-year cost	953.20 Rand	265.30 Rand	139.50 Rand
Payback period		7 weeks	6 weeks

** Lamp prices from Pick n Pay in Rosebank, 26 Oct 2018. All regular prices, no special offers or discounts. Usage assumptions are: 3 hours/day, 365 days/year. Electricity is R 1.25/kWh.*

Are mercury-free LED Cost-Effective ? 3/4
❖ Compared to LFLs

- **Yes**, LED lamps are highly cost-effective replacements for Linear Fluorescent Lamps (LFLs)
- Cost-effectiveness drives the market transition to LED
- In South Africa, payback period is 10 months; you spend **70 Rand today to save 800 Rand** on the cost of light
- In Uganda the payback is 5 months
- T5 payback periods are longer, but this lamp isn't common in Africa
- Least life-cycle cost, LED retrofit tubes are:
  - **50% less expensive than LFL**

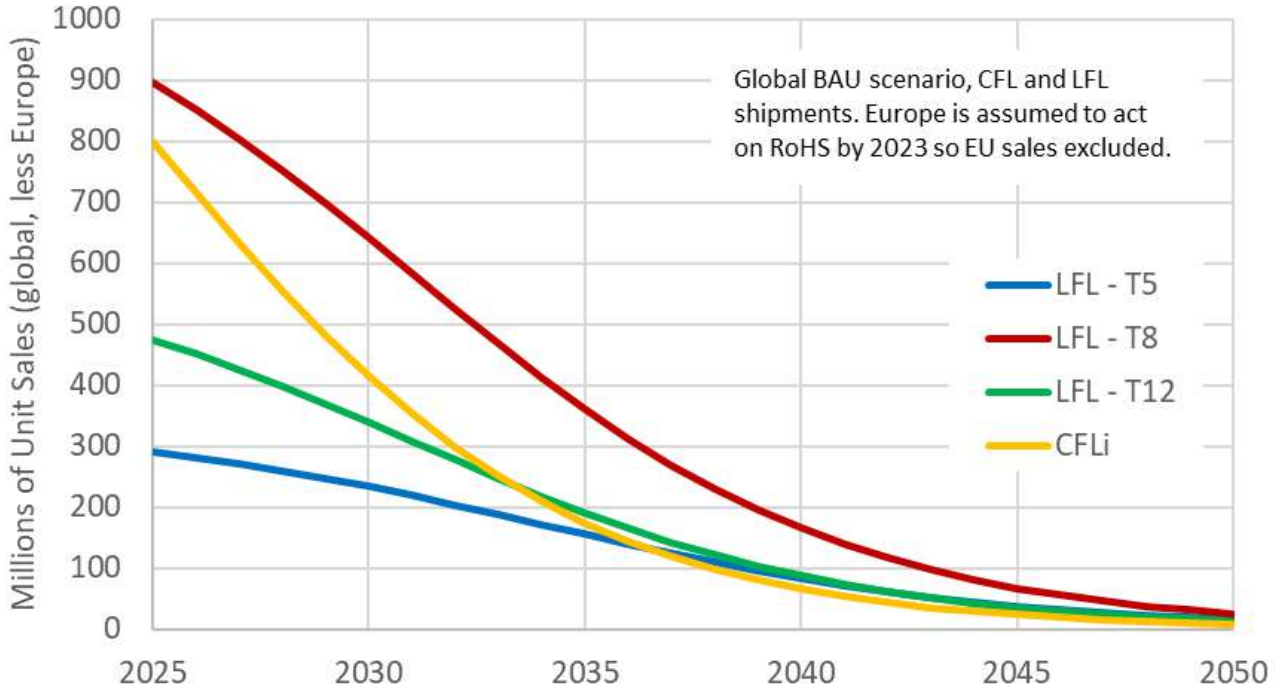


Item	Linear Fluorescent Lamp	Equivalent LED Retrofit
Life	16000 hrs	40000 hrs (~11 years)
Lamp Price*	**R 49.00**	**R 119.00**
Power	36 W	18 W
Use (10 hr/day)*	131 kWh/yr	66 kWh/yr
Elec cost.*	R 164.25/yr	R 82.13/yr
10-year total lighting cost	R 1600	R 862
Payback period		10 months

** Lamp prices for fluorescent and LED lamp collected 8 September 2020. Usage assumptions are: 10 hours/day, 365 days/year. Electricity is R 1.25/kWh. 7% discount rate.*

Are mercury-free LED Cost-Effective Compared 4/4?

❖ Savings come from Avoided Shipments of Fluorescent Lamps



- Graph of projected global sales of mercury-containing fluorescent lamps in a ‘no policy scenario’ (business as usual)

- Global sales of fluorescent are declining as users switch to LED, but still **14.8 billion fluorescent lamps** will be sold and installed if the Minamata Parties do not take action at COP5

Rationale for an ALL-Fluorescent lamps phaseout

- Economic: higher energy prices mean payback periods are even shorter
- Technical: LEDs are compatible and directly retrofittable into existing luminaires
- Market: we learned that LED retrofits and alternatives are widely available in Africa and globally
- Non-hazardous: LEDs do not contain any mercury (all fluorescent lamps contain mercury)
- Power demand: certain countries in Africa have electricity shortages; LEDs use half the power of fluorescent lamps

Conclusion: What does phasing-out fluorescent lighting mean for the world?

- According to experts, global benefits are significant (cumulative 2024-2050):
  - 232 tonnes of mercury usage reduction
  - 3.5 Gigatonnes of CO_2 emissions reductions
  - US$1 trillion in electricity bill savings

•Avoiding any delay to the phase-out dates will be key, as over 1 billion lamps are sold each year (declining sales)

Africa's Steps to Phase Out Fluorescent Lighting

Presentation by:

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

Tuesday, 20th June 9:10 AM (CEST)

Table of Contents

Mercury Waste Accumulation

Environmentally safe disposal of mercury-wastes is not occurring in many parts of the world.

"'Environmentally sound management of hazardous wastes or other wastes' means taking all practicable steps to ensure that hazardous wastes or other wastes are managed in a manner which will protect human health and the environment against the adverse effects which may result from such wastes" – Basel Convention

Challenges of Fluorescent Lamps Disposal in Africa 1/3

- Lack of facilities for ESM
- Waste is mixed and not sorted – leads to landfill and burning trash with mercury
- Issue with ESM storage of mercury
- Devaluation and expense of recycling
- Public unawareness of proper disposal
- Lack of accessibility for proper disposal

Challenges of Fluorescent Lamps Disposal 2/3

- Mercury containing products such as fluorescent lamps exacerbate the challenge of mercury contamination in landfill and waste sites due to improper disposal.

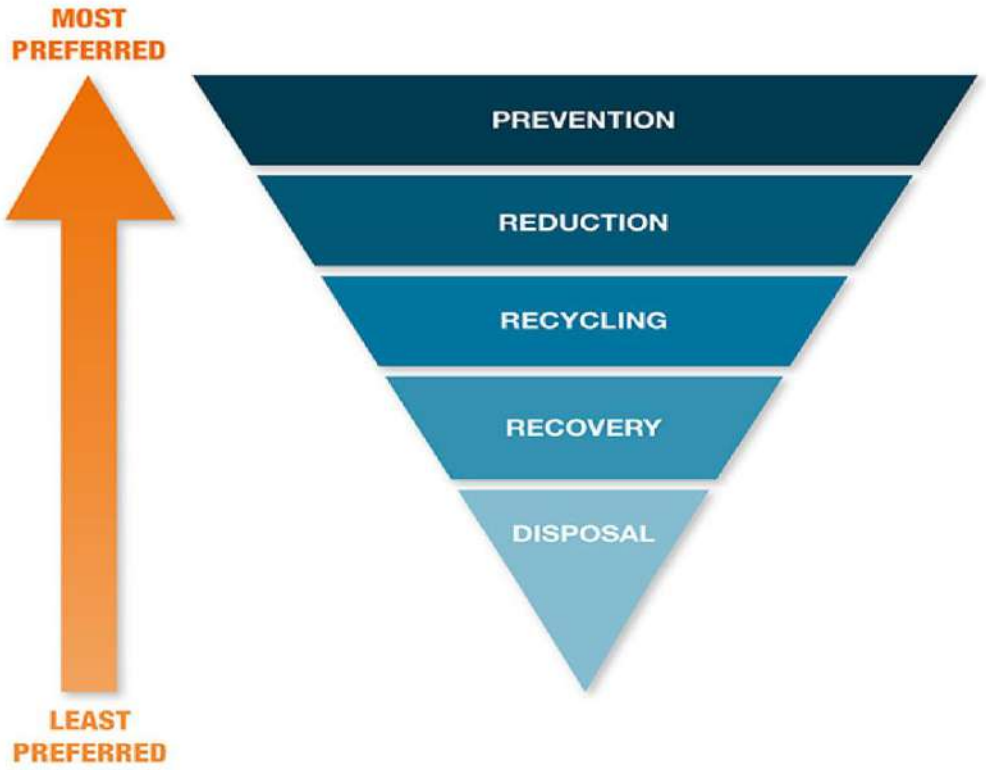
- Poor conduct and inappropriate disposal methods exercised during the handling and disposal of hazardous wastes are increasing significant health hazards and environmental pollution due to the harmful nature of the waste.

Challenges of Fluorescent Lamps Disposal 3/3

Inadequate interim storage facilities

Lack of sorting mechanism for mercury waste

Source Reduction



Best practice in managing waste from Mercury Added Products in developing countries is source reduction

Benefits from Phasing Out FLs?

- Removing FLs from the market eliminates this risk of mercury exposure and releases to the environment
- No more breakage risk in homes, schools, all buildings
- Only a small percentage of FLs are disposed of safely, virtually all mercury ends up in the environment
- FLs are like importing a toxic substance that then becomes hazardous waste and liability for governments

Does the Phasing-Out of FLs Increase FLs Disposal?

- The phase out applies to lamps imported, exported or manufactured – not lamps already installed in buildings
- Once the installed lamps stop working, they will would replaced with LED
- Thus, waste production will not increase, it will simply reduce as more LEDs enter the market
- Let us not mix the two issues: the challenges with waste management and the need to phase-out toxic FLs
- Governments can set-up temporary collection and recycling schemes, ending in 2030 (LFL life ~ 5 years)

The Transition to LED Lighting is Necessary and Inevitable

- The world is moving to LED lighting – LED global market share shifted from 5% in 2013 to more than 50% in 2021 (IEA)

- Some suppliers continue selling old technology as long as possible for profit-motivated reasons over equity, consumer cost, and environmental impact

- Policy is the best solution to resolve this issue

Equity and Anti-Dumping

- Developing countries are at risk of becoming dumping grounds for mercury-containing fluorescent lamps that no longer have viable markets in the OECD
  - Europe will have phased-out all fluorescent lamps by September 2023
  - Other countries are looking at phasing-out dates between 2023-2025

- End-of-life hazardous lamp management remains a major concern in developing countries, including waste separation and collection, transport, mercury recovery and disposal

- Cost-effective, mercury-free, energy-efficient alternatives exist now – it's time to act

Africa Lighting Amendment for COP4

In April 2021, African Parties to Minamata proposed to *phase-out* fluorescent lamps:

- Integrally ballasted CFLs (**CFL.i**) by the end of **2024**
- Linear fluorescent lamps (**LFL**) by the end of **2025** (only some categories of LFLs)
- **CCFL and EEFL** by the end of **2024**

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 with an integrated ballast (CFL.i) for general lighting purposes that are ≤ 30 watts	2024
Linear fluorescent lamps (LFLs) for general lighting purposes, (a) Triband phosphor ≤ 60 watts; (b) Halophosphate phosphor ≤ 40 watts	2025
Cold cathode fluorescent lamps (CCFL) and external electrode fluorescent lamps (EEFL) for electronic displays of all lengths.	2024

Link: https://www.mercuryconvention.org/en/documents/proposal-africa-region-amend-annex-part-i-and-annex-part-ii-minamata-convention-mercury

Africa Lighting Amendment for COP4

At COP4, Contact Group Annexes A & B – Agreed and Amended

- Amended Part I of Annex A to the Minamata Convention on Mercury as set out in the table on the right
- **Amendments proposed by the African region that were are adopted are shown in grey shading**

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 with a mercury content exceeding 5 mg per lamp burner	2020
Compact fluorescent lamps with an integrated ballast (CFL.i) for general lighting purposes that are ≤ 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 < 60 watts with a mercury content exceeding 5 mg per lamp; (b) Halophosphate phosphor ≤ 40 watts with a mercury content exceeding 10 mg per lamp	2020
High pressure mercury vapour lamps (HPMV) for general lighting purposes	2020
Mercury in cold cathode fluorescent lamps and external electrode fluorescent lamps (CCFL and EEFL) for electronic displays: (a) short length (≤ 500 mm) with mercury content exceeding 3.5 mg per lamp (b) medium length (> 500 mm and ≤ 1 500 mm) with mercury content exceeding 5 mg per lamp (c) long length (> 1 500 mm) with mercury content exceeding 13 mg per lamp	2020
Cold cathode fluorescent lamps (CCFL) and external electrode fluorescent lamps (EEFL) of all lengths for electronic displays, not included in the listing directly above	2025

Contact Group Annexes A & B – Held for COP5

- 136 governments were ok to phase out Linear Fluorescent Lamps by 2027, but this decision was not taken and instead, postponed to COP5 in Geneva (October-November 2023)

- The proposed amendments are shown in grey shading, and the phase-out years that were discussed at COP4 are shown in brackets [ ].

5. *Decides* to consider at the fifth meeting of the Conference the following phase-out dates for Part I of Annex A;

Mercury-added products	*Date after which the manufacture, import or export of the product shall not be allowed (phase-out date)*
Linear fluorescent lamps (LFLs) for general lighting purposes: (a) Halophosphate phosphor ≤ 40 watts with a mercury content not exceeding 10 mg per lamp (b) Halophosphate phosphor > 40 watts	[2025] [2027] [2030]
Linear fluorescent lamps (LFLs) for general lighting purposes: (a) Triband phosphor < 60 watts with a mercury content not exceeding 5 mg/lamp	[2027] [2030]

Why is Africa Keen on a Phase Out of All Fluorescents?

1. **There are cost-effective mercury-free alternatives for all fluorescent lighting applications.** Readily available LED retrofit lamps will enable countries to avoid the unnecessary risk of exposure to toxic mercury.
2. **Reinforcing COP4 decisions to phase out some categories of fluorescent lamps**
3. **Augmenting policy efforts in different parts of the world to phase out fluorescent lighting**
4. **Equity and anti-dumping consideration.** Developing countries are at risk of becoming dumping grounds for mercury-containing lamps.
5. **Used fluorescent lamp collection schemes are costly and ineffective.** The easiest way to eliminate this source of toxic mercury contamination of our municipal waste streams is to stop installing fluorescent lighting in our offices and homes.
6. **Responding to the Climate Emergency**. According to UNFCCC scientists, the world is entering a climate emergency.
7. **Households and businesses are experiencing a Cost-of-Living Crisis**. The cost of living has significantly gone up. Transition to energy-efficient mercury-free lighting is a way to divide lighting electricity bills in half.

THANK YOU!

MAKE
MERCURY
HISTORY

Tools and resources for implementation

Fred Bass, Independent Consultant, Bass Lighting
Soledad Garcia, the United for Efficiency (U4E) initiative, UNEP

Sustainable "Eco-Efficient" Energy Systems

Market Transformation to highly Energy Efficient Lighting, Appliances and Equipment

Soledad Garcia, UNEP U4E Project Coordinator

Supporting Countries to Save 20% of their Electricity

By accelerating the Global Transition to **much more energy efficient lighting and appliance technologies** by strengthening country capacities around the world, as well as ensuring environmentally sound management practices. Building synergies among stakeholders, sharing knowledge and information, helping create strategic policy and regulatory frameworks, and addressing technical and quality issues.

Electric Motors Systems

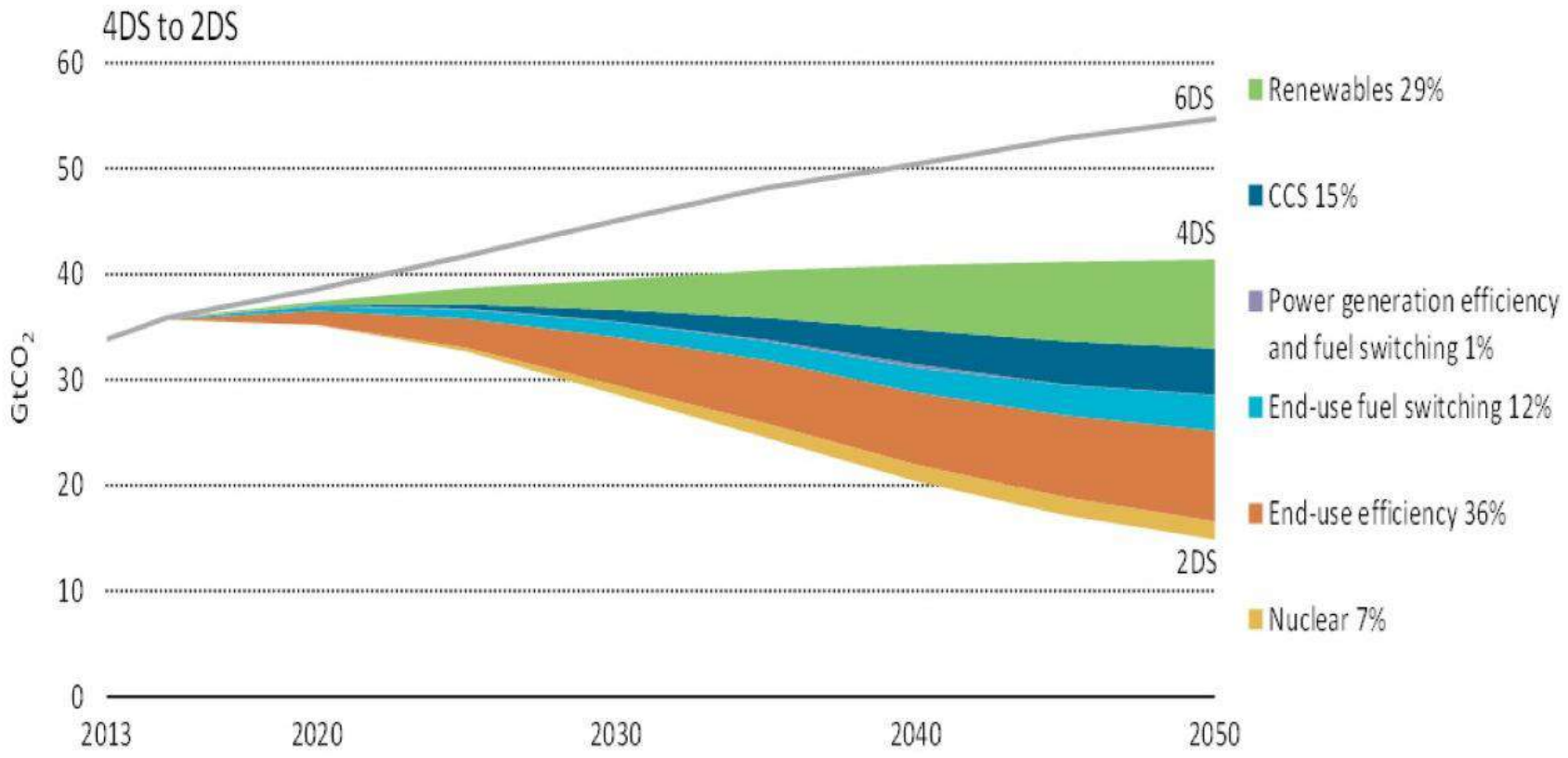
Outdoor and Indoor Lighting and controls

Domestic and Commercial Refrigerators

Room Air Conditioners

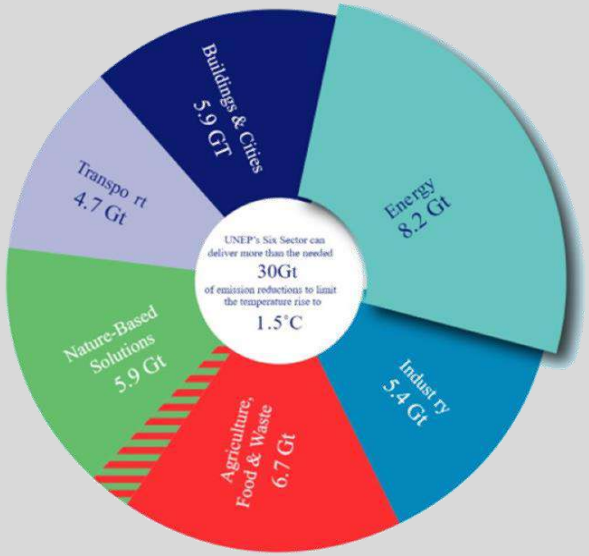
Power Distribution Transformers

The Largest GHG Reductions to get to 2 Degrees need to come from End Use Energy Efficiency and Renewables

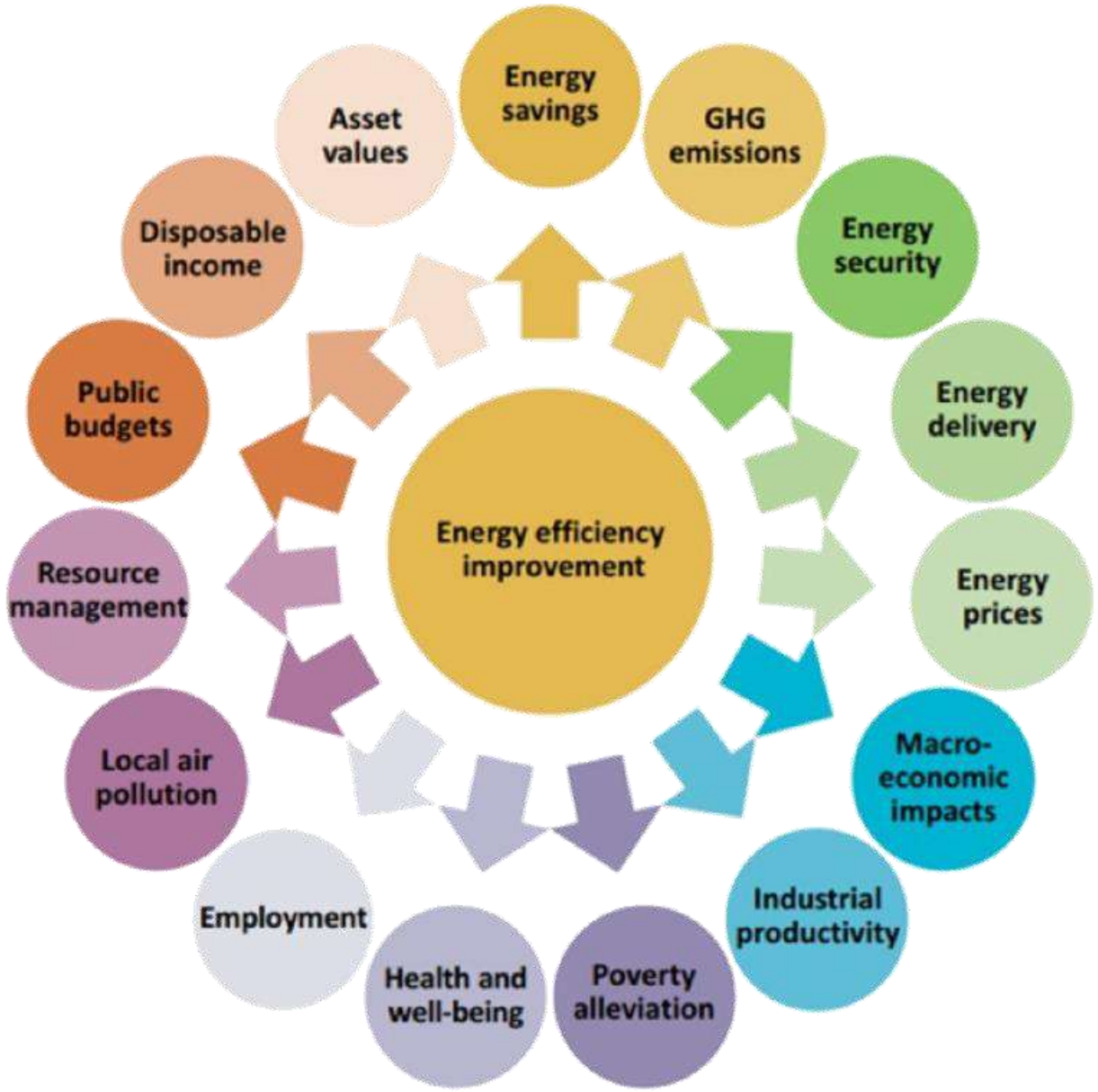


Source: IEA *Energy Technology Perspectives*

In the energy sector, we can cut **12.5 gigatonnes** (Gt) greenhouse gas emissions annually. No need to wait for new inventions

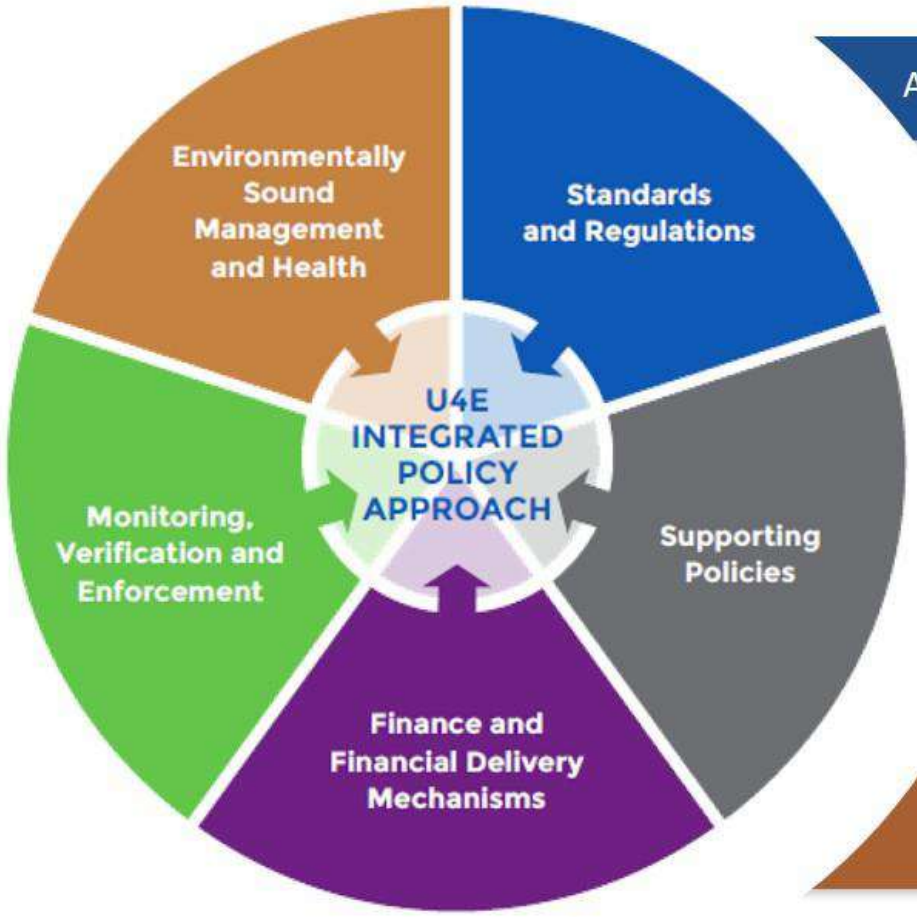


Multiple Benefits of Energy Efficiency



How do we fulfill our Mission?
Strategic 5-year Integrated Policy Approach Programmes do work

U4E implements a proven, effective approach to an accelerated, sustainable transformation.



Adopt minimum energy performance and internationally-recognized test standards

Ensure effective labels are in place and that appropriate consumer information and advice is available

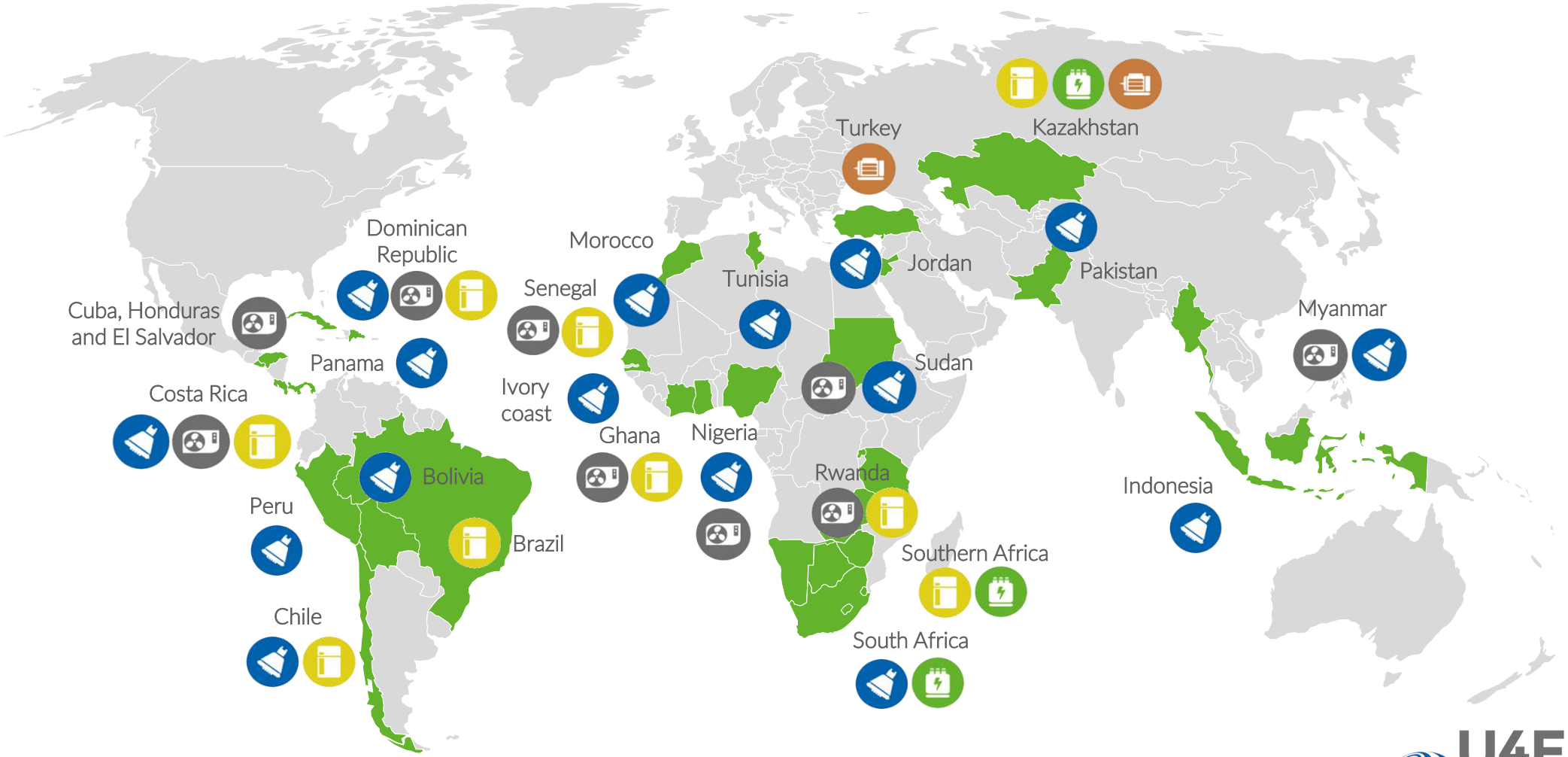
Consider a blend of financing mechanisms and incentives to help offset the incremental costs of energy-efficient products

Include legal authority, enforcement powers, capacities and penalties in the national legal and enforcement frameworks;
Use a product registration system as an initial compliance gateway

Provide for Materials Recovery (e.g. glass, ferrous and nonferrous metals and phosphors including any mercury in lamps and refrigerant gases).

Market Transformation on the ground

U4E National Projects



U4E United for Efficiency

U4E Partner Organizations

MANUFACTURERS & INDUSTRY ASSOCIATIONS

OSRAM, SANHUA, International Copper Association – Copper Alliance, GREE, Electrolux, mabe, B/S/H/, arçelik, Whirlpool Corporation, signify, ABB

TECHNICAL ORGANISATIONS & INITIATIVES

BERKELEY LAB, olade, Copenhagen Centre on Energy Efficiency – SE4ALL EE HUB, SACREEE – SADC Centre for Renewable Energy & Energy Efficiency, RCREEE – Regional Center for Renewable Energy and Energy Efficiency, EACREEE – Building a Sustainable Energy Future, giz, clasp, African Energy Commission, NRDC, GELC, CARBON TRUST, IIEC – International Institute for Energy Conservation, BASE, AMBILAMP, ASEAN Centre for Energy – ACE, topten, EESL, 4E, NIS

FUNDERS, FINANCIERS & IMPLEMENTING AGENCIES

UN environment – United Nations Environment Programme, UNDP, gef, KIGALI – COOLING EFFICIENCY PROGRAM, GREEN CLIMATE FUND, Department for Environment Food & Rural Affairs, GLOBAL CLIMATE PARTNERSHIP FUND – managed by responsAbility, Banque Africaine de Développement – African Development Bank, Sida – Swedish International Development Cooperation Agency, DEVELOPMENT BANK OF RWANDA – www.brd.rw, BRD – We empower you

STANDARDS, LABELLING, GREEN PUBLIC PROCUREMENT AND MARKET BASED INCENTIVES WORK

Energy Efficiency of Products in the Market

Offer incentives support the adoption of the best products (e.g. rebates, financing, bulk procurement)

Promote efficient products (e.g. labels and awareness campaigns to help buyers understand EE benefits)

Minimum Energy Performance Standards (MEPS) ban the worst products

Monitor the market for MEPS compliance, test the products and enforce the rules

+

ESM for Recycle & dispose old products in a sustainable way

UNEP U4E Energy Efficiency Programme

5 to 10 year Programme for achievining robust and sustainable Market Transformation

1. Policy, Standards and Regulations.

- National/regional market and policy assessment
- Enforcement of National/Regional Energy Efficiency Strategy.
- Implementation of MEPS policy/ technical regulations.
- Application of technical requirements for sustainable/green public procurement for state and semi state institutions.
- Reach agreement with national relevant stakeholders
- Capacity Building to policy decision makers.

GO

2. Supporting Policies

- Enfrocement of Labelling schemes.
- QR code and quality/validation Stickers/stamps.
- Communication / aware raising campaigns.

3. Monitoring, Verification and Enforcement (MVE).

- Assessment of MVE practices and Testing facilities.
- Enhanced/enforcement of national MVE practices harmonized with those in the region.
- National laboratories strengthened/deployment.
- Definition of national Testing Standards and product certification.
- Update of HS Codes harmonized with those in the region.
- Implementation of Product Registration Systems.
- Capacity building to testing technician, customs officials, supervisory agencies and market surveillance authorities.

4. Financial Mechanisms

- On wage, On Bill financing scheme
- Bulk Procurement
- Risk loan guarantee mechanism.
- Replacement Programmes

5. Environmental Sound Management

- Assessment of CRSO systems and Waste treatmente facilities.
- Enhance/deployment of operative Collection and Disposal Systems.
- Implementation of Extended Producers Resposanbility or Environmental taxes.
- Legal ESM frameworks.

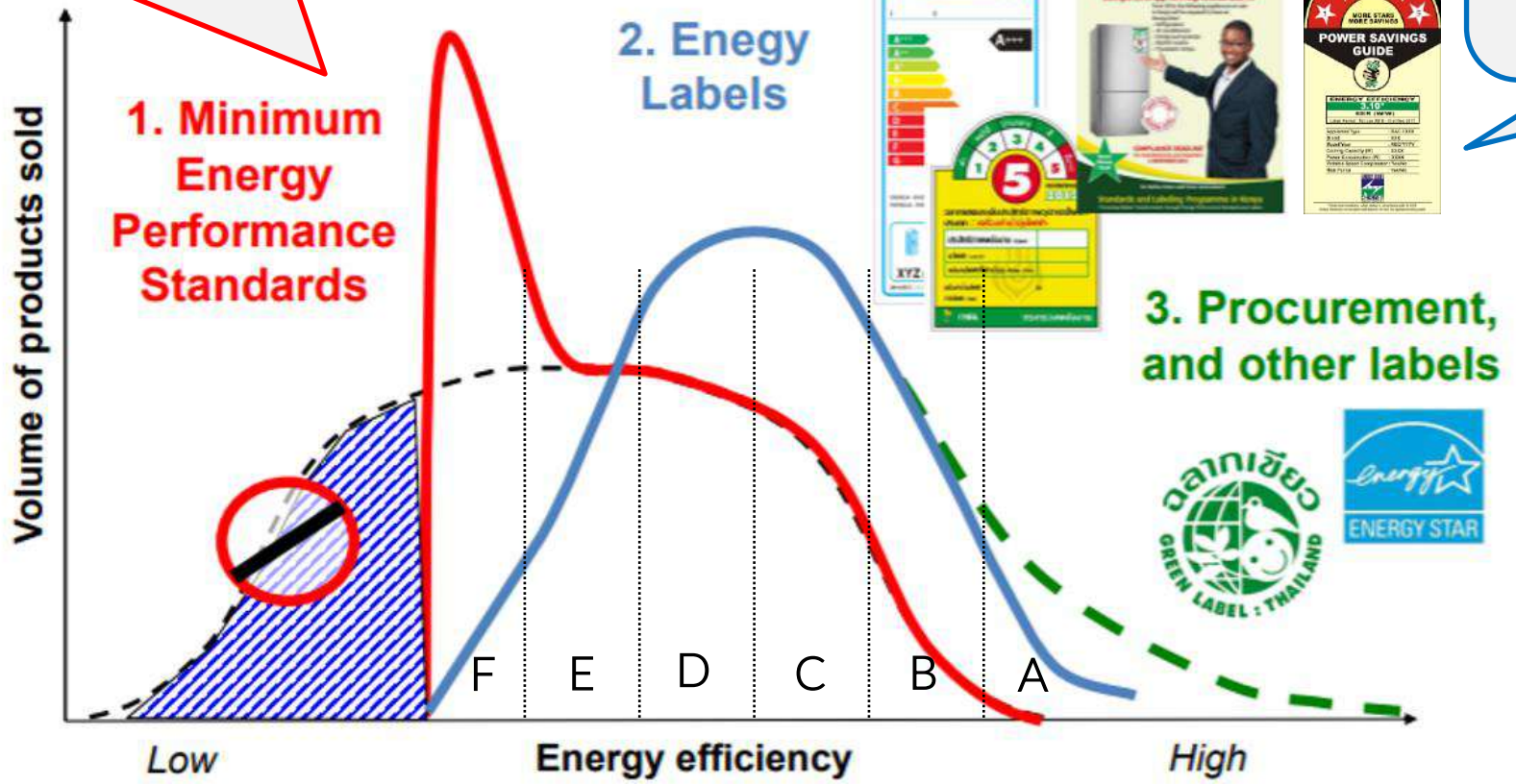
MARKET TRANSFORMATION

U4E United for Efficiency

Policy Matters: MEPS, HEPS and Labels, the framework

RAISE THE FLOOR!
MEPS eliminate products that are obsolete or inefficient from the market and "PUSHES" manufactures to produce more efficient lighting, appliances and equipment.

RAISE THE CEILING!
Stimualte consumer demand for energy efficiency products by provideing information to the end user to make informed purchasing decisions.



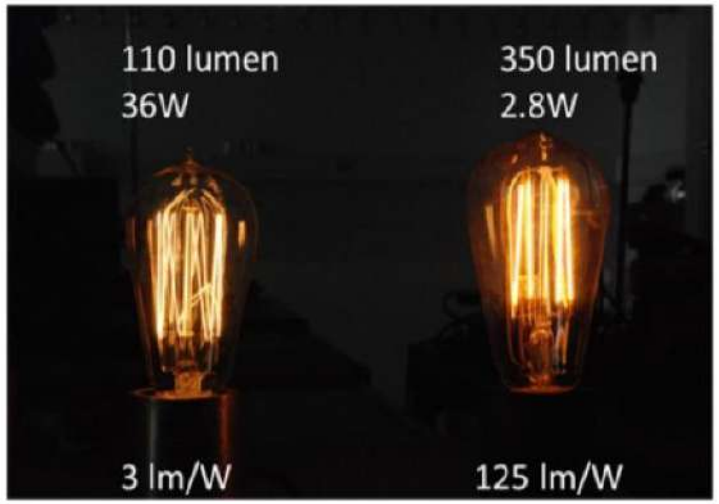
RAISE THE CEILING FURTHER!
Ambitious performance and eco-design to leverage public purchasing power to drive the national market.

U4E United for Efficiency

Technology Matters

New <u>Ultra-Efficient Lighting</u> Now Available Commercially – 50 Year Product Lifetime, 50%+ more in Electricity Savings

Incandescent (vintage) vs filament-LED



A factor of 40!

+ Smart Lighting Controls - A factor of 80 !

Efficacy 210 lm/W ; Lifetime 50 000 h

Efficacy 210 lm/W; Lifetime 100 000 h

Efficacy 210 lm/W ; Lifetime 30 000 h

Policy Matters: MEPS, HEPS and Labels, the framework

Challenges

- ✓ **Lack of knowledge of own local and regional market.**
- ✓ **Unawareness of the products/technologies yet globally available** in the market.
- ✓ Wrongly **considering that the market will regulate itself** without the need to introduce performance standards or policies.
- ✓ Lack of **information at the continental and regional levels** that compares the different normative status, level of regulations, level of MEPS and efficiency classes among countries.
- ✓ **Absence of harmonized regulations** among countries and lack of framework that foster it.
- ✓ **No reference** to update policies regularly.
- ✓ **Technical limitations** to respond to common questions, such as:
  - What is the scope of products that have to be included in the norm/regulation?
  - What are the parameters and metrics that I should use to assess the energy efficiency of products?
  - What are the test methods that I should use/reference to measure energy consumption?
  - What is a good level of efficiency to be used as MEPS and HEPS for Public Procurement?
  - What should be the efficiency levels that define the efficiency classes on the label?

The U4E Model Regulation Guidelines and SPP Technical Specifications can help regulatory authorities and policy makers with some of these questions and concerns

U4E United for Efficiency

Model Regulation Guidelines:

Objective

- → **Reference baseline document for setting efficiency levels and other quality parameters**, design in such a way that can be readily implemented as a National regulation or taken as reference for MEPS/Labels update.
- → Simplify the **adoption of new robust regulation /enhance** existing one in terms of MEPS and Labels for developing and emerging economies.
- → Guidance on setting a **minimum efficiency energy floor**, but also **define other key performance requirements simultaneously** (eg. **Zero Mercury requirement** in line with Minamata Convention on Mercury, GWP refrigerants for cooling products).
- → Reference **best practices** and **tap into global policy and technology trends** to catalyze product innovation, and give consumer more choices.
- → **Harmonize requirements** to reduce trade barriers and unlock economies of scale to make products more affordable

A range of stakeholders, including governments, manufacturers, technical institutions and environmental groups have contributed to their development.

Policy Matters: MEPS, HEPS and Labels, the framework

Example from Morocco

Model Regulation Guideline 2018

Luminous flux (lm)	Year 1	Year 2	Year 3	Year 4	Year 5
60 ≤ Φ < 600	10	10	50	60	85
600 ≤ Φ < 1200	15	55	55	75	110
1200 ≤ Φ ≤ 3300	60	60	60	80	160

++

LED

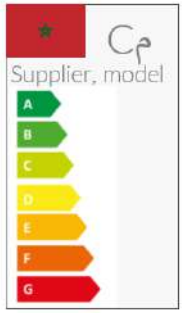
CFL

Incandescent

Policy Matters: MEPS, HEPS and Labels, the framework

Example from Morocco

Classe	Maroc	UE
A	$130 \leq \eta_{TM}$	$210 \leq \eta_{TM}$
B	$85 \leq \eta_{TM} < 130$	$185 \leq \eta_{TM} < 210$
C	$60 \leq \eta_{TM} < 85$	$160 \leq \eta_{TM} < 185$
D	$50 \leq \eta_{TM} < 60$	$135 \leq \eta_{TM} < 160$
E	$30 \leq \eta_{TM} < 50$	$110 \leq \eta_{TM} < 135$
F	$15 \leq \eta_{TM} < 30$	$85 \leq \eta_{TM} < 110$
G	$10 < \eta_{TM}$	$85 \leq \eta_{TM}$



Model Regulation Guideline 2018

Luminous flux (lm)	Year 1	Year 2	Year 3	Year 4	Year 5
$60 \leq \Phi < 600$	10	10	50	60	85
$600 \leq \Phi < 1200$	15	55	55	75	110
$1200 \leq \Phi \leq 3300$	60	60	60	80	160

Flux lumineux en lumen (lm)	**Année 1**	**Année 2**	**Année 3**	**Année 4**	**Année 5**
$60 \leq \Phi < 600$	G	G	D	C	B
$600 \leq \Phi < 1200$	F	D	D	C	B
$1200 \leq \Phi \leq 3300$	C	C	C	C	A

Sustainable Public Procurement Guidelines

Objective

- **Intended for:** Public Procurers, Lighting and Cooling Technical Personnel, Policy Makers and related officers involved in procurement activities.
- **Scope**

Lighting

Office/large buildings lighting (LED luminaires and LED tubes) and all street/outdoor lighting luminaires.

Refrigerator appliances

Domestic refrigerators and freezers, commercial/ professional refrigeration appliances, vending machines and laboratory grade refrigerators.

Room air conditioners

Portable air conditioners, split air conditioners (single and multi-split), window air conditioners and ducted air conditioners.

- **Additional U4E Resources for GPP:**
  - ✓ **Toolkit:** Key sustainable considerations (environmental, social and economic), current barriers for its deployment (financial, awareness, capacity and regulatory), Economic analysis of delivery models and overall recommendations for the tendering process.
  - ✓ **SPP Excel Spreadsheet Tool:** Compares the economic cost and environmental impact of different bids during the life span of the appliances. SPP minimum requirements on energy efficiency and refrigerant GWP can be used to easily check the compliance of each bid.

Other U4E Tools and Resources

Country Saving Assessment

- Provides information on the savings potential of implementing a transition to energy efficient lighting, appliances and equipment
- 156 developing countries and emerging economies have been assessed under the U4E Country Saving Assessments
- Explore for each country on: *https://united4efficiency.org/countries/country-assessments/*

Product Registration System

- Prototype product registration system which is an off-the-shelf tool that can be tailored to a countries individual needs and the complementary regional product database that can facilitate regional sharing of market and compliance information.
- Guidance and notes about PRS to provide guidelines to countries in building their own system.
- More information at: *https://united4efficiency.org/product-registration-systems/*

Policy and Supporting Guidelines

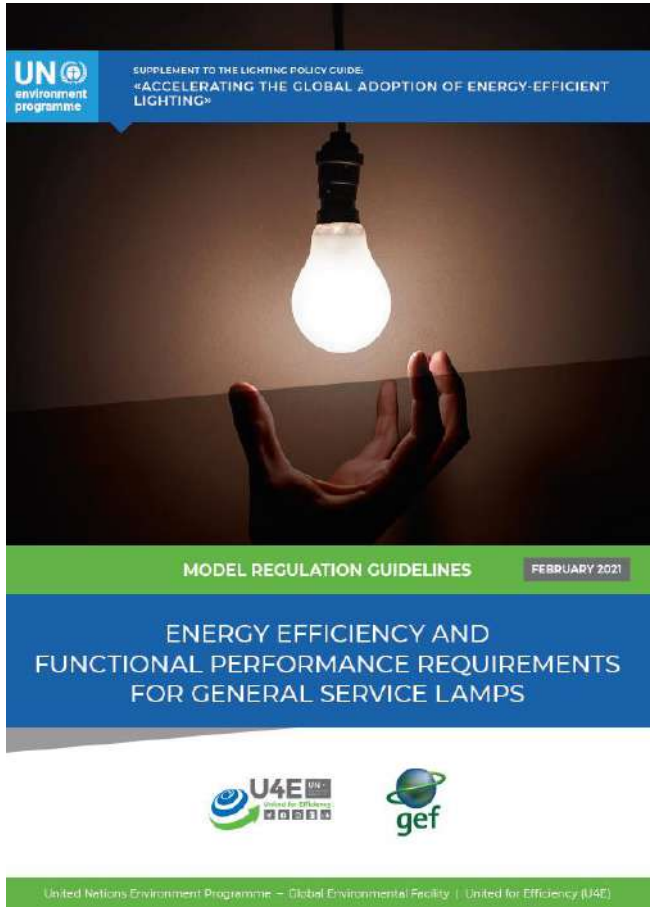
- Complementary guides on fundamental elements for a successful market transformation, such as Energy efficient labels, Market Assessment, Financial Mechanisms, Policy Guides, MVE, etc.
- More information at: *https://united4efficiency.org/resources/publications/*

U4E´s Model Regulation & Green SPP Technical Specifications for Energy Efficient Lighting

Model regulation guidelines for General Service Lamps

General Service Lighting – model regulation guidelines (revised)

- **Revised MEPS drive the use of even more efficient LED GSL.**
  - Revision of the 2018 edition, reflecting the improvement in LED sources.
  - MEPS levels eliminate Compact Florescent and focus on more efficient LED.
  - Simplified structure but same scope as first edition.
  - 2023 suggested as latest introduction date.
- **Other criteria**
  - Minimum lumen maintenance defined as part of an early failure test to make sure life long enough for GSL normal use.
  - Basic requirements for low flicker to protect the health of the end user.
  - Zero mercury required, aligned with the objective of the Minamata Convention on Mercury.

