



# MEPS Regulation for Lighting Products

Steve Coyne

# MEPS Regulation for Lighting Products

1. Product Scope
2. Efficacy requirements
3. Functional performance parameters & requirements
4. Test Methods & performance standards
5. Testing infrastructure
6. MVE

# Product Scope

1. What is form of the product scope?
2. What are the assessment features?

# Product Scope

The scope used is a hybrid technology-neutral format.

The primary categories for the in-scope products is their form:

- Non-directional lamp
- Linear lamp





Further refinement for sub-categories at a technology level (allows for inclusion of other technologies at later dates)

- Non-directional lamp
  - LED
- Linear lamp
  - Fluorescent
  - LED

Finally, need to have boundaries on product features for each particular category in order to primarily restrict to products intended as the focus of the policy.

# Product Scope - Details

## Non-directional lamps: LED

| Feature                                   | Requirement   |
|---|---|
| Features within scope of another standard | IEC 62612<br><input type="checkbox"/> rated power up to 60 W;<br><input type="checkbox"/> rated voltage of > 50 V a.c. up to 250 V a.c.;<br><input type="checkbox"/> lamp cap as listed in IEC 62560  |
| Lumen range                               | $\geq 130$ lm   |
| Wattage                                   | $\leq 60$ W   |
| Caps                                      | <input type="checkbox"/> E14  <input type="checkbox"/> B15 <br><input type="checkbox"/> E27  <input type="checkbox"/> B22d  |

# Product Scope - Details

Linear lamps: LED



| Feature | Requirement         |
|---------|---------------------|
| Length  | ☐ 550 mm to 1300 mm |

# Product Scope - Details

## Linear lamps: Fluorescent



| Feature                                   | Requirement         |        |
|---|---------------------|--------|
| Features within scope of another standard | IEC 60081           |        |
| Length                                    | ☐ 550 mm to 1300 mm | Length |

# Efficacy and Functional Requirements

1. What is efficacy?
2. What is the agreed efficacy limit?
3. What functional performance aspects matter?
4. Are there recommended limits for these?



# Efficacy and Requirement

Efficacy is the measure of the effectiveness of the lighting product to produce visible light from electrical energy. It's units are lumens per Watt (lm/watt). The higher the efficacy value, the more energy-efficient the lighting product. It is determined by the ratio of the total visible light output of a lamp, in lumens (lm), and the electrical power consumed, in Watts (W).

Agreed mandatory MEPS target for all within scope:

- Non-directional LED lamps
- Linear LED lamps
- Linear fluorescent lamps

 80 lm/W



$$\begin{aligned} \text{Efficacy} &= \frac{886.4}{10.152} \\ &= 87.3 \text{ lm/W} \end{aligned}$$

# Functional Performance Requirements

Functional performance aspects relate to important qualities of light, such as:

- Colour (appearance and ability to render)
- Temporal effects (flicker, stroboscopic)
- Maintenance of light output and colour consistency
- Photobiological safety

Other functional aspects relate to external effects, such as:

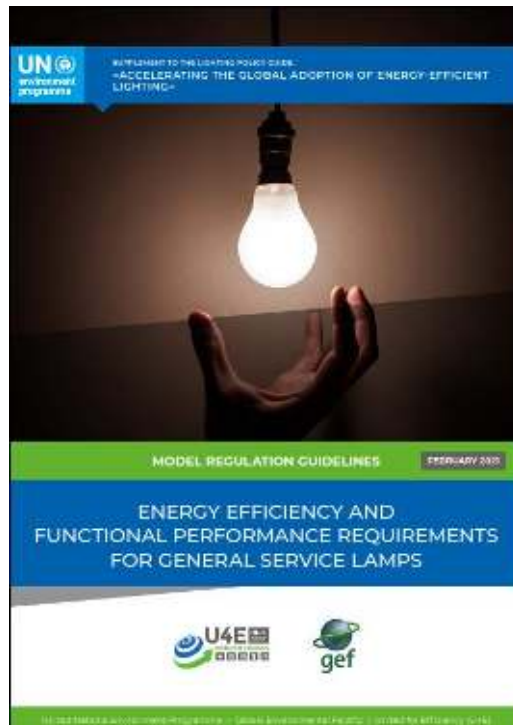
- Life of product
- Impact on electricity supply (harmonics, power factor)

Agreed limits are not stated for any of these in the Regional Roadmap.

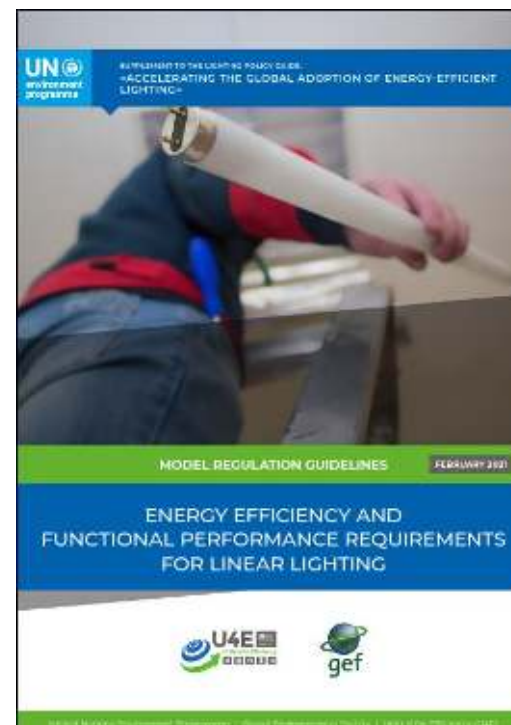
# Options for Functional Performance Requirements

Suggested parameters and recommended limits are provided in the U4E Model Regulations.

- General Service Lamps  
Published Feb 2021



- Linear Lamps  
Published Feb 2021



# Options for Functional Performance Requirements

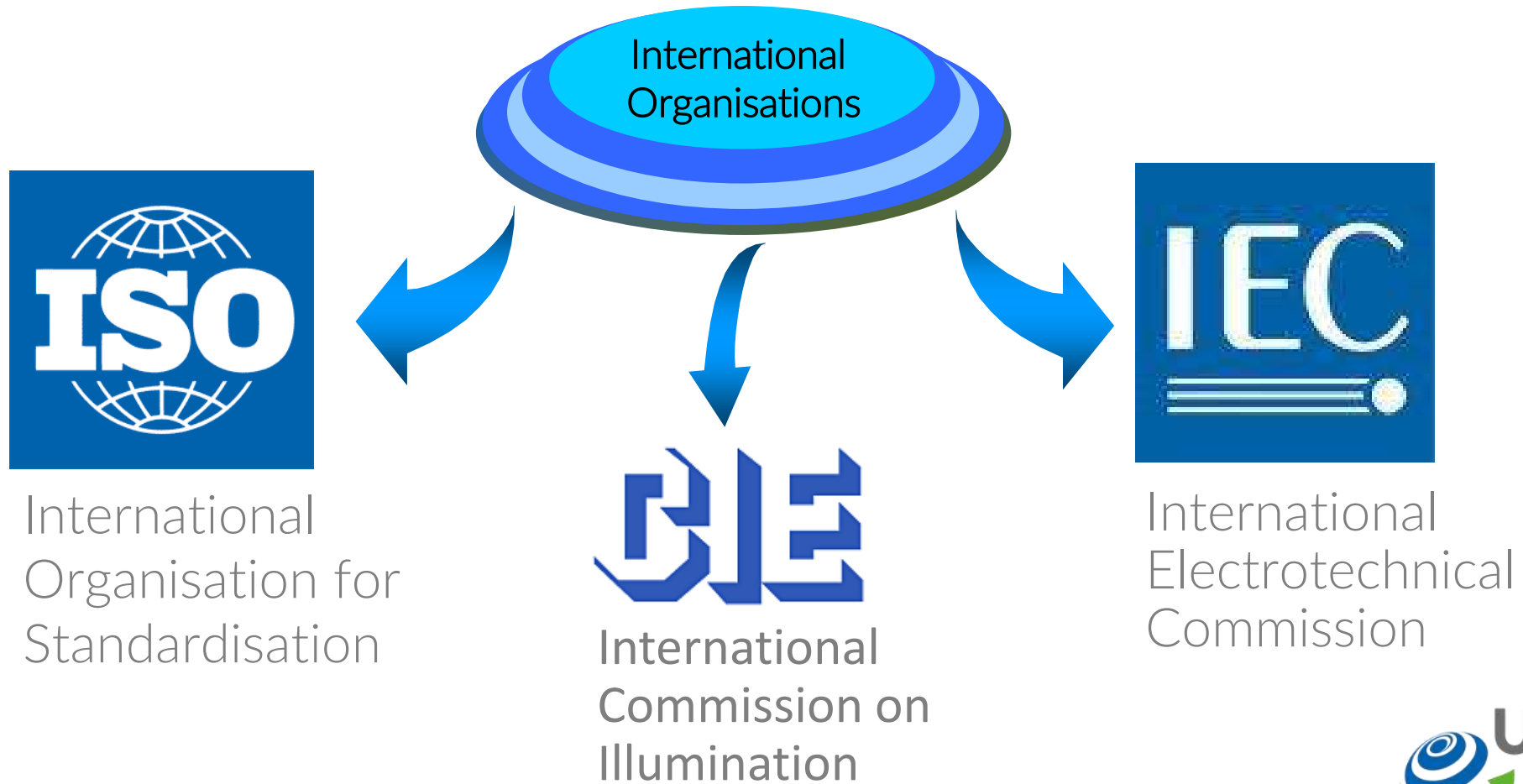
| Functional Aspect           | Phenomena  | Level   |                             |                             |             |                |                  |            |                   |            |           |            |
|-----------------------------|--|---|-----------------------------|-----------------------------|-------------|----------------|------------------|------------|-------------------|------------|-----------|------------|
| Light quality               | Colour Rendering Index (CRI)   | $\geq 80$ Ra  |                             |                             |             |                |                  |            |                   |            |           |            |
|                             | Short term flicker perceptibility ( $P_{st}^{LM}$ )  | $\leq 1.0$ at full load and a sinusoidal input voltage.   |                             |                             |             |                |                  |            |                   |            |           |            |
|                             | Stroboscopic Effect Visibility (SVM)   | $\leq 0.4$ at full load and a sinusoidal input voltage.   |                             |                             |             |                |                  |            |                   |            |           |            |
| Product reliability         | 3000 hour early failure Test (150 minutes on and 30 minutes off for 400 cycles at ambient condition) | Lamps must operate and have lumen maintenance $\geq 90\%$   |                             |                             |             |                |                  |            |                   |            |           |            |
| Electricity supply          | Displacement Factor  | <table border="1"> <thead> <tr> <th>Rated Input Power<br/>P in W</th> <th>Fundamental<br/>Power Factor</th> </tr> </thead> <tbody> <tr> <td><math>P \leq 2W</math></td> <td>Not applicable</td> </tr> <tr> <td><math>2W &lt; P \leq 5W</math></td> <td><math>\geq 0.4</math></td> </tr> <tr> <td><math>5W &lt; P \leq 25W</math></td> <td><math>\geq 0.7</math></td> </tr> <tr> <td><math>P &gt; 25W</math></td> <td><math>\geq 0.9</math></td> </tr> </tbody> </table> | Rated Input Power<br>P in W | Fundamental<br>Power Factor | $P \leq 2W$ | Not applicable | $2W < P \leq 5W$ | $\geq 0.4$ | $5W < P \leq 25W$ | $\geq 0.7$ | $P > 25W$ | $\geq 0.9$ |
| Rated Input Power<br>P in W | Fundamental<br>Power Factor  |   |                             |                             |             |                |                  |            |                   |            |           |            |
| $P \leq 2W$                 | Not applicable   |   |                             |                             |             |                |                  |            |                   |            |           |            |
| $2W < P \leq 5W$            | $\geq 0.4$   |   |                             |                             |             |                |                  |            |                   |            |           |            |
| $5W < P \leq 25W$           | $\geq 0.7$   |   |                             |                             |             |                |                  |            |                   |            |           |            |
| $P > 25W$                   | $\geq 0.9$   |   |                             |                             |             |                |                  |            |                   |            |           |            |
| Energy use                  | Standby Power  | $< 500$ mW  |                             |                             |             |                |                  |            |                   |            |           |            |

# Overview of standards

1. What standards bodies are relevant?
2. What do they produce?
3. How do they relate to supporting Regulation

# Overview of standards

## International Standards Bodies: Relevant to Lighting



# CIE

Produces International Standards and publications that are:

- On aspects of light and lighting that require a unique definition (eg lumen) or understanding (eg glare) or measurement quantities (eg chromaticity)
- A primary source of internationally accepted and agreed data which can be taken, essentially unaltered, into universal standard systems. (eg relative photopic response, colour matching functions)
- The requirements to perform reproducible photometric and colorimetric measurements
- Specifies recommended lighting requirements for situations so that people can perform the visual tasks efficiently, in comfort and safety
- <http://cie.co.at/about-cie>

# IEC

- Publishes International Standards for all electrical, electronic and related technologies.
- Most notable publication types are for:
  - Designation systems – (eg shapes and sizes of caps and bulbs)
  - Product safety
  - Product performance
- <https://www.iec.ch/about/?ref=menu>

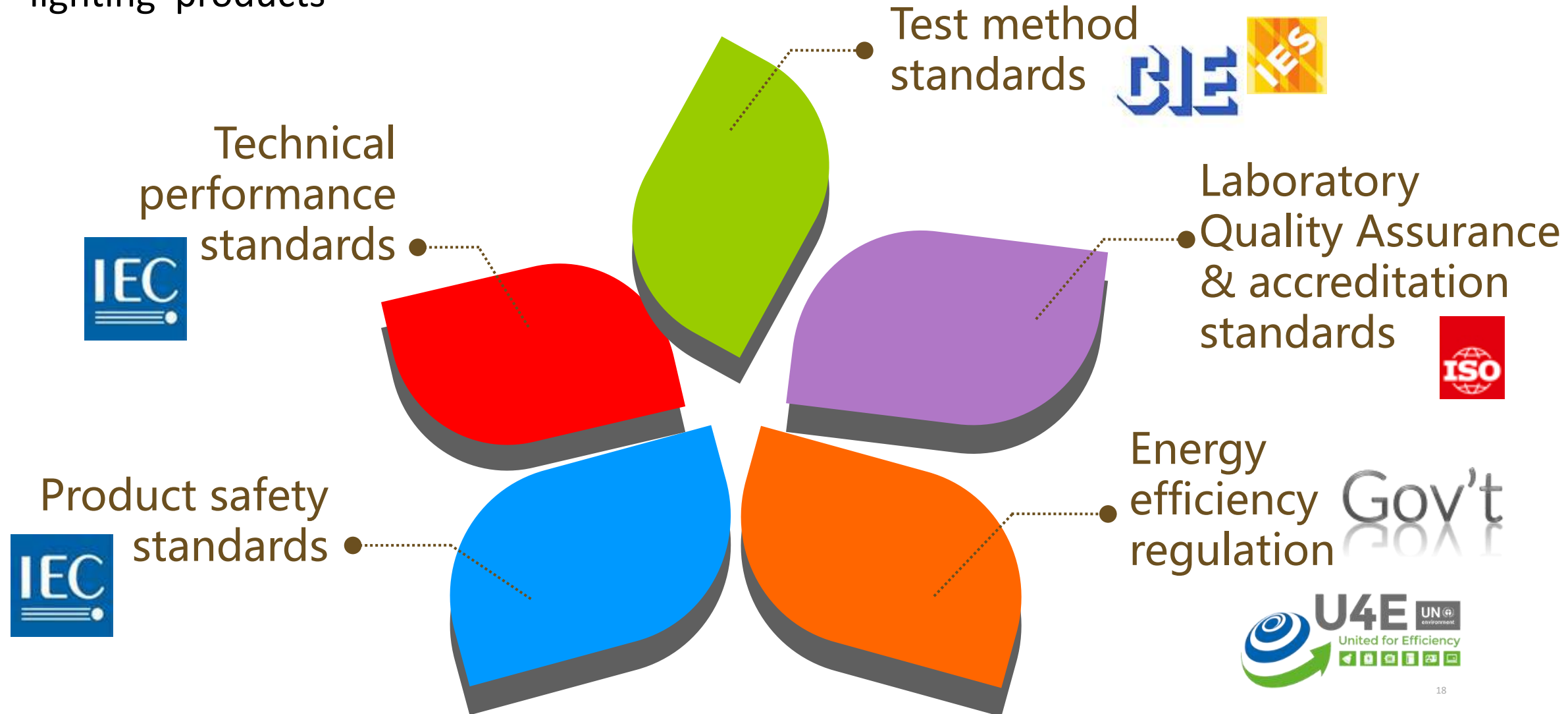


# ISO

- Preparing International Standards carried out through ISO technical committees.
- ISO collaborates closely with the IEC on all matters of electrotechnical standardization and CIE on all matters of light and lighting.
- In the area related to lighting, publishes
  - Quality management systems (eg ISO 9001)
  - Test laboratory competency and accreditation schemes (eg ISO 17025,)
  - Interlaboratory proficiency testing schemes (eg ISO 17043, ISO 13528)
  - Some light technical matters jointly with IEC and CIE (eg ISO/CIE TR 21783)
- <https://www.iso.org/about-us.html>

# Relationship between Standards and Regulation

General classification of lighting standards and relevant standards bodies for lighting products



# Harmonised Standards Specified in Regional Roadmap

1. Which standards are specified?
2. What products do they apply to?

# Harmonised Standards Specified in Regional Roadmap

## CIE Test Method Standards

CIE S 025 - Test Method for LED Lamps, LED Luminaires and LED Modules  
for testing photometric requirements of

1. Non-directional LED lamps
2. Linear LED lamps

[https://www.techstreet.com/cie/standards/cie-s-025-e-2015?product\\_id=1893005](https://www.techstreet.com/cie/standards/cie-s-025-e-2015?product_id=1893005)

CIE 084 – The Measurement of Luminous Flux  
for testing photometric requirements of

1. Linear fluorescent lamps

[https://www.techstreet.com/cie/standards/cie-084-1989?product\\_id=49369](https://www.techstreet.com/cie/standards/cie-084-1989?product_id=49369)

# Harmonised Standards Specified in Regional Roadmap

## IEC Performance Standards

IEC 62612 – Self-ballasted LED lamps for general lighting services with supply voltages > 50 V – Performance requirements

for testing functional requirements of

1. Non-directional LED lamps

[https://www.techstreet.com/cie/standards/iec-62612-ed-1-2-b-2018?product\\_id=2021645](https://www.techstreet.com/cie/standards/iec-62612-ed-1-2-b-2018?product_id=2021645)

IEC 60081 – