United Nations Environment Programme
en.lighten Initiative

Minimum Energy Performance Standards – components and processes

Essel Ben Hagan

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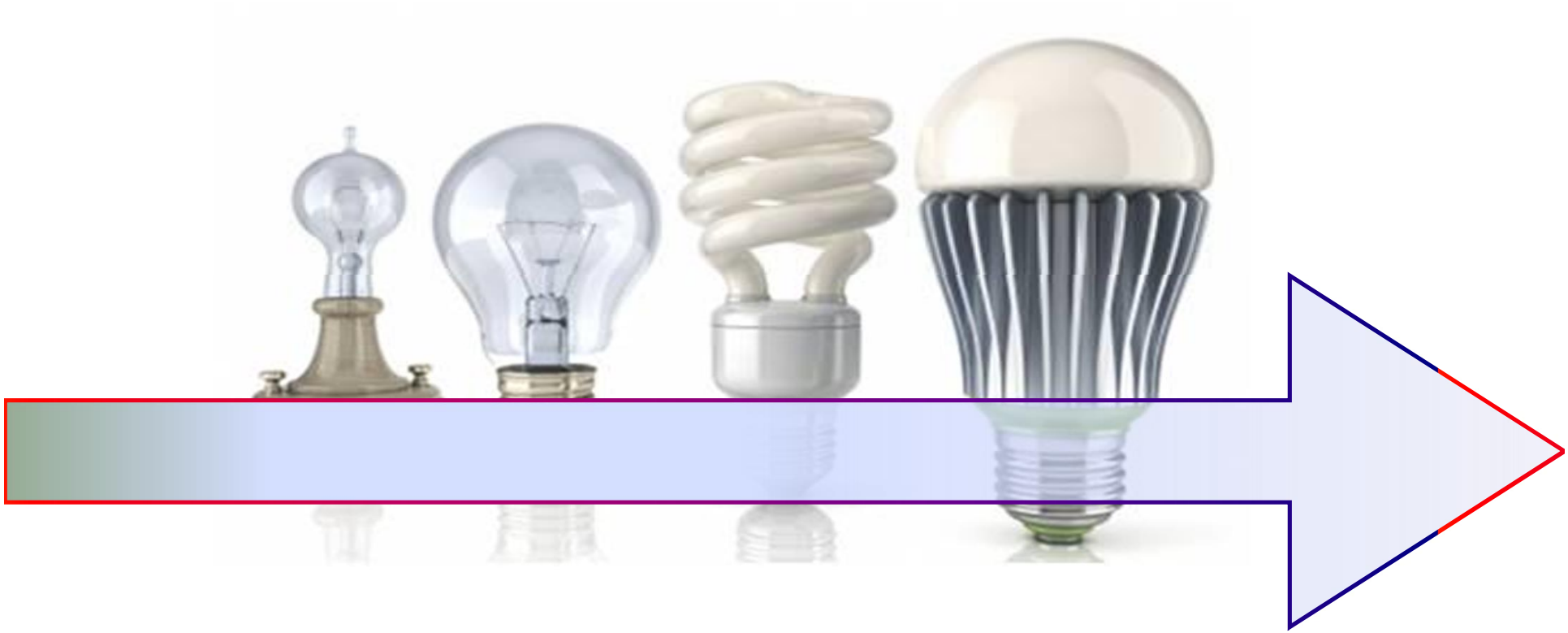
gef PHILIPS OSRAM nLtc National Lighting Test Centre China

Overview

1. Efficient lamps for residential applications
2. Minimum Energy Performance Standards (MEPS) and product labels

Efficient Lamps for Residential Applications



Efficient Lamps for Residential Applications: Definition (en.lighten initiative)

- Single-ended
- Operate on mains power (integrated ballast or circuit driver)
- Standard size/type of end-cap, fits common sockets
- Omnidirectional light distribution pattern (no “reflector”)
- Most common light sources today are:
  - Incandescent (including tungsten halogen incandescent)
  - Fluorescent (compact fluorescent: CF)
  - Solid-state (light emitting diode: LED)

Residential Lamps: Overview

Lamp Type	Technology	Relative Lamp Cost Initial	Relative Lamp Cost Lifetime	Relative Energy Consumption
 **Incandescent**	- Heated metal filament - Sealed glass bulb - Inert gas fill	Very Low	High	**100 W**
 **Tungsten halogen incandescent**	- Heated metal filament - Sealed glass bulb - Halogen/xenon gas fill	Low to Medium	High	**~72 W**
 **Compact fluorescent (CFL)**	- Sealed glass tube with phosphor coating inside - Mercury gas fill - Electric arc excites phosphors that emit light	Low to Medium	Low	**~22 W**
 **Light emitting diode (LED)**	- Electrical current in semi-conductor produces color (blue*; or, red+green+blue) - *Blue-excited phosphor coat produces colours = white	High to Very High	Medium to Low	**~15 W**

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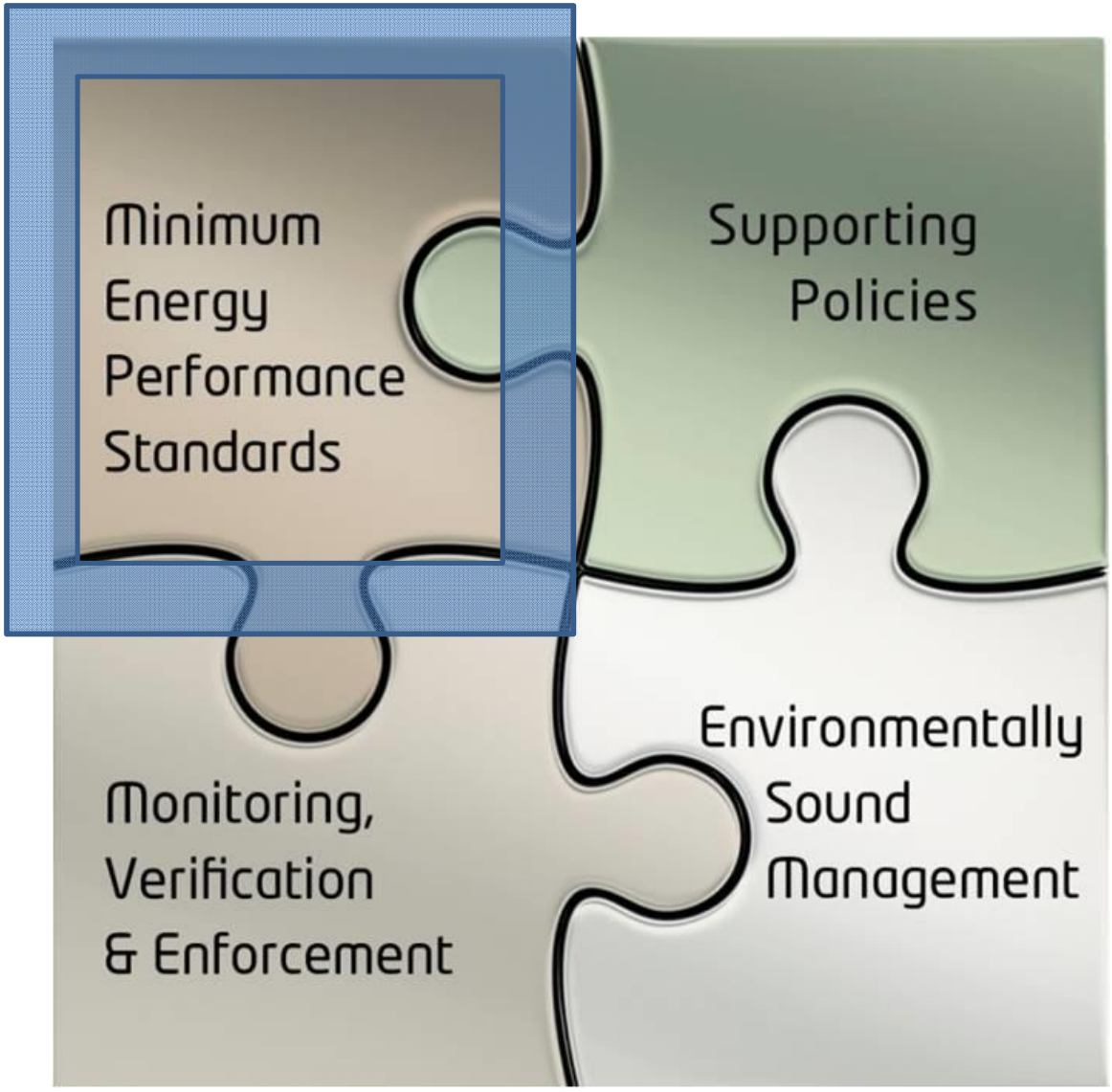
Efficient Lamps: Summary

- **Today's most efficient lamps for residential use are CFLs and LEDs**
  - The initial cost of CFLs is much lower than LEDs
  - Power demand for same amount of light is similar, but will decrease soon for LEDs
  - Lifetime of CFLs = ~6000 to 10,000 hours
  - Lifetime of LEDs =~10,000 to 50,000 hours
  - Fewer choices now for LEDs, more coming soon
- **When deciding which lamps to promote, also consider:**
  - How to monitor, verify and enforce good performance
  - Economics: what matters most to the buyer & user
  - How can government and private sector support good choices
  - Environment: What should users do with spent lamps? How to manage collection & recycling

National Efficient Lighting Strategy – Integrated Approach



Minimum Energy Performance Standards (MEPS)

- Cost-effective means of increasing the overall efficiency of the lamps in use in residences
- Stock of lamps in use is dynamic: timing and stringency of MEPS influences real-time savings and total savings during any given period
- Country may first issue enabling legislation and then assign responsibility for defining details to a ministry (usually energy)
- Timing: All at once; or, phased in: by wattage, by year, by lamp type, by increasing stringency, or any combination
- Stringency: Usually increases with wattage. More lumens per watt for higher wattage lamps

Minimum Energy Performance Standards: Primary Requirements

- Luminous efficacy: Written in the law or detailed ruling as an equation that can be graphed as a curve. This is preferred to an efficacy per wattage bin.
- Must refer to or define a comprehensive test method
- Tolerances are specified in the test method
- May include varying sub-requirements for some lamp types, to accommodate testing of light sources.
- May specify lumen maintenance over time
- May give guidance on “equivalency” (to incandescent lamps)

Minimum Energy Performance Standards: Secondary Requirements

- Lifetime: May require rated lamp life minimum, or, a declaration of rated lamp life. Warranty may be required or encouraged.
- Safety: Electrical, fire, health and communications. Warranty may be required or encouraged.
- Quality, Power: Power factor; total harmonic distortion
- Quality, light: Correlated color temperature; color rendering index or color quality scale; color consistency
- Materials: May limit or ban some materials, such as heavy metals (As, Cd, Hg, Pb)

Minimum Energy Performance Standards: Labels

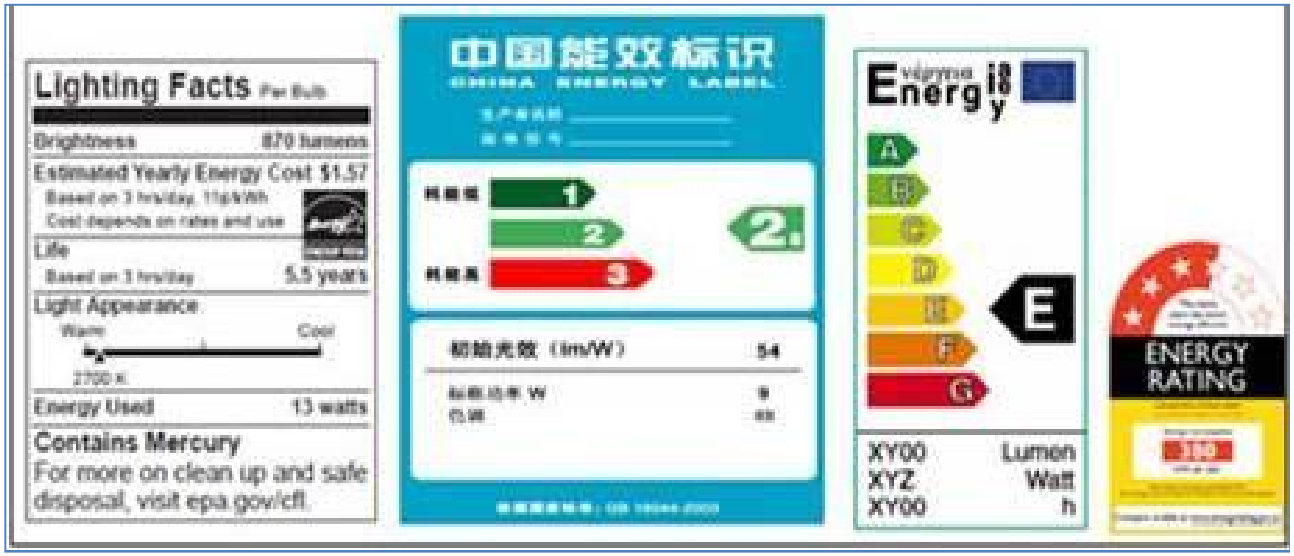
- May be part of the MEPS, or, separate legislation
- Defined format and placement
- Typically required: Input power demand (W); total luminous output (lumens); electrical and fire safety
- Should coordinate and comply with other national commerce or trade requirements
  - Note country of origin/assembly; recommended uses; warnings; warranty information, etc.
- Harmonizing with other economies can increase a country's market economic leverage and access to a larger range of high quality products
- EU and North America: commonly emulated information labels for technology-neutral MEPS

Minimum Energy Performance Standards: Labels

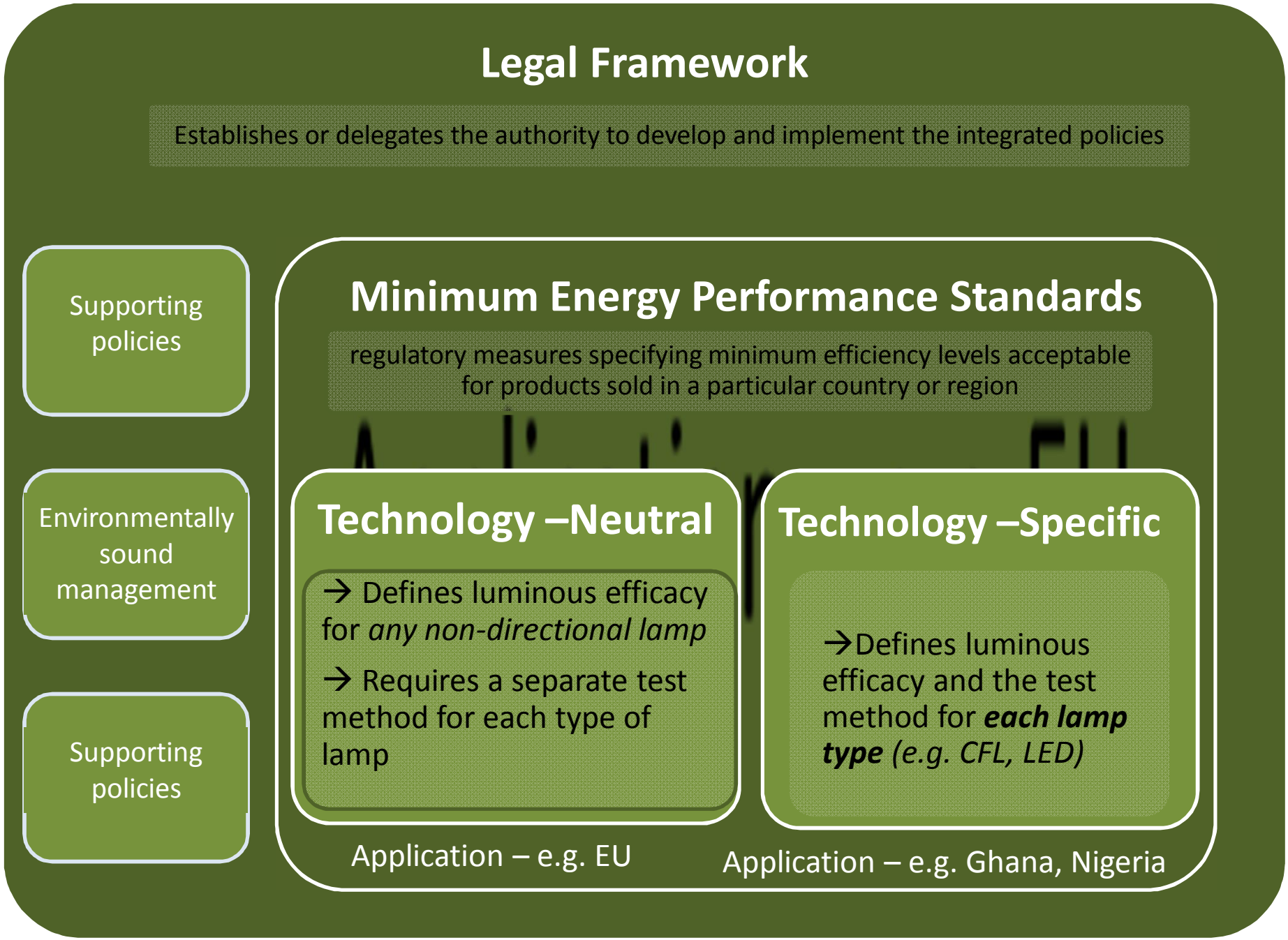
- Mandatory label provides key product performance information
- Empowers end users to make informed purchasing decisions
- Products must be evaluated and certified to meet program requirements
- Can motivate suppliers to exceed minimum levels of efficiency and quality
- Cost-effective approach for accelerating market transformation
- Effectiveness enhanced by:
  - strong stakeholder engagement and regional coordination
  - flexibility to improve label as needed

Types of Labels: Examples

Comparative:
Gives information for comparing features and performance with other products



Endorsement:
Confirms that product meets the minimum performance criteria


Legal Framework
Establishes or delegates the authority to develop and implement the integrated policies
Supporting policies
Environmentally sound management
Supporting policies
Minimum Energy Performance Standards
regulatory measures specifying minimum efficiency levels acceptable for products sold in a particular country or region
Technology –Neutral
→ Defines luminous efficacy for *any non-directional lamp*
→ Requires a separate test method for each type of lamp
Technology –Specific
→Defines luminous efficacy and the test method for ***each lamp type*** *(e.g. CFL, LED)*
Application – e.g. EU
Application – e.g. Ghana, Nigeria

TECHNOLOGY PROHIBITION POLICY

- Policy bans a specific technology from a market
  - e.g. incandescent lamps
- Approach
  - banning sale of product – local manufacture capacity
  - imposing import ban – no local manufacture capacity

- **ADVANTAGES**
- Simple policy to communicate and understand
- Forces the adoption of efficient lamps & encourage the rapid development of new alternatives
- Offers clear signal to suppliers and customers regarding efficiency levels for new products
- Help maintain and expand retail channels for efficient lamps

TECHNOLOGY BAN (CONT'D)

- **CONSTRAINTS**
- Difficult to define technology to ban
  - Some aspects of the technology / its particular applications may be still desirable
    - e.g. banning all incandescent lamps could also remove lamps required for special applications, such as lamps for medical devices
  - Creating exemptions can create unexpected loopholes that may be exploited for more general applications
    - e.g. lamp designed for medical use may appear in general consumer market
- Banning particular technology removes opportunities for innovation
  - could narrow range of products available in the future
- May require high up-front costs for replacement products
- Create challenges for collection and environmentally sustainable treatment of the banned lamps

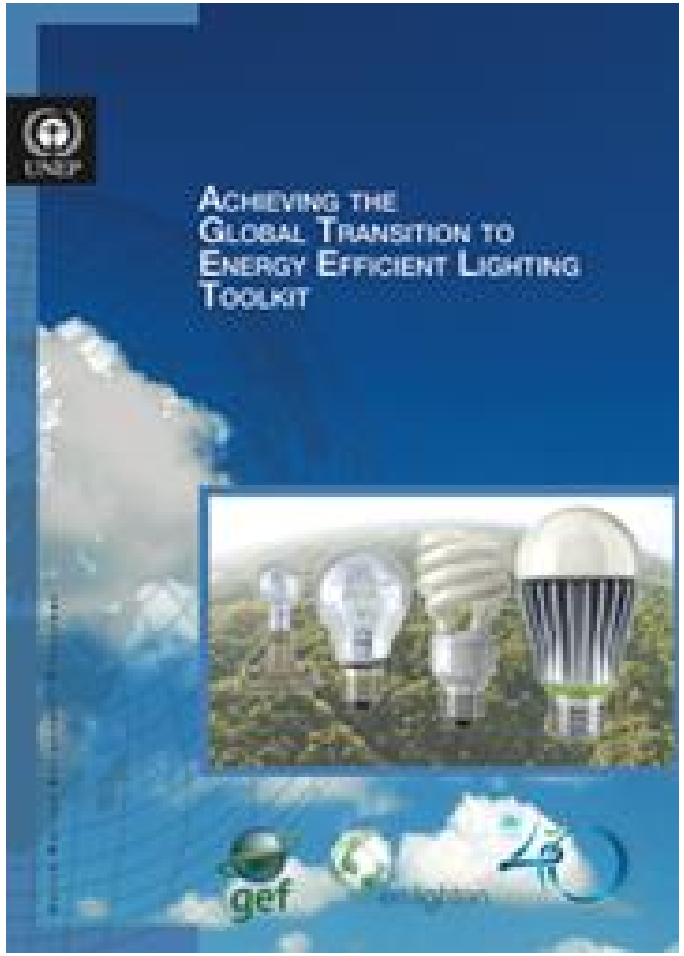
TECHNOLOGY PROHIBITION (CONT'D)

- **KEY FACTORS FOR SUCCESS**
- Establish MVE systems to ensure good quality of anew lighting technology
- Develop measures e.g. strict enforcement penalties, custom control penalties or immediate destruction and disposal of the banned lamps
  - to prevent dissatisfaction or return to the banned lamps
- Conduct market surveillance to track how the programme develops and alert regulators if policy adjustments are necessary
- Establish structured and efficient collection and environmentally-sustainable disposal of banned lamps

CONCLUSION

- MEPS are the cornerstone of a National/Regional Efficient Lighting Strategy
- MVE supports MEPS, and is an important success factor (without MVE, MEPS is ineffective)
- Labelling and product certification overcome barriers
- Program development should include engagement and industry collaboration
- New policy initiatives should consider international best practices
- Seek opportunities for regional and international program cooperation/harmonisation

More Information



See Section 2, “Selecting and Implementing Energy Efficient Lighting Policies” in the en.lighten Toolkit:

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Å **Thank You**

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