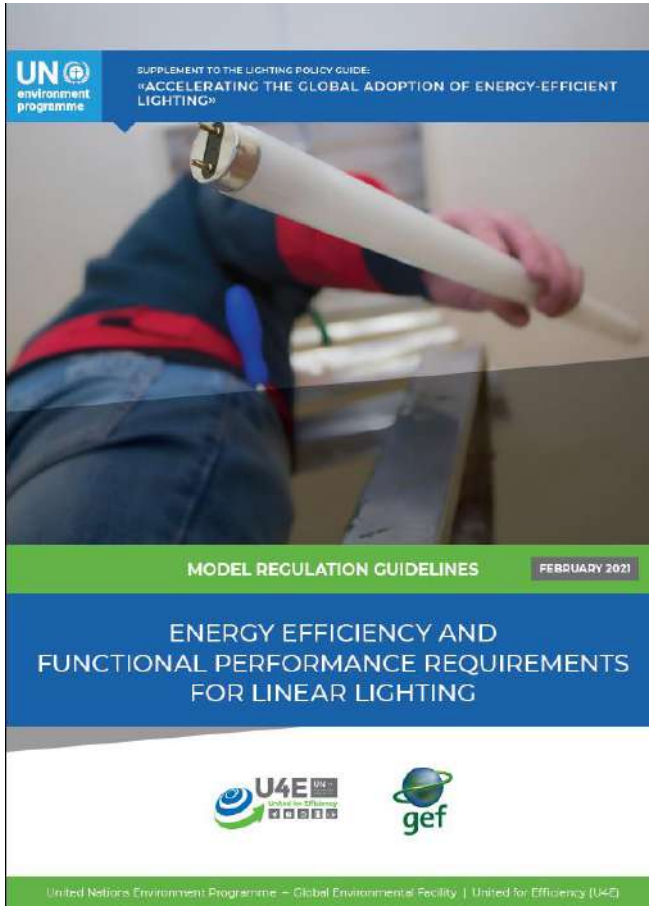


Find the Model Regulation for General Service Lamps on U4E website here

Model regulation guidelines for Linear Lighting

Linear Lighting model regulation guidelines (first edition)

- **MEPS drive the use of higher efficiency linear LED**
  - New edition covers retrofit tubes and linear luminaires
  - MEPS levels eliminate all common fluorescent tubes in favour of LED
  - A timetable is introduced to bring each tube type into scope over 3 years
  - Integrated LED Linear Luminaires included as potential leapfrog technology.
- **Other criteria**
  - Minimum lumen maintenance defined as part of an early failure test to make sure life long enough for tubes and luminaires in normal use.
  - Basic requirements for low flicker to protect the health of the end user.
  - Zero mercury required, aligned with the objective of the Minamata Convention on Mercury.



Find the Model Regulation for Linear Lighting on U4E website here

Model Regulation Guidelines

Key Components

- Scope & definitions, exemptions
- Energy and functional regulations (MEPS)
- Test methods

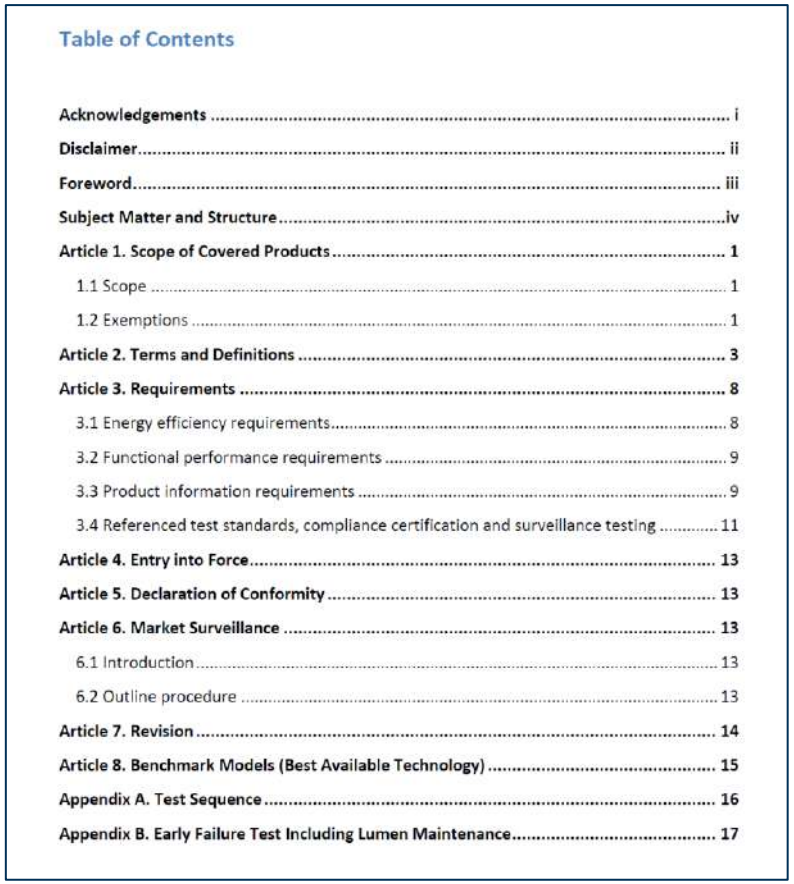


Table of Contents

General Service Lamps

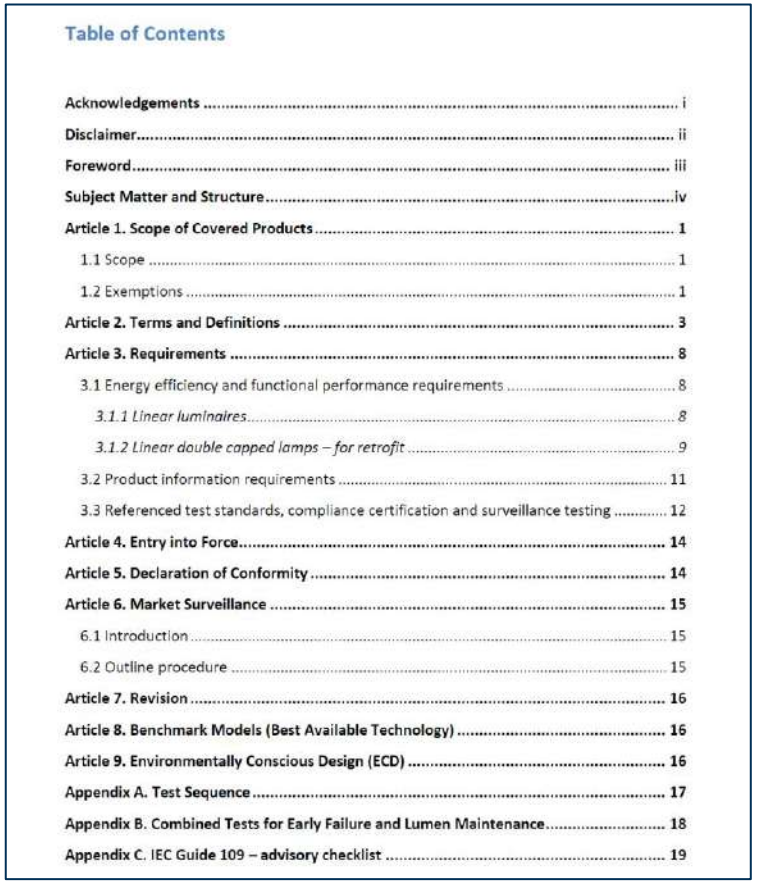


Table of Contents

Linear lighting

Designed to Facilitate national adoption and harmonization across countries

U4E United for Efficiency

Model Regulation Guidelines: Scope

Appliances Type

This Regulation applies to all types (shapes and finishes) of general service lamps for general illumination purposes using **incandescent, halogen, fluorescent, or light emitting diode (LED) light sources,** and having:

a) one or more **input voltages** of alternating current between 50 and 300 V and frequency of 50 Hz or 60 Hz, and
b) a **lamp base** which can be connected to one of the following general service lamp sockets:

- screw base types: E10, E11, E12, E14, E17, E26 or E27, or
- bayonet base types: B15d or B22d, or
- pin base types: GU10 or GZ10 base, or
- alternative base types which can be connected to the above lamp base sockets by using commercially available passive adaptors

General Service Lamps

This Regulation applies to the following types of linear products used for general illumination:

a) **Linear fluorescent luminaire systems and their LED** replacements.
b) **Double capped linear fluorescent lamps (LFL)** in three categories in line with commonly available types, T12,T8 and T5:

i. T12 category; with a tube diameter >28mm,
ii. T8 category; with a tube diameter >17mm and ≤28mm,
iii. T5 category; with tube diameter ≥9mm and ≤17mm.

c) **Double capped linear LED lamps of all sizes**:

- and connected to an electrical supply
  - directly.
  - using existing magnetic control gear.
  - using existing electronic control gear.
- Having lamp caps that can be connected to one of the following lamps sockets:
  - G5, G13, Fa6, Fa8, R17d, or
  - alternative cap types which can be connected to the above lamp base sockets by using commercially available passive adaptors.

Linear lighting

U4E United for Efficiency

Model Regulation Guidelines: Standards Adopted

Performance and Functional Requirements

<table>
<tr><th>Phenomena</th><th>Measurement Standards</th><th>GSL</th><th>Linear</th></tr>
<tr><td>Luminous Efficacy</td><td>Measured luminous flux/measured power</td><td rowspan="2">
<table>
<tr><th>Non-directional lm/W</th><th>Directional lm/W</th><th>Energy rating Level</th></tr>
<tr><td>≥80</td><td>≥70</td><td>MEPS – 0</td></tr>
<tr><td>≥95</td><td>≥85</td><td>1</td></tr>
<tr><td>≥110</td><td>≥100</td><td>2</td></tr>
<tr><td>≥125</td><td>≥115</td><td>3</td></tr>
<tr><td>≥140</td><td>≥130</td><td>4</td></tr>
</table>
</td><td rowspan="2">
<table>
<tr><th>Luminous Efficacy lm/W</th><th>Energy Rating Level</th></tr>
<tr><td>≥100</td><td>MEPS – 0</td></tr>
<tr><td>≥115</td><td>1</td></tr>
<tr><td>≥130</td><td>2</td></tr>
<tr><td>≥145</td><td>3</td></tr>
<tr><td>≥160</td><td>4</td></tr>
</table>
</td></tr>
<tr><td>Luminous Flux in lm</td><td>IEC 62612 CIE S025
IEC 62722.2.1
IEC 62717</td></tr>
<tr><td>Mercury content</td><td></td><td colspan="2">The lamp shall not contain any mercury (0.0 mg)</td></tr>
</table>

Find the Model Regulation guidelines for lighting products on U4E website here

Model Regulation Guidelines: Standards Adopted

Performance and Functional requirements

<table>
<tr><th>Phenomena</th><th>Measurement Standards</th><th>GSL</th><th>Linear</th></tr>
<tr><td>Standby Power (connected product only)</td><td>IEC 63103</td><td>< 500 mW
Note: This requirement is only applicable to connected lamps</td><td>
<table>
<tr><th>Linear LED Lighting System Characteristic</th><th>Standby Power in W</th></tr>
<tr><td>Connected</td><td>≤ 0.5</td></tr>
<tr><td>With internal sensor</td><td>≤ 0.5</td></tr>
</table>
</td></tr>
<tr><td>Fundamental Power Factor</td><td>IEC 62612</td><td>
<table>
<tr><th>Rated Input Power P in W</th><th>Fundamental Power Factor</th></tr>
<tr><td>P ≤ 2W</td><td>Not applicable</td></tr>
<tr><td>2W < P ≤ 5W</td><td>≥ 0.4</td></tr>
<tr><td>5W < P ≤ 25W</td><td>≥ 0.7</td></tr>
<tr><td>P > 25W</td><td>≥ 0.9</td></tr>
</table>
</td><td>
<table>
<tr><th>Rated Input Power P in W</th><th>Fundamental Power Factor</th></tr>
<tr><td>P ≤ 5 W</td><td>No limit</td></tr>
<tr><td>5 W < P ≤ 10 W</td><td>≥ 0.5</td></tr>
<tr><td>10 W < P ≤ 25 W</td><td>≥ 0.7</td></tr>
<tr><td>P > 25W</td><td>≥ 0.9</td></tr>
</table>
</td></tr>
<tr><td>Colour Rendering Index (CRI (Ra))</td><td>IEC 62612
CIE S 025
CIE 13.3</td><td colspan="2">≥ 80 Ra</td></tr>
</table>

Find the Model Regulation guidelines for lighting products on U4E website here

Model Regulation Guidelines: Standards Adopted

Performance and Functional requirements

Phenomena	Measurement Standards	GSL	Linear
Early Failure Test	See Appendix B	After 3000 hours operation per the prescribed cycling rate of 150 minutes on and 30 minutes off in Appendix B the average lumen maintenance must be ≥ 90%	After 3000 hours operation per the prescribed cycling rate of 150 minutes ON and 30 minutes OFF in Appendix B, the average lumen maintenance must be ≥ 96%
Short Term Flicker Perceptibility (PstLM)	IEC TR 61547-1	≤ 1.0 at full load and a sinusoidal line voltage input	*≤ 1.0 at full load and a sinusoidal input voltage*
Stoboscopic Effect Visibility	IEC TR 63158	≤0.4 at full load and a sinusoidal line voltage input	*≤0.4* *Note: Luminaires directly connected to mains supply and at full load.*

Find the Model Regulation guidelines for lighting products on U4E website here

Sustainable Public Procurement Specifications

Key Components

- Scope and Definitions
- Procurement Criteria: Energy efficiency and quality requirements.
- Testing Standards reference
- Environmental Sound Management considerations
- Life Cycle cost
- Examples of Invitation to Tender, Request for Tender and Lighting as a Service Contract Agreement

TABLE OF CONTENTS

Sustainable Public Procurement Specifications

Performance and Functional requirements

STREET/OUTDOOR LIGHTING

Performance criteria	Standard public procurement requirements
Efficacy of the luminaire	<table><tr><th>Power</th><th>< 90 Watt</th><th>≥ 90 Watt</th></tr><tr><td>2022</td><td>120</td><td>140</td></tr><tr><td>2024</td><td>135</td><td>160</td></tr><tr><td>2026</td><td>150</td><td>180</td></tr></table>
Lifetime	50,000 hours for an L70 and B50 according to IEC 62717
General safety	Compliance with IEC 60598
Photometry distribution	ULR ≤ 1% or ULOR = 0% for a tilt angle of 0°
Colour rendering index (CRI)	CRI ≥ 70
Corelated colour temperature (CCT)	CCT ≤ 5,000 Kelvin
Colour consistency	Variation of the chromaticity coordinates within a six-step McAdam ellipse
Flicker	Pst^{LM} ≤ 1.0 at full load and a sinusoidal input voltage
Operational voltage range	160 VAC to 250 VAC at 50Hz or 60 Hz
Fundamental power factor	≥ 0.9
Standby power and connected control devices	≤ 0.5W standby power ≤ 0.5W for connected control devices measured independently
Surge protection	IEC 61547 standard recommendations
Harmonic distortion	IEC 61000-3-2: standard
Protection against electrical shock	Standard IEC 60598-1 Luminaires - Part 1: General requirements and tests
Class of ingress protection	IP66 (or IP65 where no heavy rain is expected)
Class of impact resistance	Minimum IK08
Humidity and corrosion	All luminaires shall be humidity-proof where humid conditions may occur in normal use following the IEC 60598-1 humidity test. ("Luminaires – Part 1: General requirements and tests"). The outside metal envelope components of the luminaire should be made of stainless steel or aluminium (sheet, extruded or cast) or die-cast zinc. Iron coated with zinc can be acceptable with special characteristics.
Dimming	LED lighting should be dimmed by 30% of its nominal flux for at least 4 hours per night (for example from 1 AM to 5 AM). Not applicable if the nominal illuminance level is below 1 lux.
Performance criteria	Power installed should not be more than 3 Watts per linear meter per road lane
Warranty	At least 5 years
Maintenance	Luminaire should be maintainable and designed for serviceability, preferably with replaceable module

Sustainable Public Procurement Specifications

Performance and Functional requirements

Performance criteria	Standard public procurement requirements
Dimming and occupancy control	LED lighting should be dimmed when daylight is sufficient LED luminaires should incorporate automatic on/standby occupancy control/presence detection
Performance criteria	Power installed should be < 6W/m2 of floor area
Warranty	At least 4 years
Maintenance	Luminaire should be maintainable and designed for serviceability, preferably with replaceable module

OFFICES/LARGE BUILDINGS

Performance criteria	Standard public procurement requirements
Luminaires: Minimum efficacy lm/W by implementation year (Flux range in Lumen)	Flux range: 60≤ Φ< 600 / 600 ≤ Φ< 1200 / 1200 ≤ Φ 2022: 110 / 120 / 130 2024: 130 / 140 / 150 2026: 150 / 160 / 170
Retrofit tubes: Minimum efficacy lm/W by implementation year	2022: 130 2024: 150 2026: 170
Lifetime	20,000 hours for an L70 and B50 according to IEC 62717
General safety	Compliance with IEC 60598
Colour rendering index (CRI)	CRI ≥ 80
Corelated colour temperature (CCT)	CCT ≤ 6,000 Kelvin (maximum)
Colour consistency	Variation of the chromaticity coordinates within a six-step McAdam ellipse
Flicker	Pst^{LM} ≤ 1.0 at full load and a sinusoidal input voltage
Stroboscopic effect	SVM ≤ 0.4 at full load from 2024, ≤0.9 until then
Operational voltage range	160 VAC to 250 VAC at 50Hz or 60 Hz
Fundamental power factor or displacement factor (Varies with wattage)	P ≤ 5 W: No limit 5 W < P ≤ 10 W: ≥ 0.5 10 W < P ≤ 25 W: ≥ 0.7 P > 25W: ≥ 0.9
Standby power and connected control devices	≤ 0.5W standby power ≤ 0.5W for connected control devices measured independently
Surge protection	IEC 61547 standard recommendations
Harmonic distortion	IEC 61000-3-2 standard
Protection against electrical shock	Standard IEC 60598-1 Luminaires - Part 1: General requirements and tests
Class of ingress protection	IP20 or IP54 in industrial environment
Class of impact resistance	Minimum IK05 (IK08 for luminaire fixed on the wall)
Humidity and corrosion	All luminaires shall be humidity-proof where humid conditions may occur in normal use following the IEC 60598-1 humidity test. ("Luminaires – Part 1: General requirements and tests"). The outside metal envelope components of the luminaire should be made of stainless steel or aluminium (sheet, extruded or cast) or die-cast zinc. Iron coated with zinc can be acceptable with special characteristics.

Policy Status from participant countries:

Burkina Faso

- No MEPS on light sources, labelling in progress.

China

- No ban of fluorescent lamps/tubes, draft regulation released in 2021
- MEPS for LED lamps in place - LED bulbs MEPS is 65 lm/W (vs 80 lm/W for MEPS in Model Regulation)

India

- No ban of fluorescent lamps/tubes
- MEPS for LED bulbs lighting, 1 star label is for 68 lm/W for bulbs

Indonesia

- No ban of fluorescent lamps/tubes
- MEPS for LED lighting implemented in 2022 (80 lm/W)

Saudi Arabia

- MEPS based on the flux - 55 lm/W for the most common LED lamps.

Iran

- No ban of fluorescent lamps/tubes
- No information on MEPS found

Jordan

- No ban of fluorescent lamps/tubes
- No MEPS for lighting in place

Nigeria

- MEPS for all lighting sources underway to ban CFL and FL tubes

Philippines

- No ban of fluorescent lamps/tubes
- MEPS for LED lighting for 80 lm/w

Zambia

- Phase out CFL and fluorescent tubes released in 2022.
- No MEPS for LED lighting but should adopt regional SADC ones (90 lm/w)

U4E United for Efficiency

Example of Market Transformation Project:

Pakistan

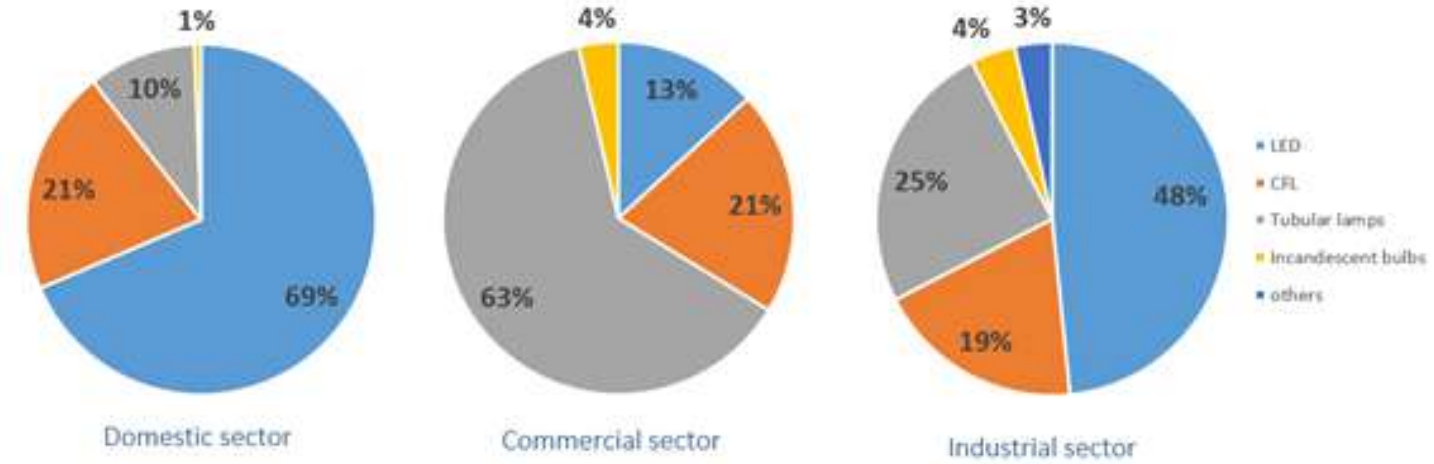
Pakistan EE Lighting Project – "Delivering the Transition to Energy Efficient Lighting in Residential, Commercial, Industrial, and Outdoor Sectors".

Project main Achievements

Q1 2019
–
Q3 2021

1. Development of Market Assessment by NEECA and sample testing by PCSIR

- **LED market share reaches the 55%** for the domestic, commercial and industrial sector, followed by Tubular lamps (23%) and CFL (21%).
- At the domestic sector level, LED Lighting accounts for nearly 70% of all lighting units, 13% in the commercial sector, and 48% in the Industrial.
- **Durability of LED products very low**:
  - ✓ Domestic – 4 years (4 times less than average). Commercial and Industrial: 2 - 3 years.
- **Very high Correlated Colour Temperature (CCT):** 7000K, cool blueish-white light



Pakistan EE Lighting Project – "Delivering the Transition to Energy Efficient Lighting in Residential, Commercial, Industrial, and Outdoor Sectors".

Project main Achievements

2. Implementation of first ever Minimum Energy Performance Standards (MEPS) for Energy Efficient LED Lighting.

- **Collaborative approach** among a wide range of stakeholders (NEECA, local manufacturers and the lighting associations) to agree on the MEPS policy´s technical criteria.
- National Minimum Energy Performance requirements were defined and agreed for all the main lighting sectors: **LED Bulbs, LED Downlights, LED Tubes, & LED Outdoor Lighting in Pakistan**. (Efficacy 35% more stringent that U4E Model Regulation and additional criterio)
- Additionally, **Sustainable Public Procurement (SPP) recommendations** for: Street Lighting & Office Building Lighting.
- **Come into force from December 2020**. Products placed on the market before the application date can be sold till end of June 2021.

	MEPS		SPP	
Power of luminaire	MEPS efficacy	Star rating	SPP efficacy	Star ratting
< 90 Watt	≥ 100 lumen / Watt	1 star *	≥ 110 lumen / Watt	2 stars **
≥ 90 Watt	≥ 120 lumen / Watt	3 stars ***	≥ 130 lumen / Watt	4 stars ****

Example or MEPS and SPP levels for Street Lighting

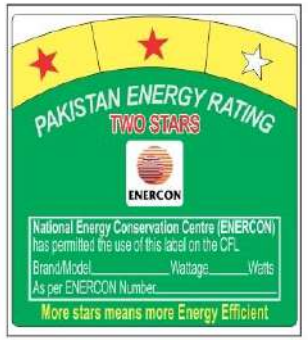
Find more information in our Case Study: https://united4efficiency.org/resources/successful-implementation-of-first-ever-minimum-energy-performance-standards-meps-and-labels-for-energy-efficient-led-lighting-in-pakistan/

Pakistan EE Lighting Project – "Delivering the Transition to Energy Efficient Lighting in Residential, Commercial, Industrial, and Outdoor Sectors".

Project main Achievements

3. Implementation of Labels for Energy Efficient LED Lighting.

- Mandatory **common five step label** based on the lighting Luminous Efficacy was proposed for the four categories: LED lamps, Tubes/Rods, Down-Lighters and Street Lighting/Outdoor lighting.
- NEECA **security/verification** sticker affixed with the Labelling**,** that the user can send the unique security scratch code for instant digital verification using mobile phone SMS.



FLUX (LM)	60 ≤ ϕ < 600	600 ≤ ϕ < 1200	1200 ≤ ϕ
1 star*	≥ 80 lm/W	≥ 90 lm/W	≥ 100 lm/W
2 stars**	≥ 90 lm/W	≥ 100 lm/W	≥ 110 lm/W
3 stars***	≥ 100 lm/W	≥ 110 lm/W	≥ 120 lm/W
4 stars****	≥ 110 lm/W	≥ 120 lm/W	≥ 130 lm/W
5 stars*****	≥ 120 lm/W	≥ 130 lm/W	≥ 140 lm/W

Reference: ϕ is the flux in lumen (lm) of the lamp or luminaire of power expressed in Watt (W).

U4E United for Efficiency

Pakistan EE Lighting Project – "Delivering the Transition to Energy Efficient Lighting in Residential, Commercial, Industrial, and Outdoor Sectors".

Project main Achievements

3. Capacity Building and Technical training session on MEPS, Labels, SPP, MVE and Financial Mechanisms, including Photometry Study Tour for Lighting testing.

4. Proposal for Environmental Sound Management system for Electric and Electronic Equipment in Pakistan (including Extended Producer Responsibility).

5. Communication / awareness Campaigns.

Find more information in our Case Study: https://united4efficiency.org/resources/pakistan-capacity-building-study-tour-in-thailand/

Pakistan EE Lighting Project – "Delivering the Transition to Energy Efficient Lighting in Residential, Commercial, Industrial, and Outdoor Sectors".

Project main Achievements

6. Development of administrative and operational procedures and technical documentation to stablish a Revolving Loan Fund (Guarantee Loan Fund).

Risk guarantee mechanism has been established by NEECA to mitigate the risks against loans provided for energy-efficient lighting projects with **allocated funds of USD 350,000**. In the case of default on a loan, this mechanism absorbs a portion of the lender's losses on the loan. By mitigating some of the risk to lenders, it aims to stimulate commercial lending for replacement of conventional lighting with energy-efficient light emitting diode (LED) lighting in all end-use sectors in Pakistan.

890 fluorescent tubes replaced with LED tubes in the production lines

Annual energy savings of **63,000 kWh**

1.3 million Pakistani Rupee saved per year through this LED tube investment

Find more information in our Case Study: https://united4efficiency.org/resources/promoting-and-implementing-energy-efficient-environmentally-friendly-lighting-in-pakistan-developing-a-framework-for-an-innovative-financing-mechanism/

Pakistan EE Lighting Project – "Delivering the Transition to Energy Efficient Lighting in Residential, Commercial, Industrial, and Outdoor Sectors".

Project main Achievements

- Technical SPP criteria **implemented in the Pilot Project**, for retrofit indoor lighting fixtures replacement**. A total of 1,800 lamps** were replaced for **LED lights and controls** in 3 main public buildings in Islamabad in line with U4E's *Green Public Procurement Technical Guidelines and Specifications for Energy-efficient Lighting.*

- **NEECA´s Office Building.**

Emissions reduction of	Annual energy savings of	Cost savings of	Payback of
7.9 tCO_2	12.4 MWh	248,780 Rs per year	0.86 years

- **Quaid e Azam University Islamabad Library**

Emissions reduction of	Annual energy savings of	Cost savings of	Payback of
4.1 tCO_2	6.5 MWh	130,680 Rs per year	3.25 years

- **Capital Hospital**

Emissions reduction of	Annual energy savings of	Cost savings of	Payback of
43.5 tCO_2	68.3 MWh	1,366,560 Rs per year	0.36 years

Find more information in our Case Study: https://united4efficiency.org/resources/pakistan-pilot-lighting-projects/

KNOW MORE ABOUT U4E AND JOIN US:

Check our websites

Find out tools, policy guides and policy briefs, webinars, model regulations, country assessments and news releases on our official website.

http://united4efficiency.org/

U4E introduction video

Need a quick introduction to our project? Our three minute general video is at:
EN http://united4efficiency.org/accelerating-the-transition-to-_high-efficiency-products/

Model Regulation Guidelines and GPP Technical Guidelines and Specifications

Check U4E´s Model Regulation and Sustainable Public Procurement section for our Technicial Guidelines, Tools, Webinars and other resources

https://united4efficiency.org/resources/model-regulation-guidelines/
https://united4efficiency.org/sustainable-public-procurement/


WE NEED MORE
ENERGY EFFICIENCY
TO COOL THE WORLD
U4E
United for Efficiency
UN environment

Contact

TRANSFORMING MARKETS TO ENERGY-EFFICIENT PRODUCTS

Thank you

EMAIL

Soledad Garcia – soledad.garcia@un.org

WEBSITE

united4efficiency.org

Success Stories: Phasing Out Fluorescent Lamps

from EC, India, Indonesia, Nigeria and Pakistan

Technical Session

„Transitioning to Mercury-Free Lighting in Asia-Pacific Countries“

Success Stories: Phasing Out Fluorescent Lamps

Mercury containing lamps under the RoHS Directive in the EU

Hendrik Engelkamp

DG ENVIRONMENT

Unit B3: From Waste to Resources

Introduction to the RoHS Directive

- RoHS - **R**estriction **o**f **H**azardous **S**ubstances
- Environmental and human health risks from hazardous substances in **E**lectrical and **E**lectronic **E**quipment (EEE): release of hazardous substances into the environment, exposure to workers, waste treatment problems, differences in policies of MS
- Objectives:

  Protection health and environment
  Enhancing Recycling & Reuse
  Protection of workers from waste
  Establishing one playing field in the EU

- RoHS 1 (2002/95/EC) entered into force in 2003

Introduction to the RoHS Directive

- **Directive 2011/65/EU** (recast of RoHS 1) in force since 2011;

- From 22 July 2019, RoHS is **applicable to all EEE**, with the exception of equipment explicitly excluded ("open scope")
- Strong links to other EU legislation on waste, chemicals and product design (Waste Framework Directive, WEEE, ELV, REACH, Ecodesign …)
- About 40 countries outside of EEA adopted similar rules

Introduction to the RoHS Directive

- Restrictions apply at the point of placing on the EU market; CE marking obligation for finished EEE
- Restricted substances (Annex II):
  - **certain heavy metals:** lead, **mercury**, cadmium, and hexavalent chromium;
  - **certain flame retardants:** polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE);
  - **certain phthalates**: Bis(2-ethylhexyl) phthalate (DEHP), Butyl benzyl phthalate (BBP), Dibutyl phthalate (DBP), Diisobutyl phthalate (DIBP)
- Maximum concentration allowed in homogenous material specified for each substance

Exemptions

Amendment of Annexes III & IV

- 'Continuous' adaption to technical and scientific progress:
  - Time-limited exemptions can be granted for specific applications (Annexes III and IV), based on criteria specified in Article 5

0. Threshold criterion – does not weaken the environmental and health protection afforded by REACH
1. Elimination or substitution is scientifically and technically impracticable
2. Reliability of substitutes is not ensured
3. Total negative impacts caused by substitution are likely outweigh the benefits.

\+ Availability of substitutes & socioeconomic impact

- Lead in alloys
- Lead in solders
- **Mercury in discharge lamps**
- Cadmium in electrical contacts
- …

European Commission

Mercury in discharge lamps - History

2003

1. Mercury in compact fluorescent lamps not exceeding 5 mg per lamp.
2. Mercury in straight fluorescent lamps for general purposes not exceeding:
   - — halophosphate 10 mg
   - — triphosphate with normal lifetime 5 mg
   - — triphosphate with long lifetime 8 mg.
3. Mercury in straight fluorescent lamps for special purposes.
4. Mercury in other lamps not specifically mentioned in this Annex.

Mercury in discharge lamps - History

2011

	Exemption	Scope and dates of applicability
1	Mercury in single capped (compact) fluorescent lamps not exceeding (per burner):	
1(a)	For general lighting purposes < 30 W: 5 mg	Expires on 31 December 2011; 3,5 mg may be used per burner after 31 December 2011 until 31 December 2012; 2,5 mg shall be used per burner after 31 December 2012
1(b)	For general lighting purposes ≥ 30 W and < 50 W: 5 mg	Expires on 31 December 2011; 3,5 mg may be used per burner after 31 December 2011
1(c)	For general lighting purposes ≥ 50 W and < 150 W: 5 mg	
1(d)	For general lighting purposes ≥ 150 W: 15 mg	
1(e)	For general lighting purposes with circular or square structural shape and tube diameter ≤ 17 mm	No limitation of use until 31 December 2011; 7 mg may be used per burner after 31 December 2011
1(f)	For special purposes: 5 mg	
2(a)	Mercury in double-capped linear fluorescent lamps for general lighting purposes not exceeding (per lamp):	
2(a)(1)	Tri-band phosphor with normal lifetime and a tube diameter < 9 mm (e.g. T2): 5 mg	Expires on 31 December 2011; 4 mg may be used per lamp after 31 December 2011
2(a)(2)	Tri-band phosphor with normal lifetime and a tube diameter ≥ 9 mm and ≤ 17 mm (e.g. T5): 5 mg	Expires on 31 December 2011; 3 mg may be used per lamp after 31 December 2011
2(a)(3)	Tri-band phosphor with normal lifetime and a tube diameter > 17 mm and ≤ 28 mm (e.g. T8): 5 mg	Expires on 31 December 2011; 3,5 mg may be used per lamp after 31 December 2011
2(a)(4)	Tri-band phosphor with normal lifetime and a tube diameter > 28 mm (e.g. T12): 5 mg	Expires on 31 December 2012; 3,5 mg may be used per lamp after 31 December 2012
2(a)(5)	Tri-band phosphor with long lifetime (≥ 25 000 h): 8 mg	Expires on 31 December 2011; 5 mg may be used per lamp after 31 December 2011
2(b)	Mercury in other fluorescent lamps not exceeding (per lamp):	
2(b)(1)	Linear halophosphate lamps with tube > 28 mm (e.g. T10 and T12): 10 mg	Expires on 13 April 2012
2(b)(2)	Non-linear halophosphate lamps (all diameters): 15 mg	Expires on 13 April 2016
2(b)(3)	Non-linear tri-band phosphor lamps with tube diameter > 17 mm (e.g. T9)	No limitation of use until 31 December 2011; 15 mg may be used per lamp after 31 December 2011
2(b)(4)	Lamps for other general lighting and special purposes (e.g. induction lamps)	No limitation of use until 31 December 2011; 15 mg may be used per lamp after 31 December 2011

	Exemption	Scope and dates of applicability
3	Mercury in cold cathode fluorescent lamps and external electrode fluorescent lamps (CCFL and EEFL) for special purposes not exceeding (per lamp):	
3(a)	Short length (≤ 500 mm)	No limitation of use until 31 December 2011; 3,5 mg may be used per lamp after 31 December 2011
3(b)	Medium length (> 500 mm and ≤ 1 500 mm)	No limitation of use until 31 December 2011; 5 mg may be used per lamp after 31 December 2011
3(c)	Long length (> 1 500 mm)	No limitation of use until 31 December 2011; 13 mg may be used per lamp after 31 December 2011
4(a)	Mercury in other low pressure discharge lamps (per lamp)	No limitation of use until 31 December 2011; 15 mg may be used per lamp after 31 December 2011
4(b)	Mercury in High Pressure Sodium (vapour) lamps for general lighting purposes not exceeding (per burner) in lamps with improved colour rendering index Ra > 60:	
4(b)-I	P ≤ 155 W	No limitation of use until 31 December 2011; 30 mg may be used per burner after 31 December 2011
4(b)-II	155 W < P ≤ 405 W	No limitation of use until 31 December 2011; 40 mg may be used per burner after 31 December 2011
4(b)-III	P > 405 W	No limitation of use until 31 December 2011; 40 mg may be used per burner after 31 December 2011
4(c)	Mercury in other High Pressure Sodium (vapour) lamps for general lighting purposes not exceeding (per burner):	
4(c)-I	P ≤ 155 W	No limitation of use until 31 December 2011; 25 mg may be used per burner after 31 December 2011
4(c)-II	155 W < P ≤ 405 W	No limitation of use until 31 December 2011; 30 mg may be used per burner after 31 December 2011
4(c)-III	P > 405 W	No limitation of use until 31 December 2011; 40 mg may be used per burner after 31 December 2011
4(d)	Mercury in High Pressure Mercury (vapour) lamps (HPMV)	Expires on 13 April 2015
4(e)	Mercury in metal halide lamps (MH)	
4(f)	Mercury in other discharge lamps for special purposes not specifically mentioned in this Annex	

Mercury in discharge lamps - History

2011

	Exemption
1	Mercury in single capped (compact) fluorescent lamps not exceeding (per burner): **CFL**
2(a)	Mercury in double-capped linear fluorescent lamps for general lighting purposes not exceeding (per lamp): **LFL** **Induction lamps**
3	Mercury in cold cathode fluorescent lamps and external electrode fluorescent lamps (CCFL and EEFL) for special purposes not exceeding (per lamp): **CCFL and EEFL**
4(a)	Mercury in other low pressure discharge lamps (per lamp) **Low Pressure**

	Exemption
4(b)	Mercury in **High Pressure Sodium** for general lighting purposes not exceeding (per burner) in lamps with improved colour rendering index Ra > 60:
4(c)	Mercury in other High Pressure Sodium (vapour) lamps for general lighting purposes not exceeding (per burner):
4(e)	Mercury in metal halide lamps (MH) **Metal Halide**
4(f)	Mercury in other discharge lamps for special purposes not specifically mentioned in this Annex **special purposes**

Mercury in discharge lamps - History

- **2014-2015**: Renewal Request - Expiry dates from June 2016

- **2016:** Technical Evaluation Study

- **2019:** Study to assess socio-economic impacts of substitution of certain mercury-based lamps

- **2020:** Update on assessing socio-economic impacts

Decisions under the RoHS Directive

Focus on CFLni and LFL T5 & T8

Assumptions for a period 2021-2035:

50% of fluorescent lamps can be directly replaced by plug&play LED substitutes, 10% requires a rewiring of the luminaire and 40% requires a replacement of the luminaire

premature generation of e-waste from rewiring and lamp replacement of 753.000 t

Energy savings by moving to LED technology would cumulatively amount to 309 TWh

Investment costs for the transition will be offset by the lower energy consumption

Decisions under the RoHS Directive

Assumptions for a period 2021-2035:

CFLni	=	-3.4 billion € costs
LFL with T5 diameter	=	+2.4 billion € benefits
LFL with T8 diameter	=	+2.9 billion € benefits

Shift to LED technology – manufacturing jobs are partially moved and electricians benefits from rewiring and replacement of lamps

LED substitutes for replacements are usually only needed when the service life has expired and no more fluorescent lamps are at stock

Decisions under the RoHS Directive

Assumptions for a period 2021-2035:

2,882 kg of mercury will no longer be placed on the EU market

European Commission

Decisions under the RoHS Directive

➢ **February 2022**: 12 Delegated Directives

	Exemption	Scope and dates of applicability
1	Mercury in single capped (compact) fluorescent lamps not exceeding (per burner): **CFL**	**Expires on 24 February 2023**

Except 1(f) for lamps emitting UV (2027) and lamps for special purposes (2025)
Except 1(g) for long-lifetime lamps (24 August 2023)

Decisions under the RoHS Directive

	Exemption	Scope and dates of applicability
‘2(a)	Mercury in double-capped linear fluorescent lamps for general lighting purposes not exceeding (per lamp):	
2(a)(1)	Tri-band phosphor with normal lifetime and a tube diameter < 9 mm (e.g. T2): 4 mg	Expires on 24 February 2023
2(a)(2)	Tri-band phosphor with normal lifetime and a tube diameter ≥ 9 mm and ≤ 17 mm (e.g. T5): 3 mg	Expires on 24 August 2023
2(a)(3)	Tri-band phosphor with normal lifetime and a tube diameter > 17 mm and ≤ 28 mm (e.g. T8): 3,5 mg	Expires on 24 August 2023
2(a)(4)	Tri-band phosphor with normal lifetime and a tube diameter > 28 mm (e.g. T12): 3,5 mg	Expires on 24 February 2023
2(a)(5)	Tri-band phosphor with long lifetime (≥ 25 000 h): 5 mg.	Expires on 24 February 2023

LFL

T5 and T8 longer

2(b)(3)	Non-linear tri-band phosphor lamps with tube diameter > 17 mm (e.g. T9): 15 mg	Expires on 24 February 2023; 10 mg may be used per lamp from 25 February 2023 until 24 February 2025

Non-linear double-capped FL till 2025

European Commission

Decisions under the RoHS Directive

2(b)(4)- I	Lamps for other general lighting and special purposes (e.g. induction lamps): 15 mg	Expires on 24 February 2025
2(b)(4)- II	Lamps emitting mainly light in the ultraviolet spectrum: 15 mg	Expires on 24 February 2027
2(b)(4)- III	Emergency lamps: 15 mg	Expires on 24 February 2027

special purposes
3 and 5 years

3	Mercury in cold cathode fluorescent lamps and external electrode fluorescent lamps (CCFL and EEFL) for special purposes used in EEE placed on the market before 24 February 2022 not exceeding (per lamp):	
3(a)	Short length (≤ 500 mm): 3,5 mg	Expires on 24 February 2025
3(b)	Medium length (> 500 mm and ≤ 1 500 mm): 5 mg	Expires on 24 February 2025
3(c)	Long length (> 1 500 mm): 13 mg	Expires on 24 February 2025

CCFL and EEFL
as spare parts for old devices

Decisions under the RoHS Directive

4(a)	Mercury in other low pressure discharge lamps (per lamp): 15 mg	Expires on 24 February 2023
4(a)-I	Mercury in low pressure n the main range of the lan mercury may be used per lamp	Expires on 24 February 2027

low pressure – extended

4(b)	Mercury in High Pressure Sodium (vapour) lamps for general lighting purposes not exceeding (per burner) in lamps with improved colour rendering index Ra > 80: P ≤ 105 W: 16 mg may be used per burner	Expires on 24 February 2027
4(b)-I	Mercury in High Pressure Sodium (vapour) lamps for general lighting purposes not exceeding	Expires on 24 February 2023
4(b)-II	mg may be used per burner	ruary 2023
4(b)-III	Mercury in High Pressure Sodium (vapour) lamps for general lighting purposes not exceeding (per burner) in lamps with improved colour rendering index Ra > 60: P > 405 W: 40 mg may be used per burner	Expires on 24 February 2023

Ra>80 High Pressure Sodium – extended with limited scope: P<105 W with 16 mg Hg

4(c)	Mercury in other High Pressure Sodium (vapour) lamps for general lighting purposes not	
4(c)-I		February 2027
4(c)-II		February 2027
4(c)-III	P > 405 W: 25 mg	Expires on 24 February 2027

Other High Pressure Sodium – extended with lower amount of Hg

European Commission

Decisions under the RoHS Directive

4(e)	Mercury in metal halide lamps (MH)	Expires on 24 February 2027

Metal Halide - extended

4(f) -I	Mercury in other discharge lamps for special purposes not specifically mentioned in this Annex	Expires on 24 February 2025
4(f) -II	Mercury in high pressure mercury vapour lamps used in projectors where an output ≥ 2000 lumen ANSI is required	Expires on 24 February 2027
4(f) -III	Mercury in high pressure sodium vapour lamps used for horticulture ligh	February 2027
4(f) -IV	Mercury in lamps emitting light in the ultraviolet spectrum	Expires on 24 February 2027

special purposes
3 and 5 years

Thank you!

European Commission

Final remarks

These were the recent decisions on mercury-containing lamps under the RoHS Directive. How do you see them and what impact do you expect from such phase-out decisions?

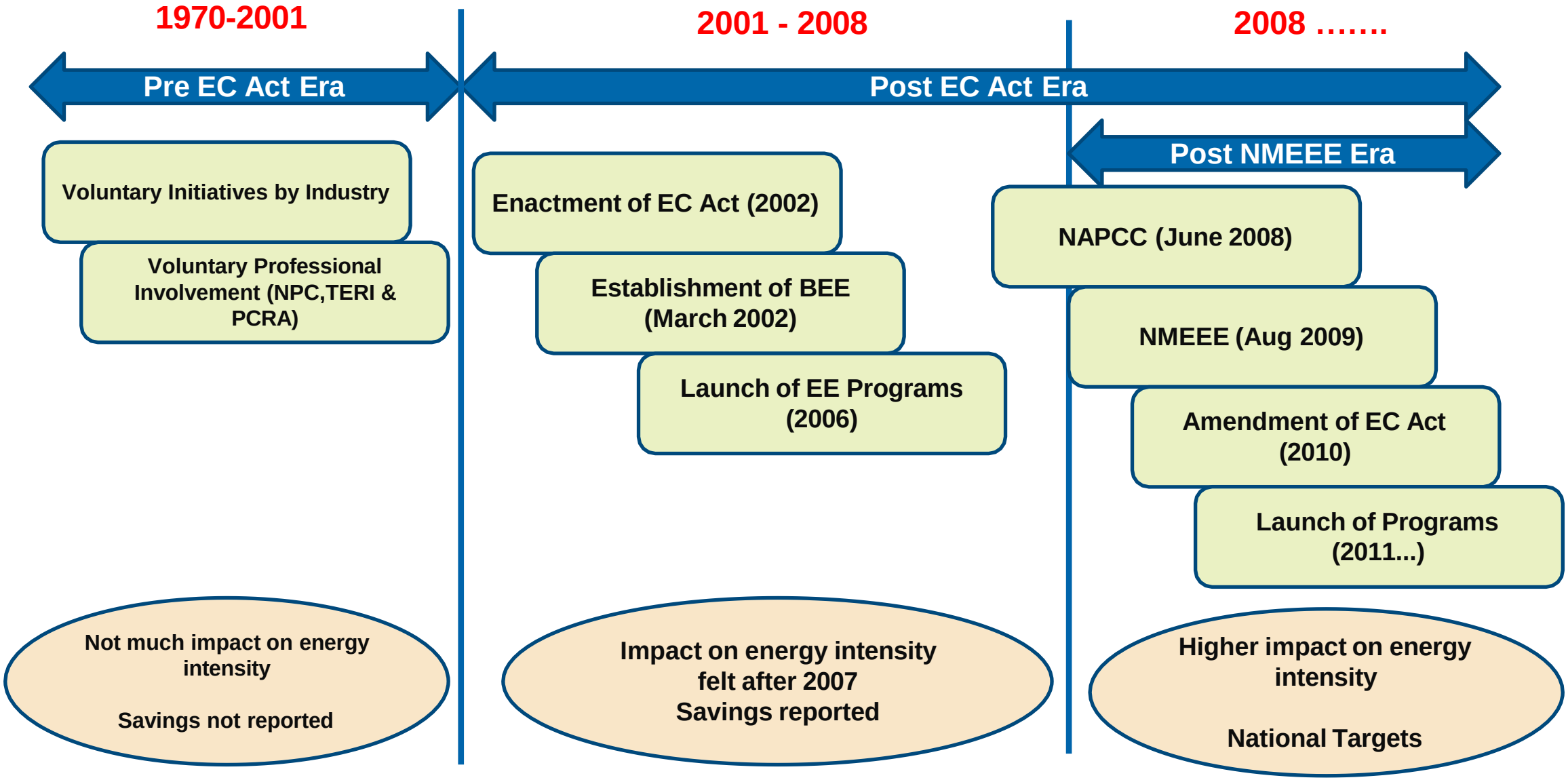
There are many discharge lamps, which still require mercury e.g. low pressure lamps, high pressure sodium lamps, mercury halide lamps and in particular lamps for special purposes e.g. emitting in UV spectrum. It would be interesting to know what the are on this.

India’s LED Story

20th June 2023

ABHISHEK GUPTA
Head-International & Strategy

Energy Efficiency Transition in India



NAPCC : National Action Plan on Climate Change

NMEEE : National Mission on Enhanced Energy Efficiency

EESL –Who we are!

NTPC	Power Grid Corporation of India	REC	PFC
33.33%	*33.33%*	*15.68%*	*17.65%*

Promoters shareholding in EESL

ENERGY EFFICIENCY SERVICES LIMITED
A JV of PSUs under the Ministry of Power

Energy Savings Achieved: ~60 billion kWh per year, Avoided peak demand > 12,000 MW

GHG reduction - More than 48 million t of CO_2 per year

Estimated Monetary Savings of USD 3 billion

EESL Programmes

Programmes	Milestones
UJALA	**368.6 Mn LED bulbs, 7.2 Mn Tube Lights, 2.3 Mn EE Fans**
Gram UJALA	**10 Mn+ LED bulbs distributed**
SLNP *Street Lighting National program*	**12.9 Mn LED Street Lights installed with CCMS**
Smart Meter Programme	**3.6 Mn smart meters installed**
Solar	**~177 MW of decentralised solar commissioned**
E-Mobility Programme 2w, 3w, (4w), buses	**More than 1,894 4Wheelers (4W) on lease**
Electric Vehicle Charging Infrastructure	**441 public charging stations installed** **1,000+ AC & DC Captive chargers installed**

Contd.

EESL Programmes

Programmes	Milestones
BEEP (Building Energy Efficiency Programme**)**	**12,700+ Buildings Retrofitted**
AgDSM (Agriculture Demand Side Management)	**81,180 EE Pumps installed**
Super Efficient AC Programme	**3,146 ACs sold**
AJAY	**0.272 Mn Solar Street Lights**
Trigeneration	**Project commissioned for 0.8 MW with M&M**
NMRP (National Motor Replacement Programme)	**5,280 nos. of IE3 motors installed**

EESL Business Approach

Flexible Business Models- Supply/ESCO/Supply+Opex

Leverage economies of scale through bulk procurement

Demand-Driven Aggregation

- Zero-Subsidy
- Deemed savings
- Transparent operations with outcomes in public domain
- Commercially viable*
- ESCO; Repayment from monetised energy savings

Win-Win for all stakeholders

* With low interest, long term loan and cost reduction achieved by demand aggregation.

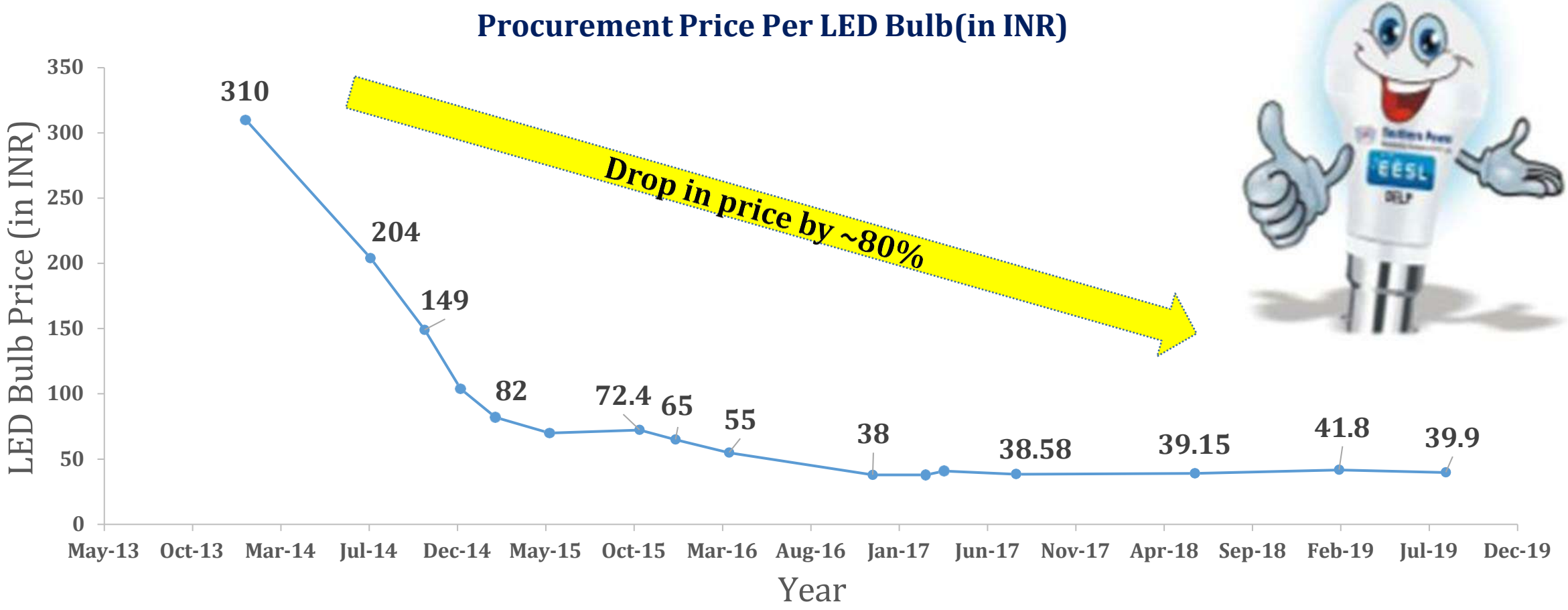
How EESL Transformed LED market?

Launch :Domestic Efficient Lighting Program(DELP) Now UJALA

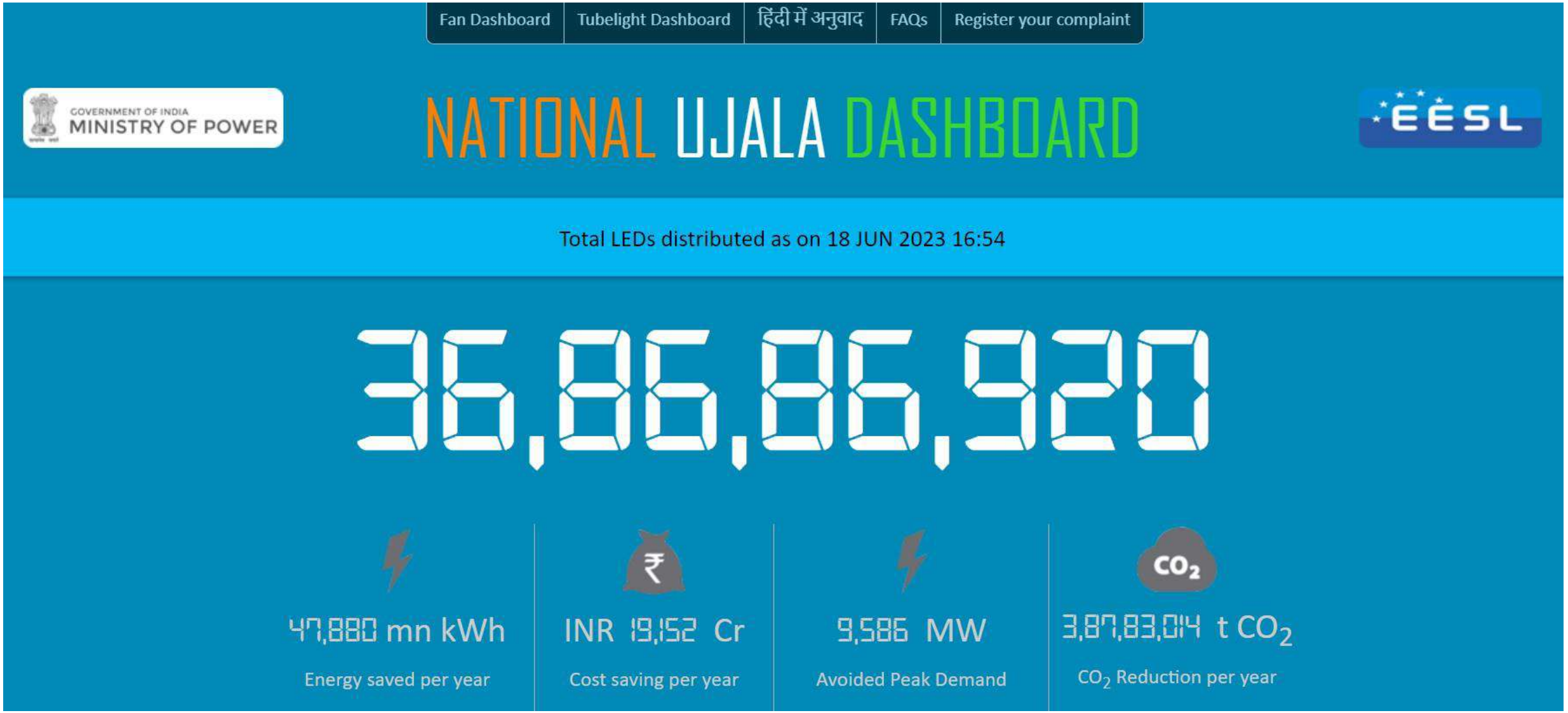
Hon'ble Prime Minister of India(Sh. Narendera Modi) launches scheme for LED bulb distribution under Domestic Efficient Lighting Programme in Delhi on 5th January 2015

Impact of Demand Aggregation

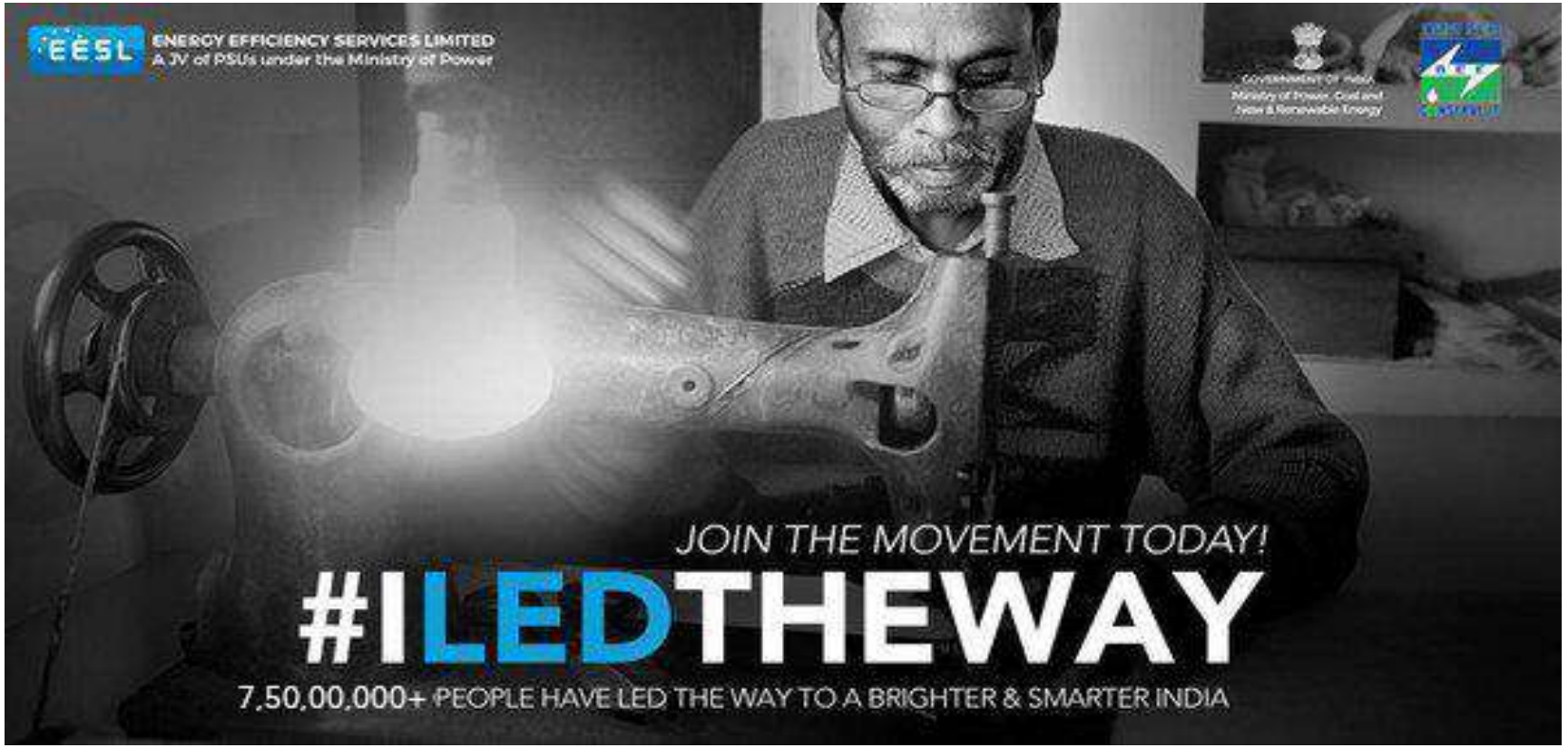
Significant price reduction leading to faster implementation of EE measures



Unnat Jyoti By Affordable LEDs For All (UJALA)



UJALA Awareness- #ILEDTHEWAY Campaign



OBJECTIVES

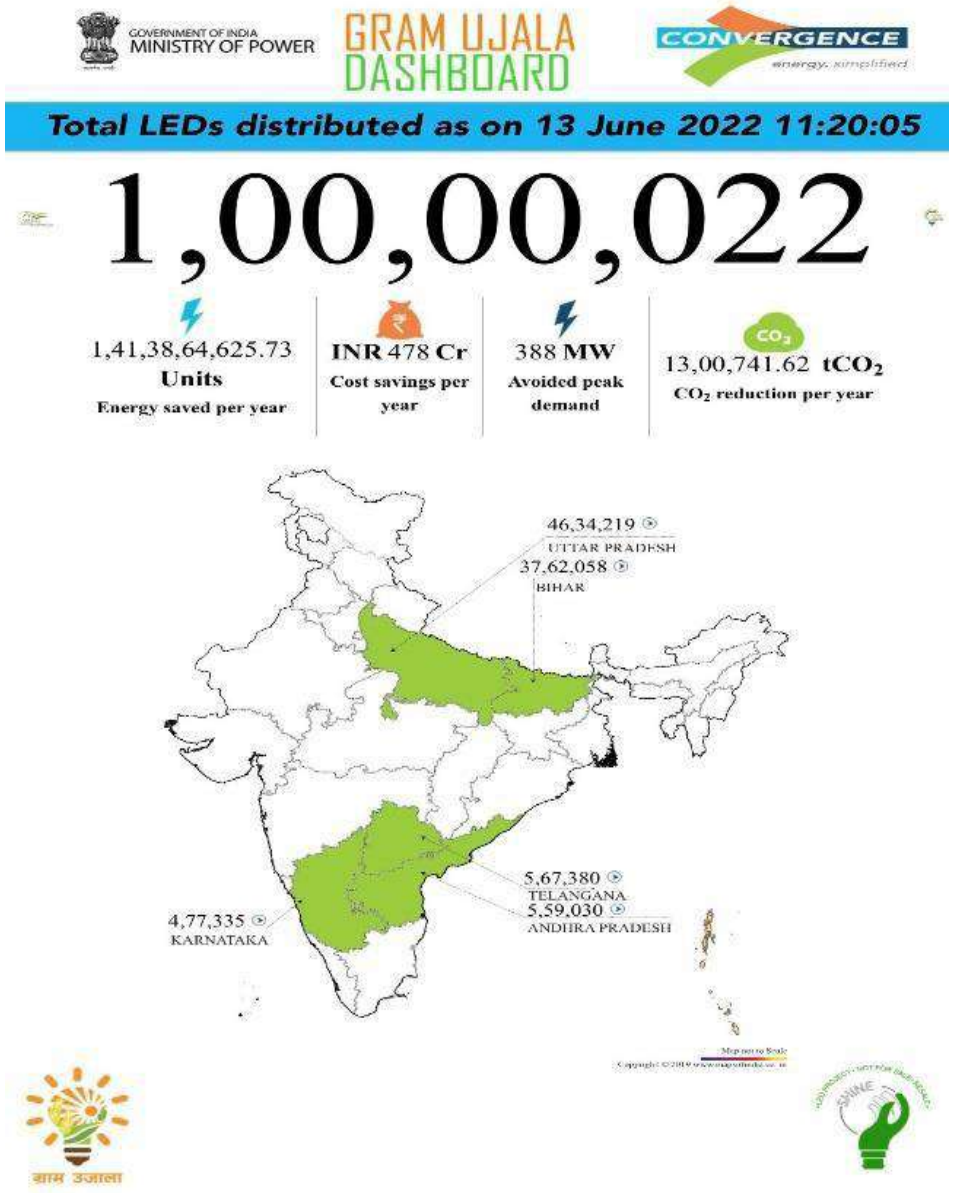
- ✓ Break the myths around LEDs
- ✓ Start conversations around energy efficiency
- ✓ Make people aware of the programme and its benefits
- ✓ To involve the consumers and make it an inclusive campaign- Behavioural Change
- ✓ To drive sales of EESL's LED bulbs across India

Reinforcement through Gram Ujala: A carbon finance model

- Distribution of LED bulbs (7W & 12W) at $0.12
- Launched by **Hon'ble Minister of Power, New and Renewable Energy** in March 2021
- Collected ICLs/CFLs bulbs (60W/100W) and disposed as per protocol.
- **Achieved distribution of 1 million in One Day -**(National Energy Conservation Day, 14th December 2021)
- **10 million distribution completed by 2022**

Progress till date :

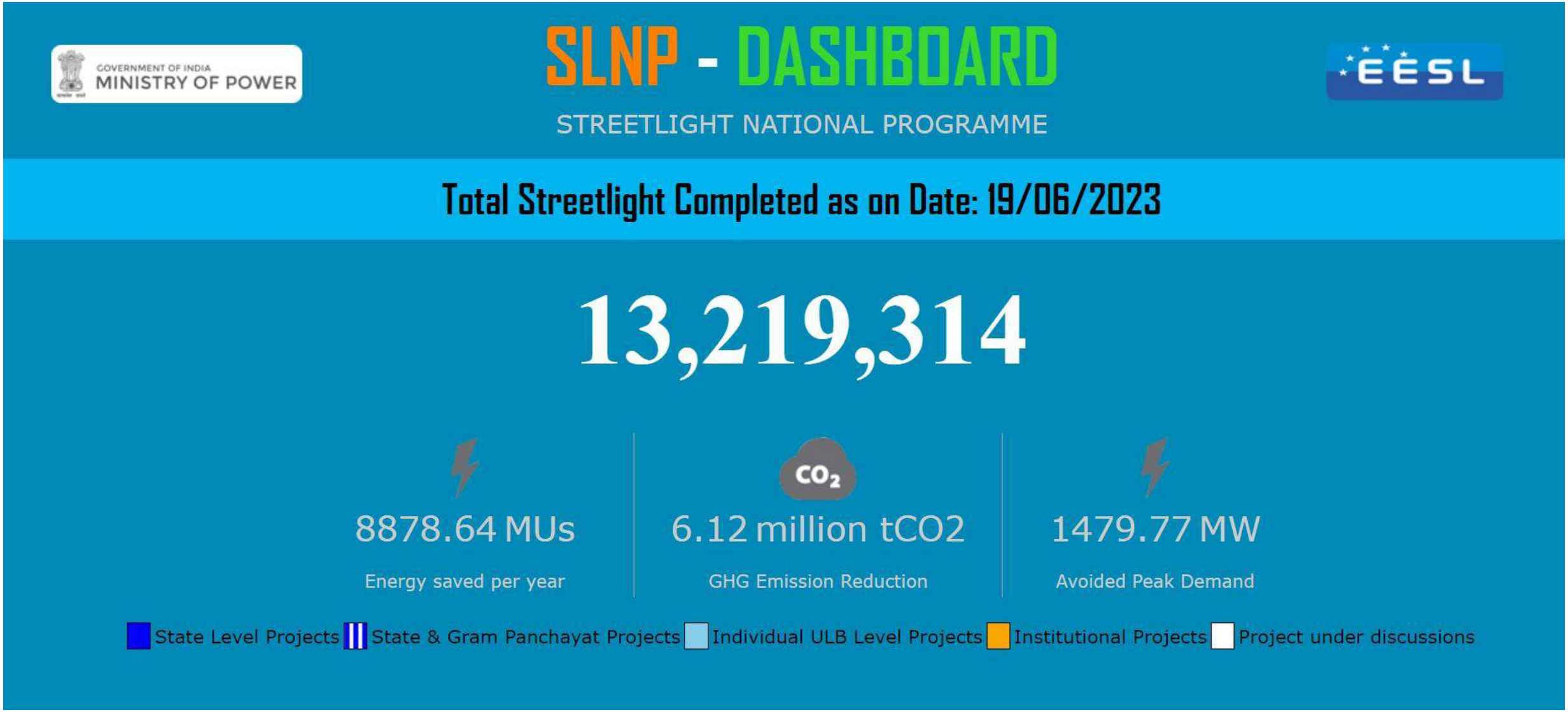
No. of LED bulbs	Capacity generation avoided	Annual Energy Saving	Annual CO2 emission reduction
- 10 mn	**- 388 MW**	**- 141.38 Crore kWh**	**- 13.00 Lakhs t CO2**



Gram Ujala Dashboard https://gramujala.ceslindia.co.in/

Street Light National Programme (SLNP)

Street Light National Programme (SLNP)



Building Energy Efficiency Program (BEEP)

- Implemented in ESCO Model : 5 Years Project
- 12,700+ Buildings completed
- 30-50% savings in Energy Consumption

7175
Railway Stations & Service Buildings

400+
CPWD Buildings

63
Airports

2034
PWD, Maharastra

1100
Bank Branches

594
AP Courts & Govt Buildings

Enabling More

Building Energy Efficiency Program (BEEP)

BEEP
NATIONAL BUILDING ENERGY EFFICIENCY PROGRAM

GOVERNMENT OF INDIA
MINISTRY OF POWER

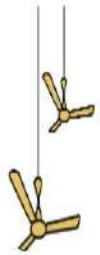
19 June 2023 11:59:57 AM

Till Now

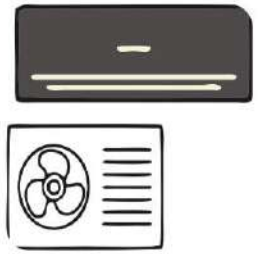
994,556,671.71 kWh	INR 86,042.77 Lakh	75.64 MW	815,536.47 tCO_2
Energy Saving	Cost Saving	Avoided Demand	Emmision Reduction

1,254,222
Indoor Lights Installed

156,710
Outdoor Lights Installed



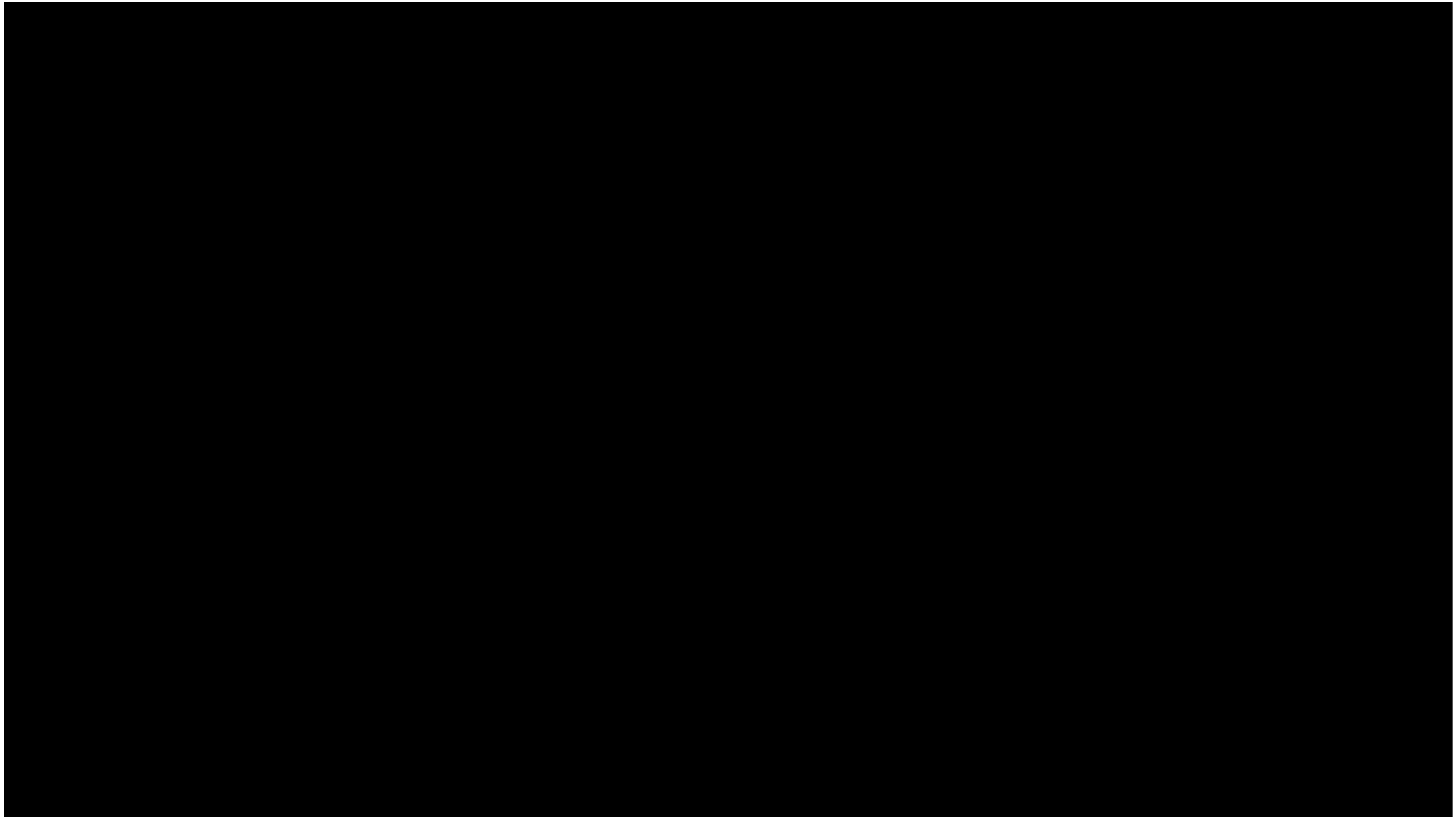
290,073
Fans Installed



34,780
AC's Installed

259 Completed	132 Ongoing	6,660 Completed	3,800 Ongoing
PROJECTS		BUILDINGS	

UJALA



ENERGY EFFICIENCY SERVICES LIMITED
A JV of PSUs under the Ministry of Power

Abhishek Gupta
Head- International & Strategy
agupta4@eesl.co.in
(+91- 9717066607)

Registered and Corporate Office: NFL Building, 5th & 6th Floor,
Core – III, SCOPE Complex, Lodhi Road, New Delhi – 110003, India
Tel.: +91 (011) 45801260
Website: www.eeslindia.org

TECHNICAL SESSION "TRANSITIONING TO MERCURY-FREE LIGHTING IN ASIA-PACIFIC COUNTRIES

National Action Plan on Mercury: from Production to Disposal, Supporting LED Acceleration in Indonesia under ADLIGHT

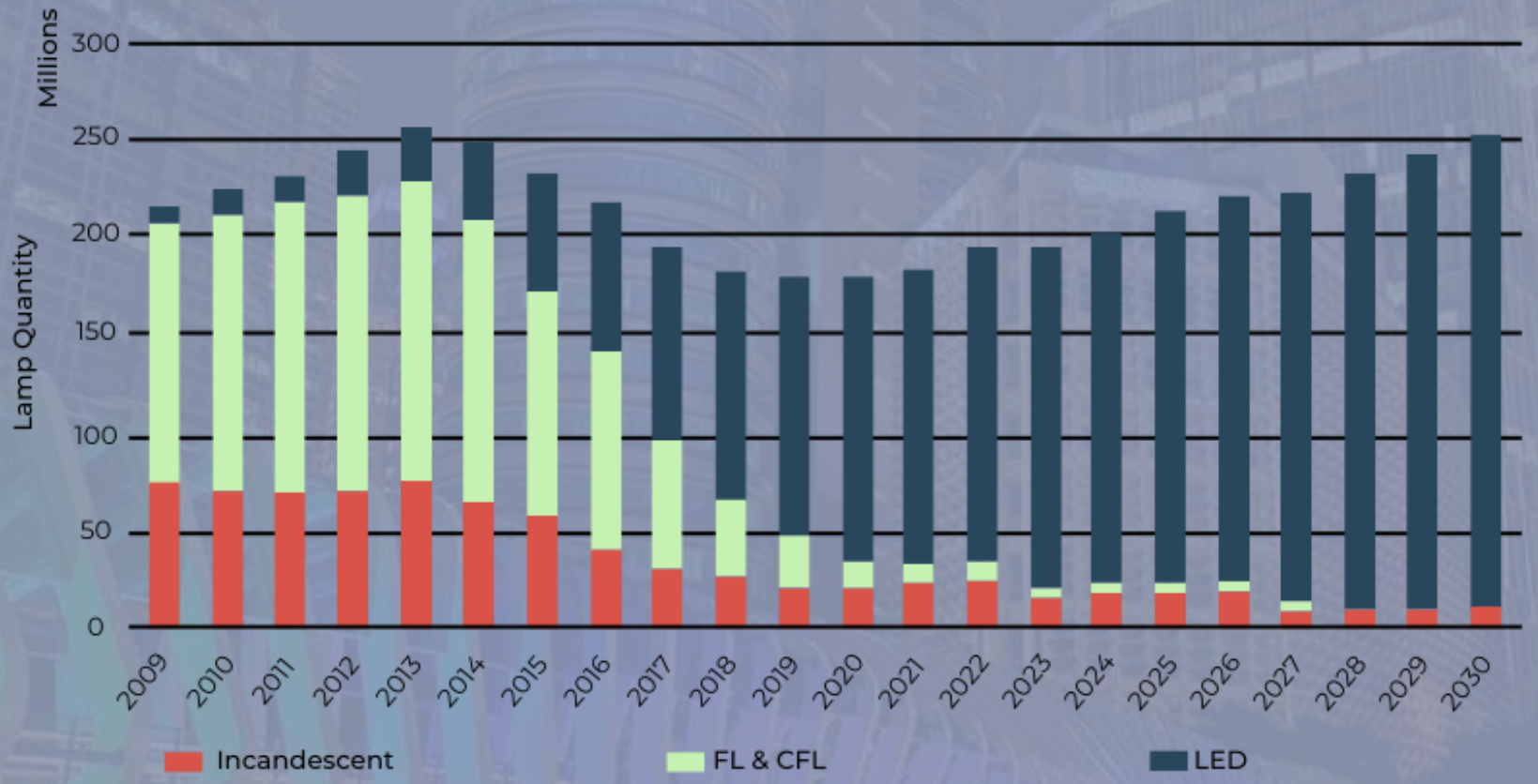
Dr. Eng. Mega Mutiara Sari, ST., M.Si
Universitas Pertamina-Indonesia

ADLIGHT (Advancing Indonesia's Lighting Market to High Efficient Technologies). The project aims to increase the use of high-efficiency lighting technologies through national market transformation so as to reduce GHG emissions.

ADLIGHT

Advancing Indonesia's Lighting Market to High Efficient Technologies

Over the past few years, **Indonesia has successfully phased out mercury-containing lamps and is shifting towards more efficient LED lighting!**



Source: GAMATRINDO Data and Projection of Lighting Needs

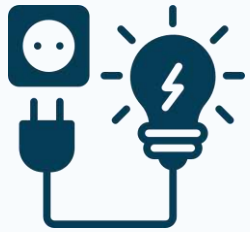
WHAT'S BEHIND INDONESIA'S SUCCESS STORY?

Understanding Community Characteristics

2013

LED lights first entered the Indonesian market

Building design that does not support sufficient sunlight **requires continuous use of lamps**



Unstable electricity requires **lamp replacement every 8 months**

Each household requires a minimum of **5 lamps every eight months**

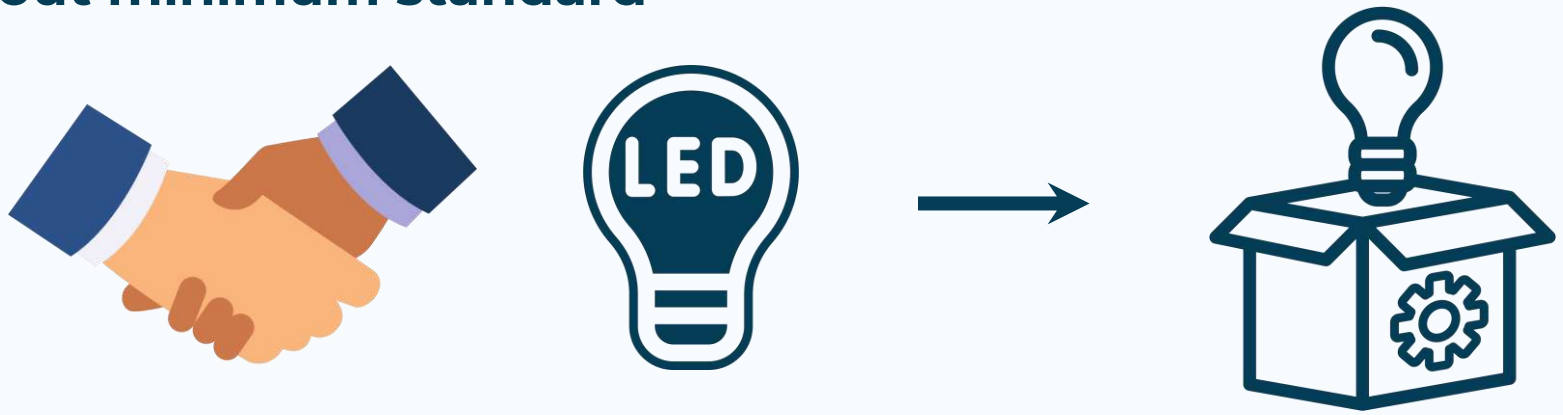
The price of one LED lamp in 2013 was approximately **up to 11 USD**

The **incompatibility of the price** of LED lights **with people's income** at the time (approx. 300 USD)

People prefer cheap mercury lamps to fulfill their lighting needs

2015

Government and ADLIGHT **ease the import of cheap LED lights without minimum standard**



Government Supports

2015

Gradual replacement of street and road lightings with **solar-powered LED lights** throughout Indonesia.

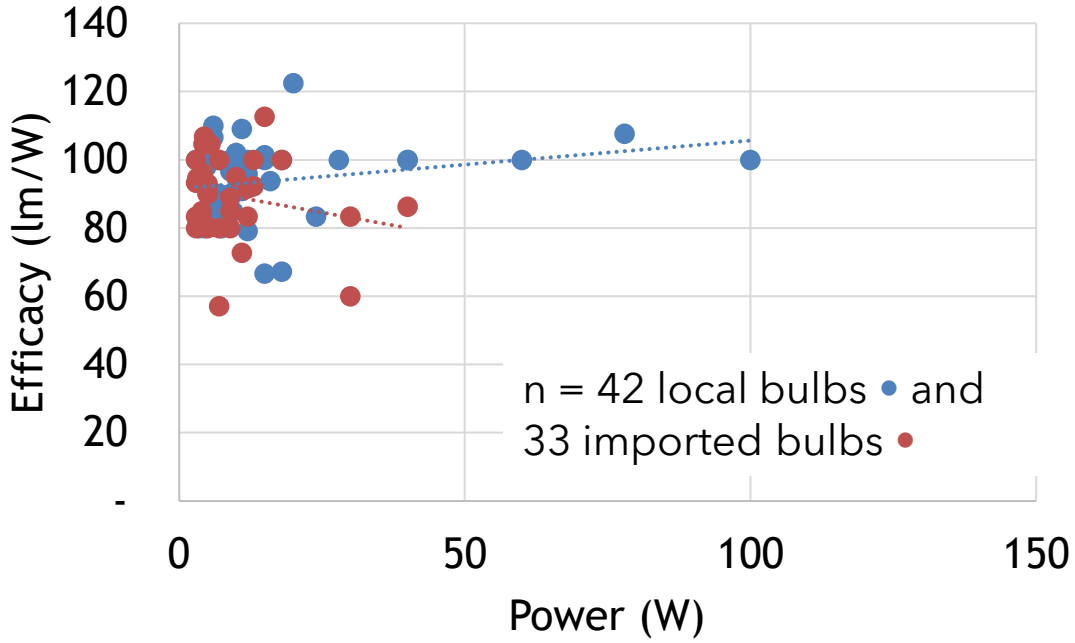
Government Supports - 2019

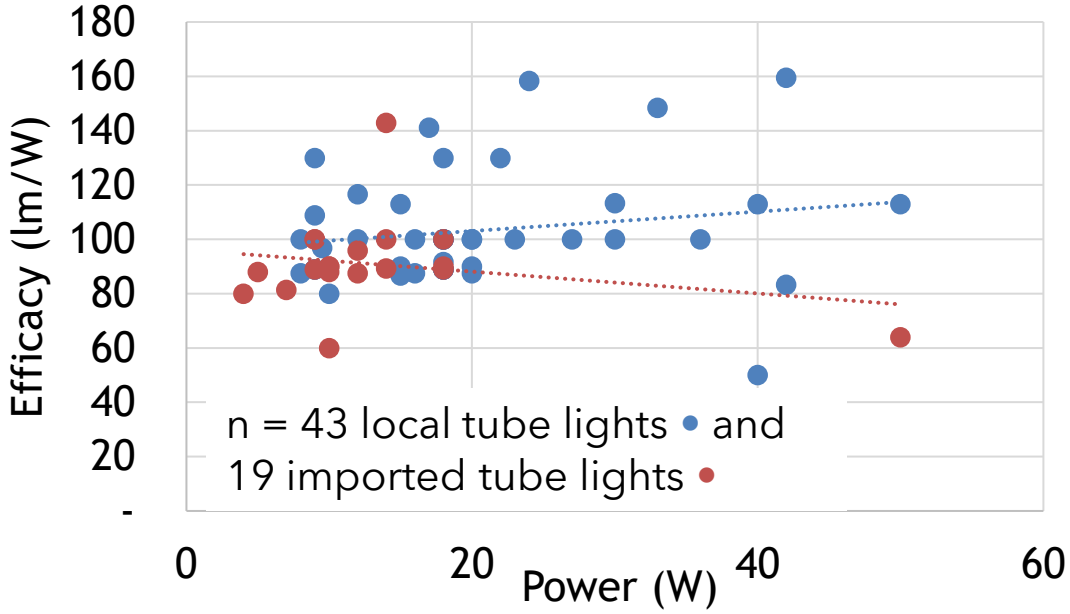
An obligation of Government agencies to use local lights that meets the national safety standard.

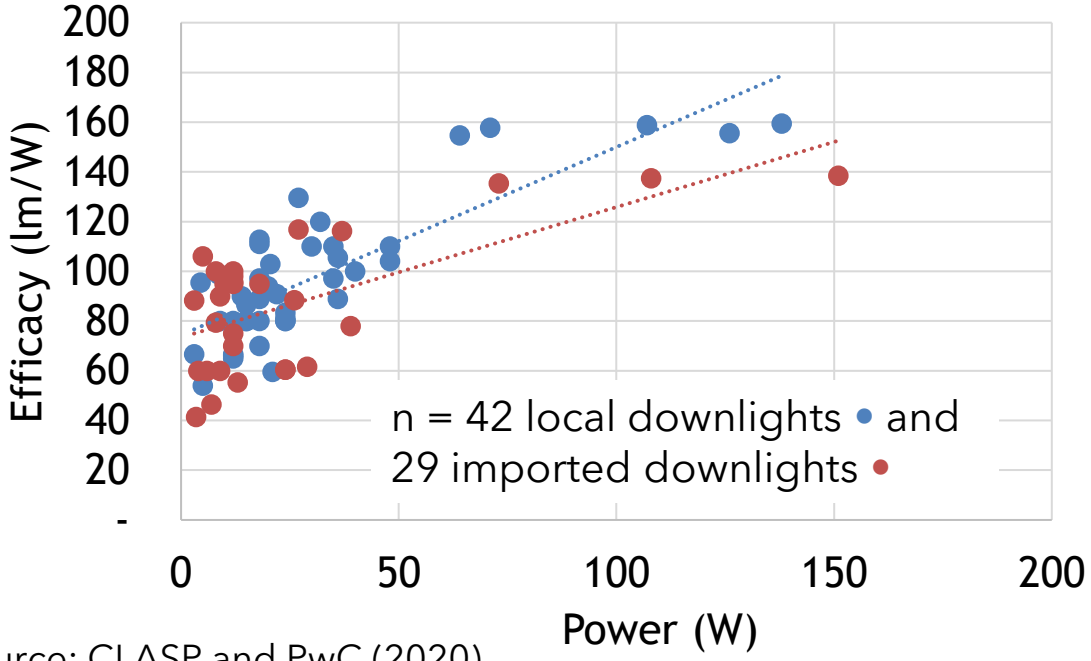
The Government Procurement Agency's catalogue contains local lights that meets the national safety standard.

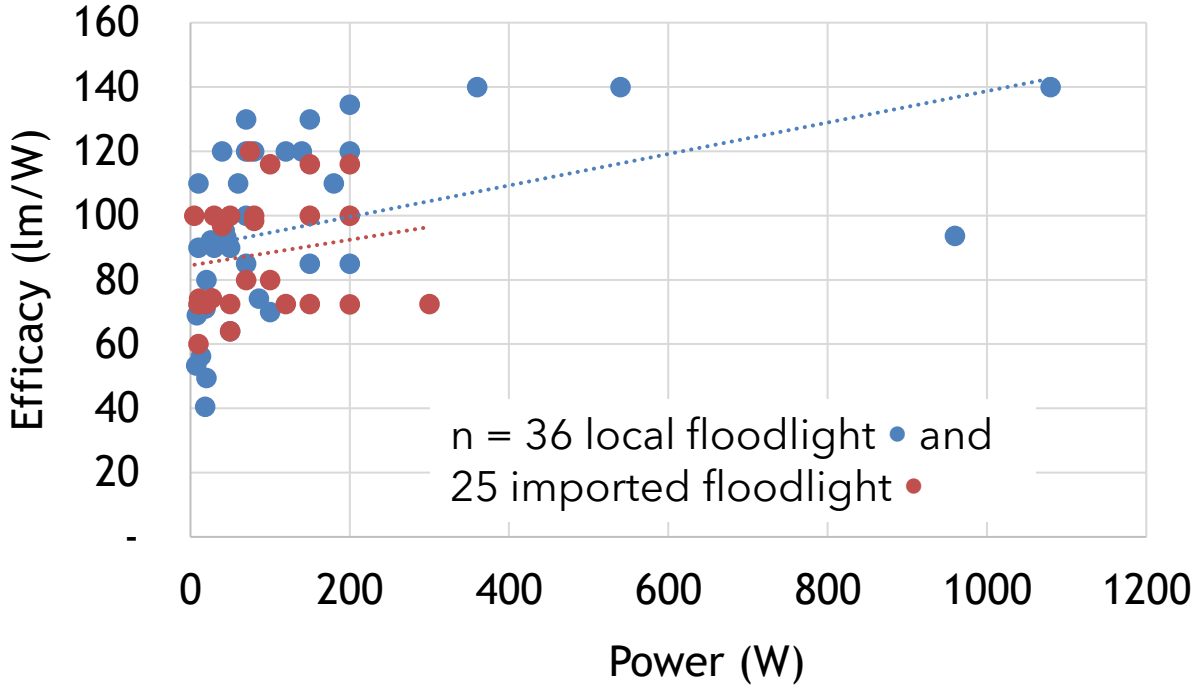
Disseminations of local lights brand that meets national safety standard.

QUALITY & PRICE OF LAMPS CIRCULATED IN INDONESIA

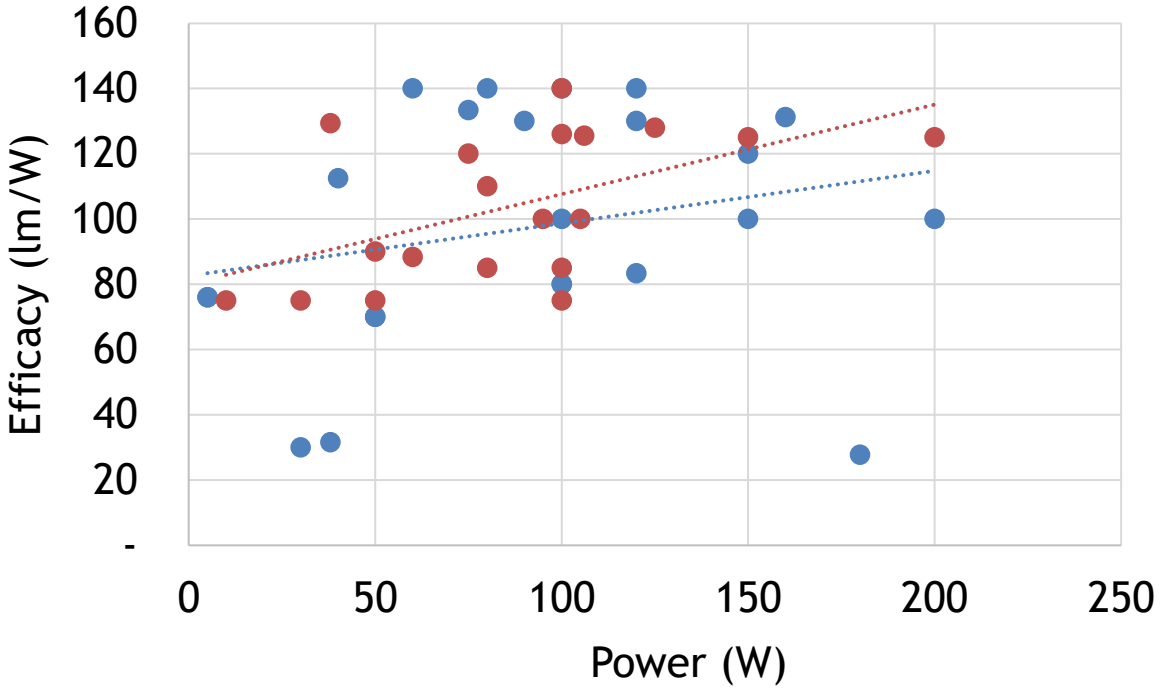




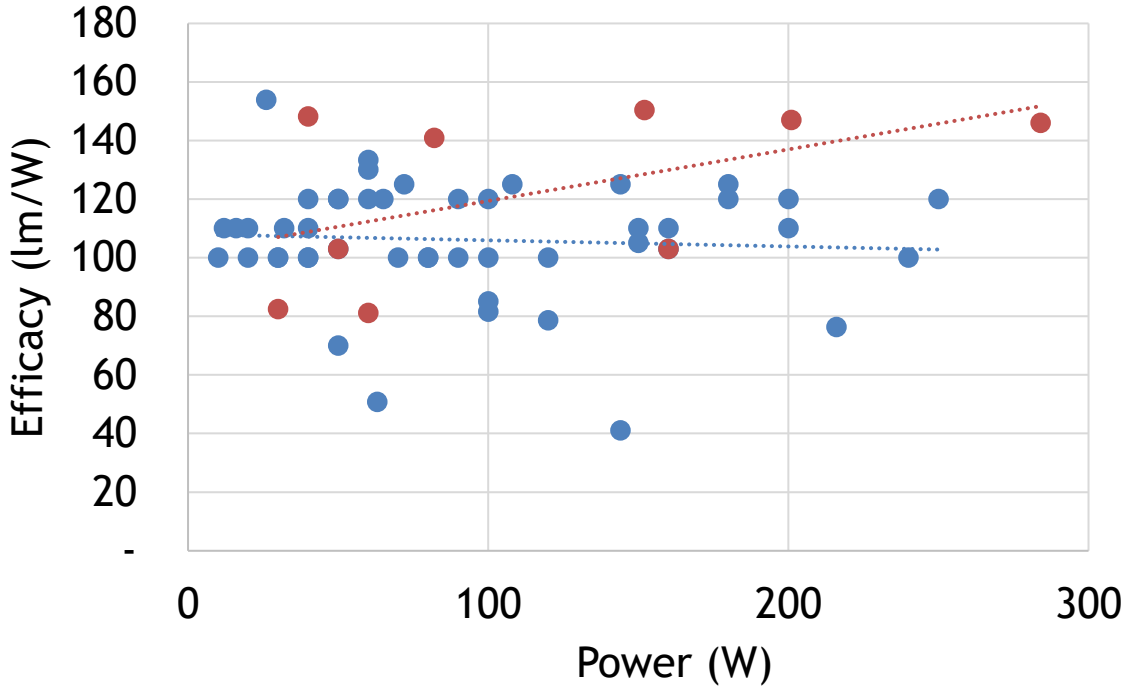




Source: CLASP and PwC (2020)

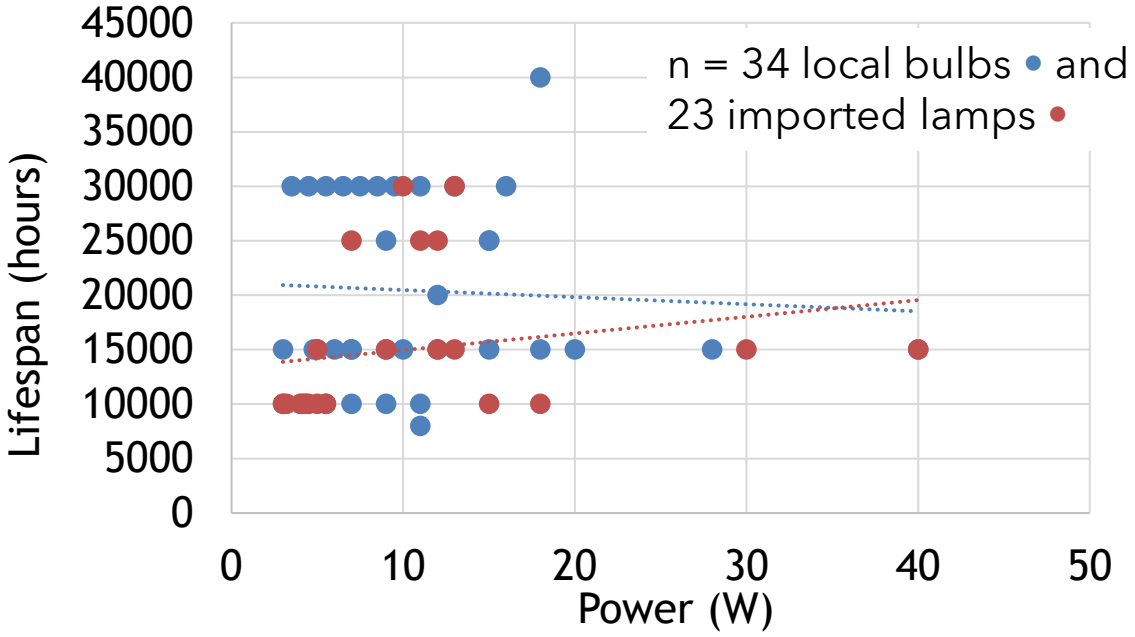


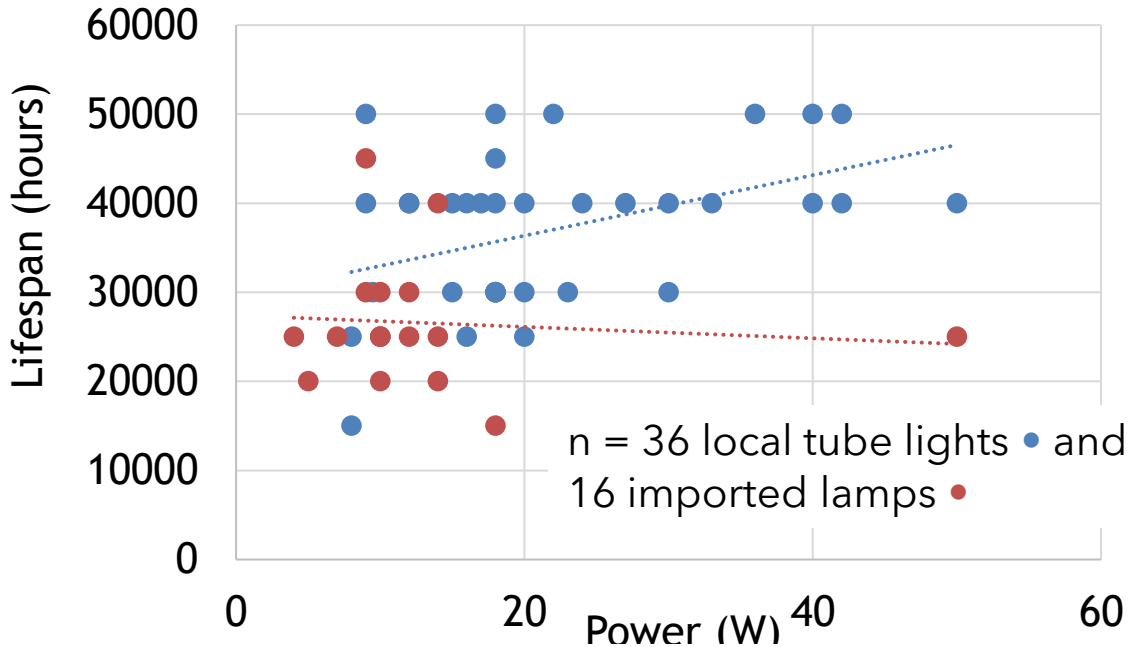
n = 23 local high bay • and
19 imported high bay •

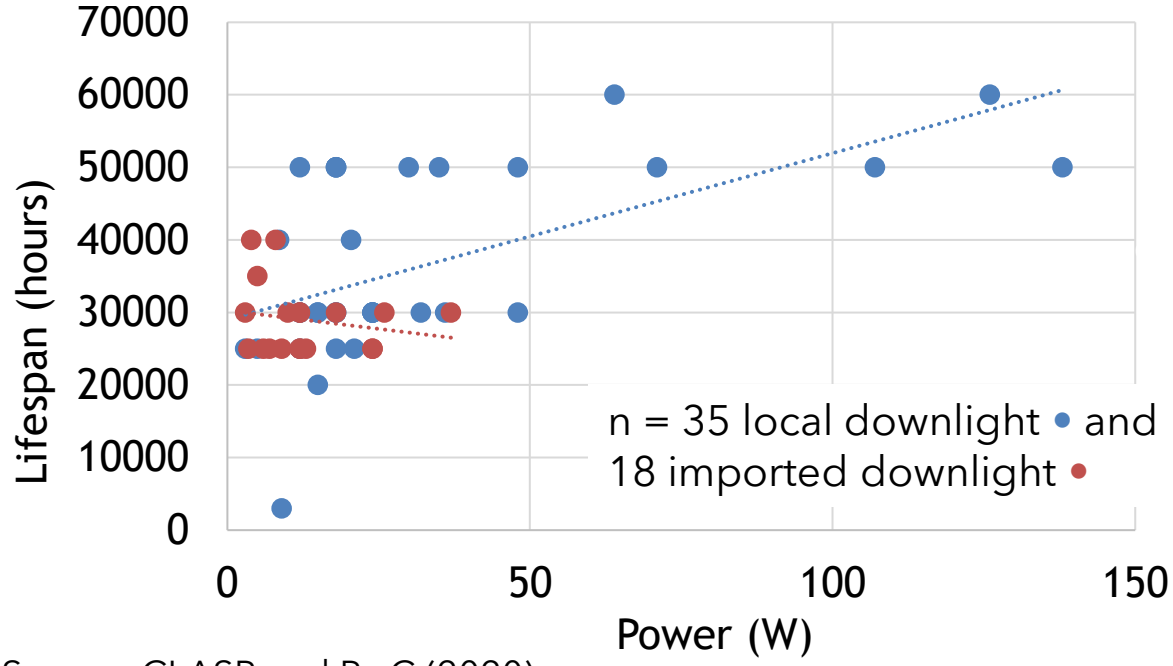


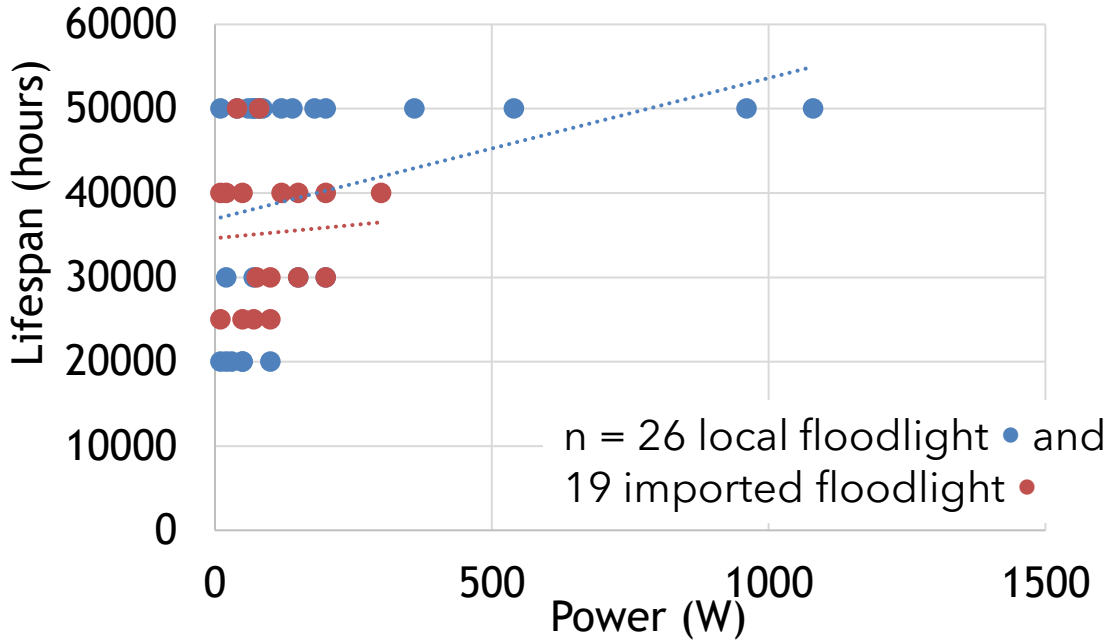
n = 48 local street lights • and
9 imported street lights •

Source: CLASP and PwC (2020)



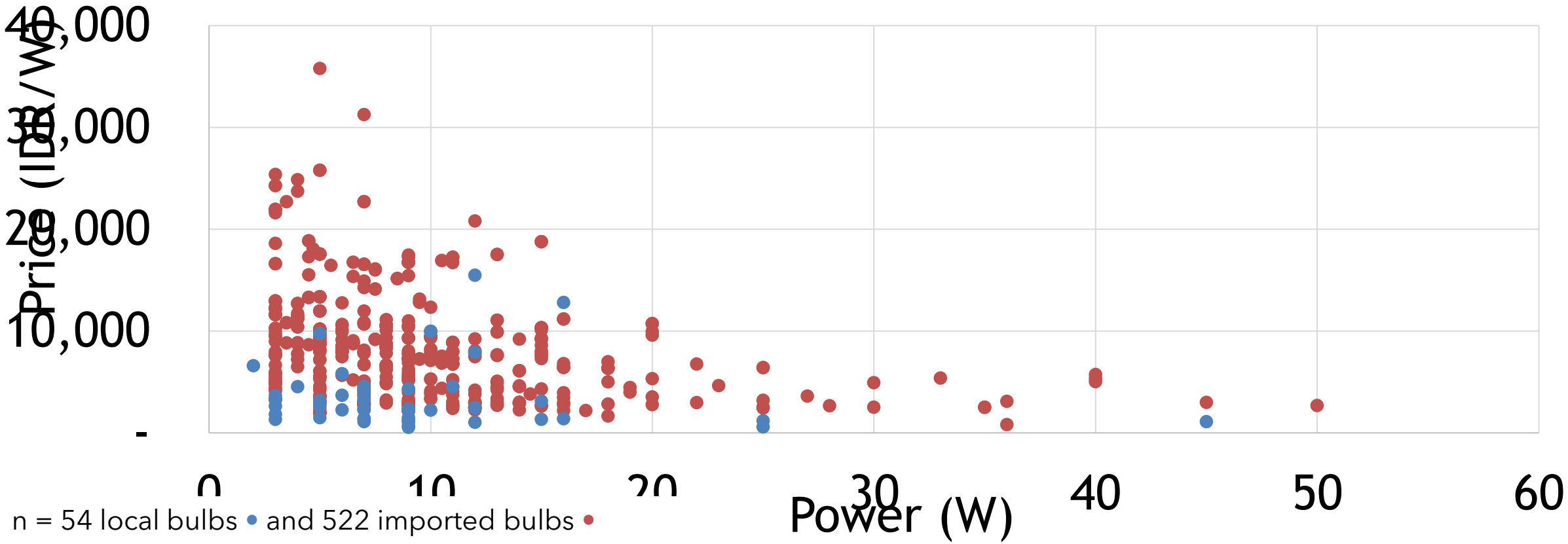






Source: CLASP and PwC (2020)

PRICE LED *BULB*



	Local lamps	Imported lamps
Maximum (IDR/W)	15.500	35.800
Average (IDR/W)	3.972	8.264
Minimum (IDR/W)	556	831

Source: CLASP and PwC (2020)

LED *BULB*

DLIGHT

Present Day

Minister of Energy and Resources Decision Number 135.k/EK.07/DJE/2022

Indonesia's **Minimum Energy Performance Standards (MEPS) for LED lights**

Set the **standard for all lighting**, both local and imported, must have **> 80 lumens/watt** to be sold

Supporting **local lighting production**

Carbon dioxide (CO2) mitigation

Adapting to the Culture

Women Empowerment

Training and socialization on the hazards of mercury lamps and how to handle them

CURRENTLY, **LAMP WASTE MANAGEMENT IS INCLUDED IN THE CURRICULUM** AS ONE OF THE MATERIALS IN HAZARDOUS WASTE EDUCATION.

Regulations on the Import of Lamps and Hazardous Materials

Minister of Trade Regulation No. 75/M-DAG/PER/10/2014 concerning Procurement, Distribution and Supervision of Hazardous Materials

Minister of Trade Regulation No. 25 of 2022 concerning Amendments to Minister of Trade Regulation No. 20 of 2021 concerning Import Policies and Regulations

National Regulations on Mercury Reduction and Elimination Actions

Law No. 11 of 2017 concerning Confirmation of the Minamata Convention on Mercury

Presidential Decree No. 21 of 2019 concerning the National Action Plan for Reduction and Abolishment of Mercury Use

Minister of Environment and Forestry Regulation No. 81 of 2019 concerning Implementation of Presidential Decree Number 21 of 2019

Minister of Health Regulation No. 41 of 2019 concerning Removal and Withdrawal of Mercury Medical Devices in Health Care Facilities Health

Minister of Environment and Forestry Regulation No. 27 of 2020 concerning Waste Management of Medical Devices
Medical Devices Containing Mercury

Lamp Waste Management

2015

No waste management of mercury lamps

2019

Regulation for Specific Waste (Government Regulation Number 27 Year 2020 about Specific Waste Management)

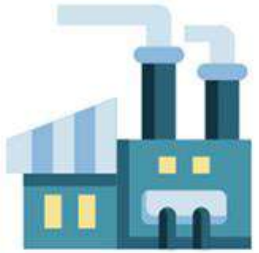
PRESENT DAY

ADLIGHT's approach for **Lamp Waste Management**

B3 waste storage

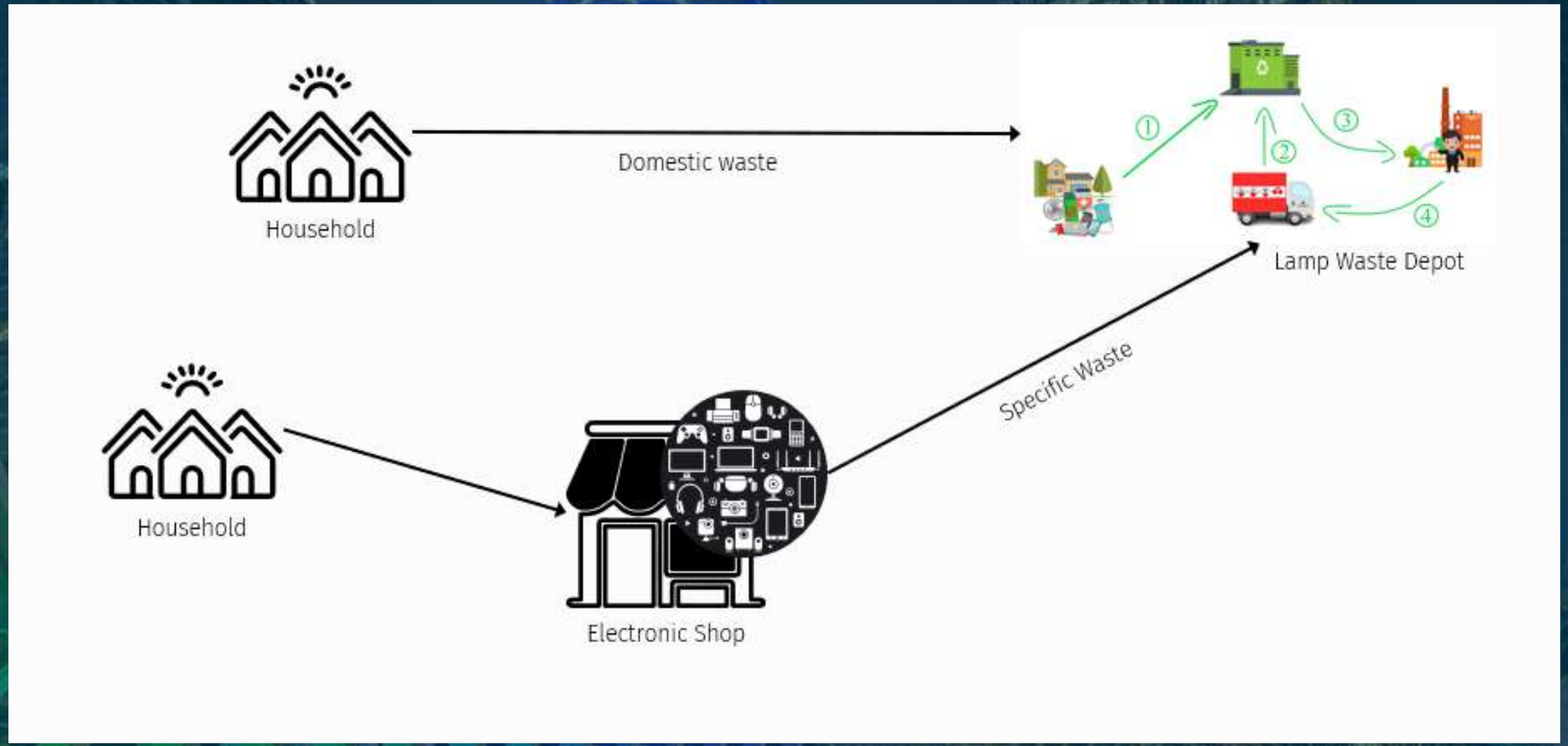
B3 waste Collection

B3 waste transportation



B3 waste utilization/processing

B3 waste landfilling


Household
Domestic waste
①
②
③
④
Lamp Waste Depot
Household
Electronic Shop
Specific Waste

Data on the Hazardous Lamp Waste Generation from PPLI

	Units			
	Ton/year	**Ton/month**	**Ton/day**	**Ton/week**
Waste Generation	228.24	19.02	0.625	4.377

Regulation Plan for TL Lamp Waste Management System

Estimated Cost of Processing TL Lamp Waste

228.24 ton/year

(PPLI, 2021)

Assuming one TL bulb weighs 0.14 kg,

1 Kg => 7 Lamps

The cost of processing lamp waste in PPLI is **10 USD/kg**

Therefore, the estimated cost of processing TL lamp waste is **1.45 USD/lamp**


THANK YOU

PRESENTATION OF
THE STANDARDS ORGANISAION OF NIGERIA (SON)

AT THE

Technical Session:
"Transitioning to Mercury-Free Lighting in Asia-Pacific Countries"

19 and 20 June 2023,
Geneva, Switzerland





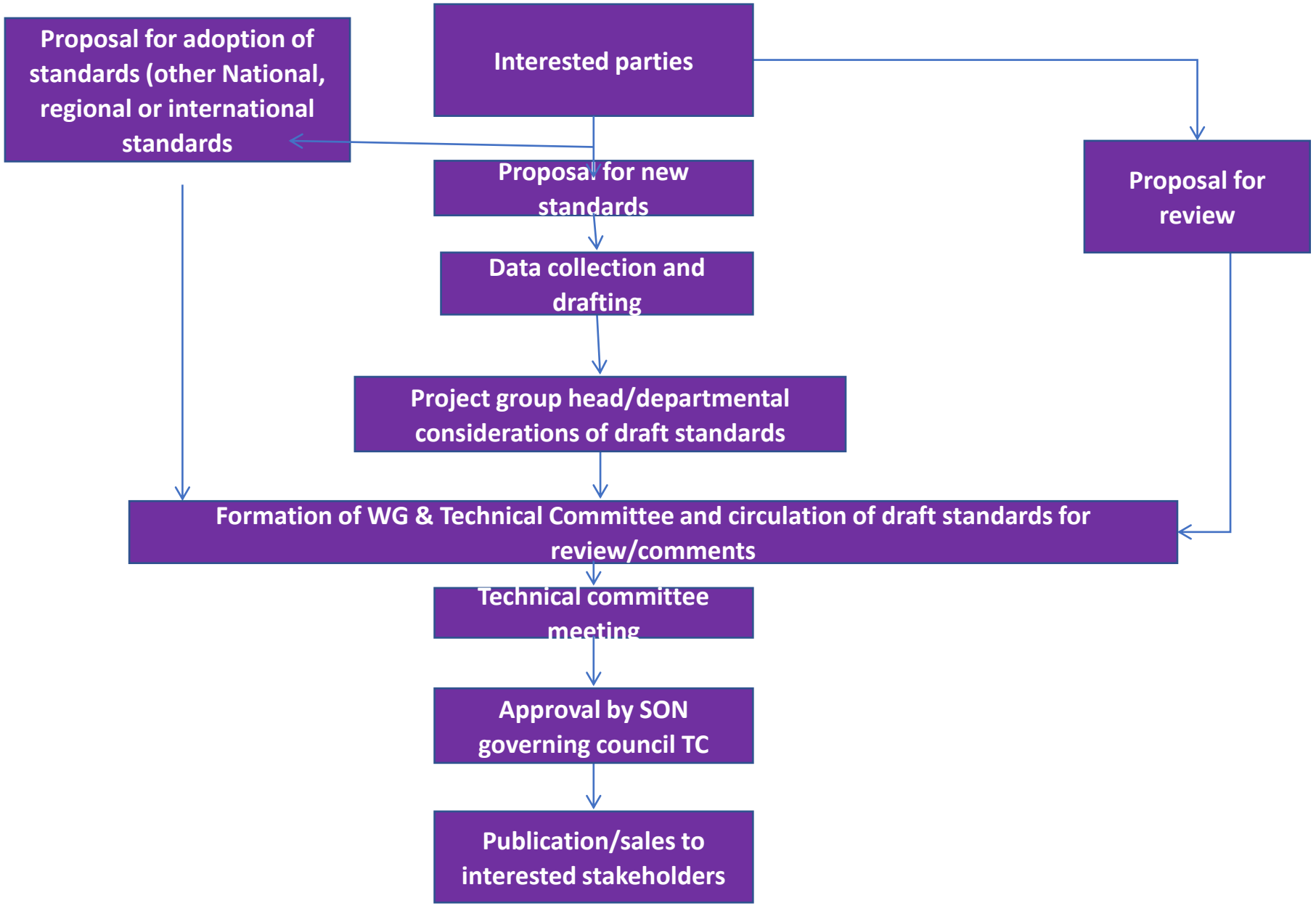



BY:

ENGR. ACHEMA CHERRY ALEWU (Dep Dir. Elec/Elect)

Convened by the UNEP Global Mercury Partnership

Standards Development Processes



LIGHTING MEPS DEVELOPMENTAL PROCESSES IN NIGERIA

Research and Analysis

- Identify the need for MEPS: (CLASP/STRADev)
- Conduct feasibility studies

Stakeholder Engagement

- Consultation and public input (Inception workshop)
- Working Group of NMC:

Standards Development

- SON standards development procedures
- Establish baseline data:
- From proposal to editorial stage

Legal and Regulatory Processes

- SON Standards Council Approval

Implementation and Enforcement

- Testing
- Inspectorate & Compliance
- Nationwide implementations

Monitoring and Evaluation

- SON Planning Research and Statistics.

THE GENERAL PERSPECTIVES OF IMPORTERS ON MEPS ON LIGHTING

Compliance Costs

Concerns that additional costs may be associated with complying with MEPS

Market Access:

MEPS can act as barriers to entry for importers if they are not able to meet the required energy performance standards

Competitive Disadvantage:

Importers apprehension that competitors who adapt to MEPS more quickly or effectively, could gain a competitive advantage

Consumer Demand:

MEPS can drive the market towards more energy-efficient options for importers who are able to offer compliant products therefore benefiting from increased consumer trust and demand

Level Playing Field:

Concerns about unfair competition if MEPS are not consistently and fairly enforced

Product Innovation and Differentiation:

Importers who actively invest in research and development to develop energy-efficient lighting solutions can position themselves as leaders in the market thereby differentiating and offering products that exceed the minimum requirements

Long-term Benefits:

Importers feeling good to contribute to reducing greenhouse gas emissions and enhance energy security. May therefore align strategies with sustainability objectives.

International Harmonization:

Importers operating in multiple markets may appreciate efforts toward regional and/or continental harmonization of MEPS

Regulatory Stability:

Fear of Frequent changes to MEPS which may disrupt supply chains and costly adjustments

THE NEXT PLANS (*POST STANDARDS DEVELOPMENT ACTIVITIES*)

These collectively, are efforts/responsibilities of Government, Manufacturers/Assemblers, consumer and NGOs)

Lab Test Procedures and Compliance criteria	*a. Develop testing protocols/methods* *b. Determine compliance pathways: (in line with requirements of standards)* *c. Verify labelling requirements:* *d. Inspectorate & Compliance in all 36 state plus FCT*
Market and Technology Assessment:	*a. Analyzing market trends:* *b. Evaluate technological advancements:*
Regular Public Consultation and Feedback	*Seek stakeholder input:* *a. Creating awareness & Publicizing the approved standards:*
Economic and Cost-Benefit Analysis	*Conduct cost-benefit analysis:* *a. Consider payback periods:*
Revision and Finalization	*i. Revise MEPS: after 5 years, and/or government policies or tech/market trends* *a. Regulatory approval:* *b. Establish effective dates: in the lifecycle of the MEPS (maintenance)*

Thank you

Success Stories: Phasing Out Fluorescent Lamps in Pakistan

Dr. Zaigham Abbas
Deputy Director(Chemical)

Ministry of Climate Change &
Environmental Coordination

Technical Session "Transitioning to Mercury Free Lighting in Asia-Pacific Countries"

20 June 2023

Introduction

- Signed the Convention: 10 October 2013
- Ratified the Convention: 16 December 2020
- Entry into force: 16 March 2021

147

Projects on Mercury in Pakistan

- Mercury Inventory Pilot Project (January 2008 to November, 2008)
- Management of Mercury and Mercury containing waste (December, 2008 to June, 2010)
- Guidance for Chlor-alkali industry in Pakistan (July 2010 to October,2010)
- Development of Minamata Initial Assessment in Pakistan (March 2016 to March 2019)
- Development of National Action Plan(NAP) for Artisanal and Small Scale Gold Mining (ASGM) Sector of Pakistan“ (ongoing project)

Manufacturing of Florescent Lamps in Pakistan

- Compact Florescent Lamps (CFLs) manufacturing have been stopped and replaced with LEDs.

1. Philips Pakistan
2. Khyber Lamps

Import Policy Order 2016

The import of mercury and mercury compounds shall be allowed in favour of industrial consumers having valid environmental approval from the concerned Federal/Provincial Environmental Protection Agency/Department

Market Survey on LED Lighting

- For market analysis, an extensive survey of products consisting of Incandescent bulbs (IBs), Compact fluorescent lamp (CFL), Light Emitting Diode (LED) bulbs, and linear tubes (both fluorescent and LEDs) was conducted in the cities of Rawalpindi, Islamabad, and Cantt areas of Gujranwala

- Survey results along with interviews and discussions with the relevant entities indicate that currently **LED bulbs are by far the most suitable option for both consumers and suppliers in Pakistan**

Market Survey on LED Lighting (Cont.)

- **LEDs have penetrated to above 90% of the market and in around 85% of them, only lighting products are being sold**. The use of fluorescent lighting products is now mainly limited to industrial and street lighting
- Apart from linear tubes, the retail as well as wholesale market has completely shifted towards LEDs

Market Survey on LED Lighting (Cont.)

- CFL bulbs that are still available on shops are mostly the ones that have already entered the market. Although significant models and brands of LED linear tubes are available at every retail and wholesale center, traditional fluorescent tubes (mainly of Philips) are still available for sale.

Comparative Assessment of LED retrofit products as compared to Linear Fluorescent Lamps

➢Cost effectiveness of LEDs have already driven a transition towards LED lighting in Pakistan.

Item	Linear Fluorescent Lamp	Equivalent LED Retrofit
Life	13,000 hrs	25,000 hrs
Lamp Price*	PKR 210	PKR 650
Power	36 W	18 W
Use (9 hr/day)*	118 kWh/yr	59 kWh/yr
Elec cost.*	PKR 2,074/yr	PKR 1,037/yr
7-year cost	PKR 14,887	PKR 7,912
Payback period		**5 months**

Comparative Assessment of Pakistan with other Asia Pacific countries

Country	LED payback vs. Inc/Hal	LED savings compared to CFL	LED payback vs. LFL	LED savings compared to LFL
Bangladesh	30 weeks	42%	11 months	40%
India	9 weeks	50%	9 months	40%
Philippines	12 weeks	40%	4 months	46%
Sri Lanka	8 weeks	50%	**	
Pakistan	3 weeks	41%	5 months	47%
Vietnam	9 weeks	46%	8 months	47%

National and Regional Benefits

Country / Region	Mercury avoided in lamps	CO2 avoided	Electricity bill savings
	(Metric tonnes)	(Million metric tonnes)	(Billion USD)
Pakistan	**0.7**	**33**	**$6.50**
Asia-Pacific	75.9	3,279	$691.80
Latin America	11.3	239	$90.90
Africa	4.9	221	$31.40

Global Benefits

- Globally, phasing out fluorescents can remove ***3.5 gigatons of CO_2 emissions*** and ***reduce global electricity uses by 3% by 2050, $1.3 trillion dollars in energy bill savings*** while simultaneously ***eliminating 232 tonnes of mercury pollution.***

Views of Relevant Stakeholders

➢**Federal Board of Revenue**

"As compared to traditional lighting, FBR has reduced the custom tariff rates on LEDs. ***The custom duty rate for LEDs and energy savers is 3%*** whereas it is 20% for all other bulbs. For domestic manufacturing of LEDs, ***the rate of sales tax was zero*** while it was 17% for import of LEDs"

Views of Relevant Stakeholders (Cont.)

- **National Energy Efficiency and Conservation Authority (NEECA)**

"NEECA has already made a substantial progress in a complete shift towards LED lighting. ***Mercury based lighting products are not included in Minimum Energy Performance standards for lighting*** which indicates that there use in not encouraged in Pakistan. Although there is no official moratorium on mercury-based lighting, but through MEPs, NEECA has already phased them out"

Views of Relevant Stakeholders (Cont.)

➢**Clean Lighting Coalition (CLiC)**

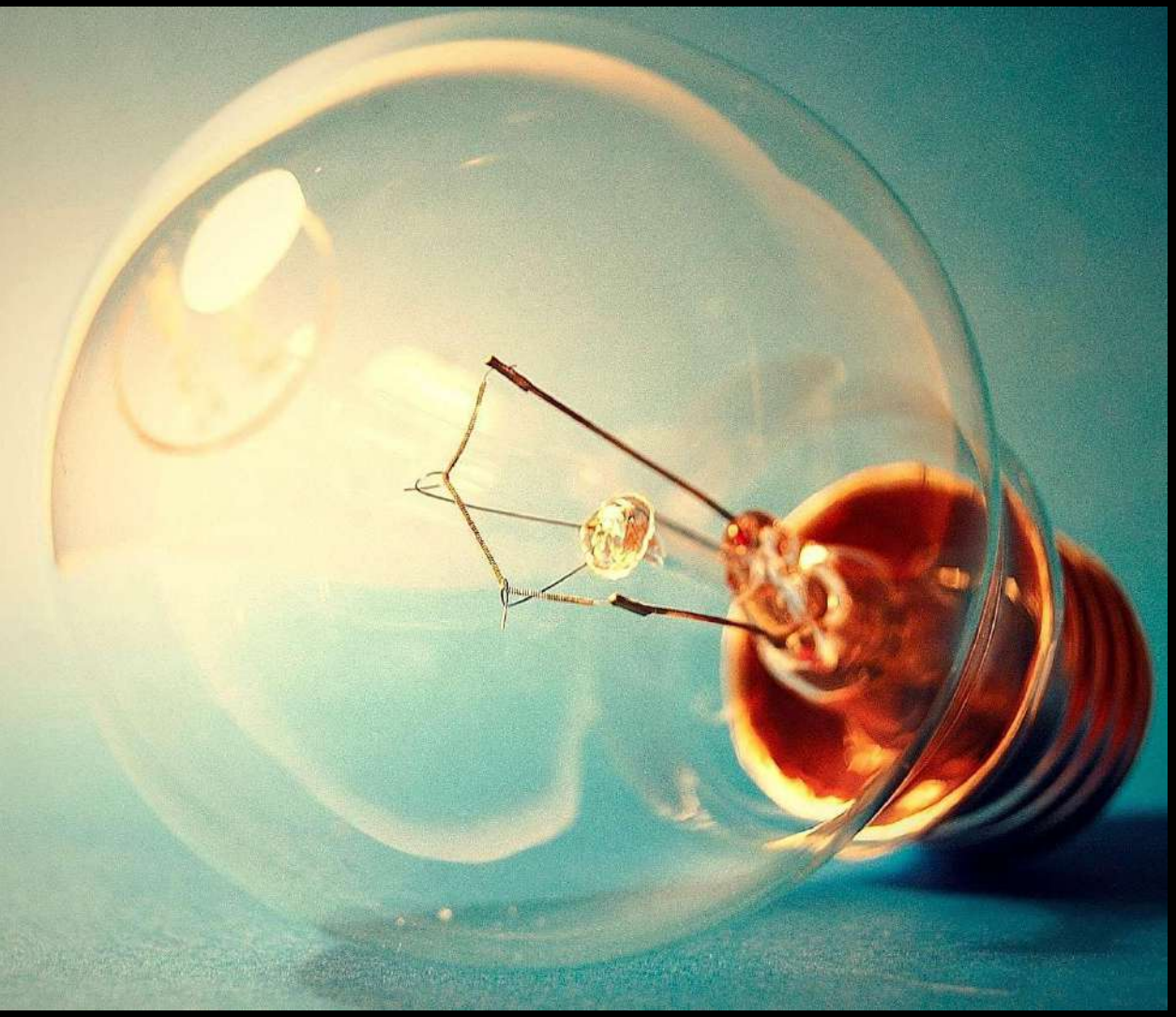
"The prospects of transition towards ***LED lighting goes beyond reducing mercury to providing a much better economic case for energy consumption*** in countries. LEDs today represent the ***most energy efficient and least life-cycle cost alternative*** across the countries"

Future Target of Pakistan

Making Pakistan Mercury Free

Thank You

162



Global Policy overview and status

Colin Taylor, Implementation Lead, CLiC

Global Update: The Fluorescent Phase-Out

Clean Lighting Coalition Implementation Activities

Policy implementation

- Supporting the development standards and labels for a smooth transition away from fluorescents
- Ensuring policies are effectively implemented

Evidence base

- Collecting data on the lighting products available in each market
- Analyzing benefits and potential costs of a transition to LEDs

Market Transformation

- Retrofit projects in the Philippines, Indonesia, Nigeria, and Brazil
- Leveraging revised labels for subsidy and replacement programs

Mercury-Free Momentum: Global Action to End Toxic Lighting

North America

Canada proposed a Mercury Regulation to phase out CFLs and LFLs.

USA

Adopted

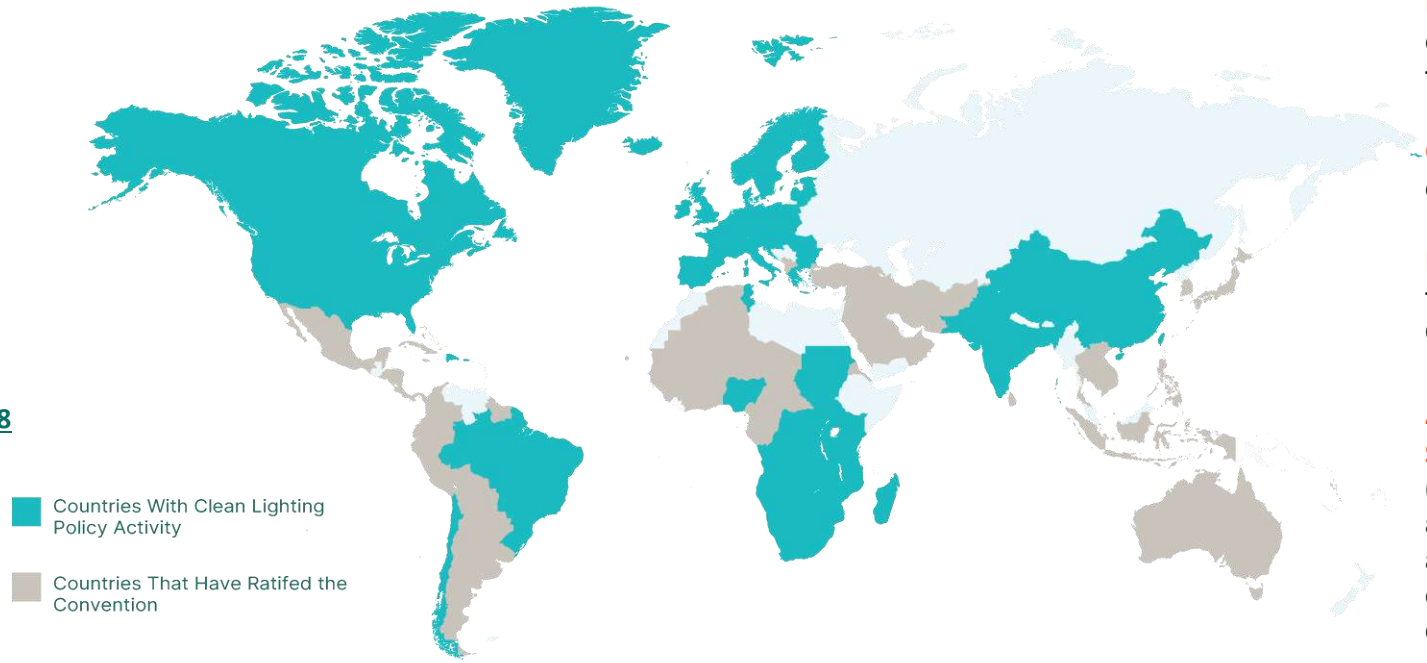
- California: AB2208
- Vermont: ACT120

At Governor's Desk

- Colorado: HB23-1161
- Hawaii: HB192 HD2

Introduced

- Hawaii: SB690 SD2
- Illinois: HB2363
- Maryland: HB 1021
- Massachusetts: H.777 and S.538
- Nevada: AB 144
- New Mexico: HB 185
- Oregon: HB2351
- Rhode Island: H.5550
- Washington: HB 1185



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 will ban 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.

European Lighting Policy Measures, 2009 to 2022

- **EU-27 and the European Economic Area** have adopted policy-measures to keep improving their lighting market

- **ECODESIGN Regulation (Environmental Regulation) –** measures applicable to fluorescent lamps only:
  - 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 60cm, 120cm and 150cm: 1 September 2023; **EU No 2019/2020**

- **RoHS Regulation (Hazardous Substances Regulation)**
  - Removes fluorescent lighting from virtually all general-purpose lighting applications on either 24 February 2023 or 24 August 2023.
  - CFLni – all base-types (single capped): 2023; **EU No 2022/276** (RoHS)
  - T8, T5 – all lengths and diameters: 2023; **EU No 2022/284** (RoHS)

EU/EEA – Phase out Dates

2010-2012 Ecodesign

2021 Ecodesign

2023 RoHS

United Kingdom – New Lighting Regulation

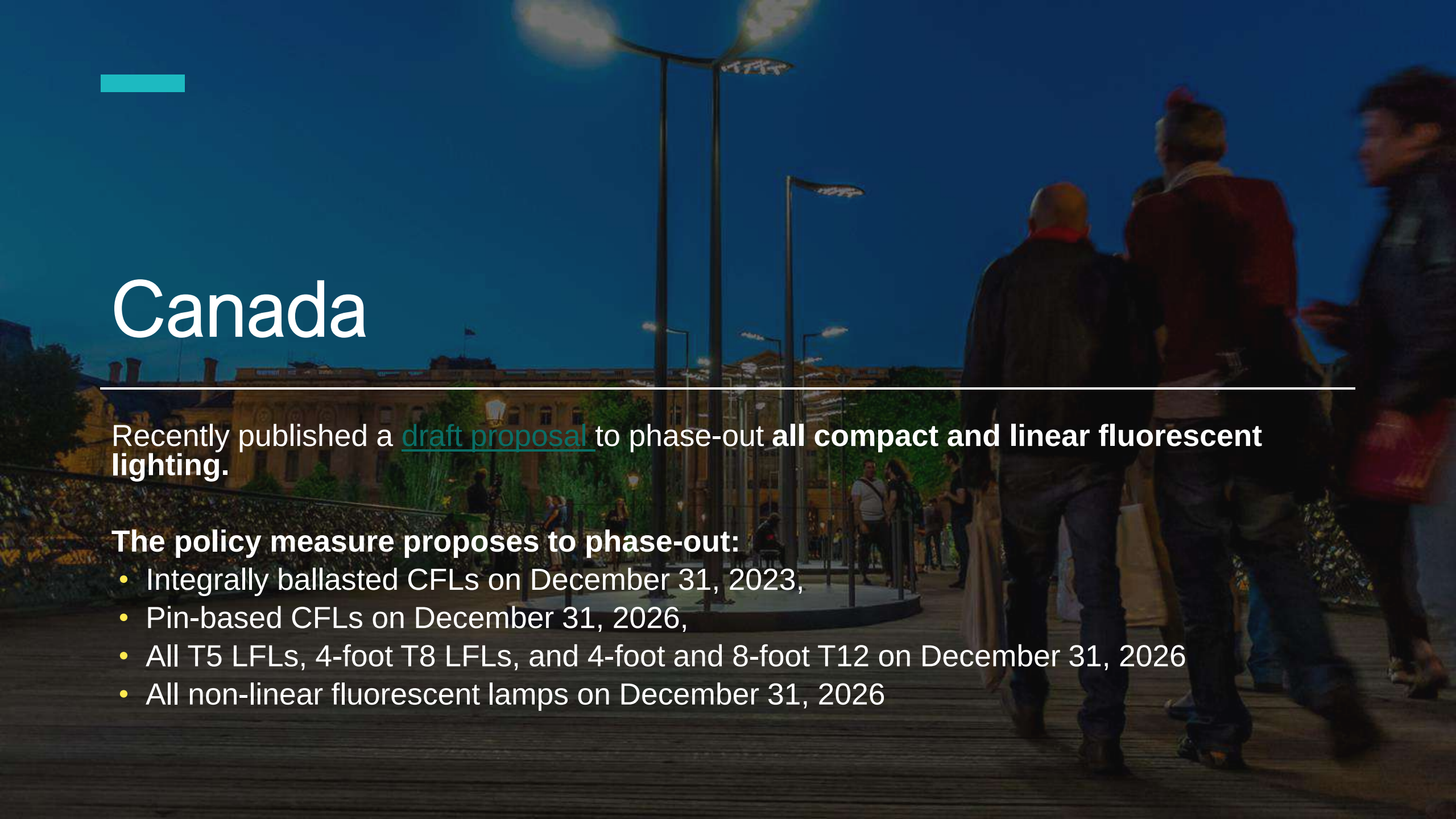
- UK announcement in November 2021, aligned with UNFCCC COP26 in Glasgow
- January 2023, GB announced most ambitious lighting MEPS proposal by any government
- Proposed minimum performance requirements:
  - 120 lm/W from 2023
  - 140 lm/W from 2025

United State Fluorescent Phase-Out

- **California, Colorado, and Vermont** have successfully adopted laws phasing out the sale of fluorescent lighting.
- **Hawaii** passed a bill phasing out the sale of fluorescent which is awaiting the governor's signature.
- The **US DOE** has proposed efficiency regulations (MEPS) that would eliminate CFLs from the market.

The following states have introduced legislation to phase out the sale of fluorescents:

- **Oregon** - HB2531.
- **Washington** - HB 1185.
- **Illinois** - HB2363.
- **Massachusetts** - bills 777 & S.538.
- **Maryland** - HB 1021.
- **New Mexico** - HB 185.
- **Nevada** - AB 144.
- **Rhode Island** - 5550.
- **Minnesota** – HF 3326



Canada

Recently published a draft proposal to phase-out **all compact and linear fluorescent lighting.**

The policy measure proposes to phase-out:

- Integrally ballasted CFLs on December 31, 2023,
- Pin-based CFLs on December 31, 2026,
- All T5 LFLs, 4-foot T8 LFLs, and 4-foot and 8-foot T12 on December 31, 2026
- All non-linear fluorescent lamps on December 31, 2026

Brazil

- Inmetro currently updating labelling and quality regulations; new regulations will include an **explicit ban on CFLs**
- The Ministry of Mines and Energy has confirmed their intention to **develop MEPS** this year that would effectively **ban all non-LED** lighting products, such as LFLs, halogen lamps, and HID luminaires.

East African Community

- In July 2022, the seven countries including Kenya have adopted a regionally harmonized quality and performance standard, EAS 1064-1:2022.
- The standard covers energy efficiency and functional performance requirements, sampling, and test methods for general service and tubular lamps.
- The requirements of the East African standard are aligned with the Southern African standard and will phase out fluorescent lamps in favor of LEDs.

South African Development Community

- In June 2021, the sixteen countries of SADC adopted regionally harmonized quality and performance standard SADCSTAN HT-109.
- **South Africa** has also adopted the SADC policy for GSLs.
- This standard sets a technology-neutral efficacy requirement that phases out fluorescent lamps and transitions to LEDs.

Nigeria

- The Standards Organisation of Nigeria (SON) hosted an Inception Workshop on the Minimum Energy Performance Standards (MEPS) and Labeling of Lighting in Nigeria to begin the process of developing Nigeria's first lighting MEPS.
- The technical committee has approved Nigeria's proposed MEPS and labels.
- Nigeria is in the process of collaboratively developing regional MEPS to implement in the Economic Community of West Africa States (ECOWAS).

Pakistan

- The National Energy Efficiency & Conservation Authority has approved the country's first ever LED MEPS and labelling regulations with the new policy specifically,

"aimed to enhance the best quality LED products, for a rapid phase-out of CFL lamps and incandescent bulbs."

- In February 2023, the Pakistan Ministry of Science & Technology announced a law that would prohibit the manufacture, sale & import of incandescent lamps & compact fluorescent lamps with effect from July 1, 2023.

China

- Has begun work on the development world-leading Minimum Energy Performance Standards (MEPS) for LEDs, targeting policy adoption by the end of 2024
- These will not cover non-LED products, as their market share is rapidly decreasing.

Indonesia

- 2021 Roadmap for High Efficiency Lamps for Indonesia
  - Includes phasing out lamps that contain mercury in government agencies and SOEs buildings by 2022

Singapore

- National Environment Agency is aiming for all bulbs sold to meet the same minimum efficacy levels as LEDs from 2023 onwards

Philippines

- House Bill No. 262 (pending approval) aims to require all government office to use LEDs instead of incandescent and CFL bulbs, and fluorescent tubes.

Thailand

- 2021 Long-term Low Greenhouse Gas Development Strategy includes LEDs as part of the technologies for a successful transition.
- Voluntary MEPS for LEDs have been in place in Thailand since 2013.

Vietnam

- 2020 GEF/UNDP project to support Vietnam's transition to non-mercury lighting (among others).
- In 2019 MOIT issued Circular mandating certification requirements for domestically produced and imported LED products

Conclusion

- We are seeing a global shift away from fluorescent lighting and toward high-quality, mercury-free, efficient LEDs
- 60+ countries representing over 70% of the global market are developing policies for a smooth transition away from fluorescent lighting
- Markets for fluorescent lighting across the world are disappearing fast
- The time to say farewell to fluorescents is now

Thank you!

Vivian Cox
Climate Policy Analyst
Clean Lighting Coalition
www.cleanlightingcoalition.org
United States

vcox@clasp.ngo
Tel: +1 315 237 7057

Colin Taylor
Senior Manager, Climate
Clean Lighting Coalition
www.cleanlightingcoalition.org
United States

ctaylor@clasp.ngo
Tel: +1 240 370 5544

Clean Lighting Coalition

Discussion and Conclusions

Rodges Ankrah, Chair of the Partnership Advisory Group, Global Mercury Partnership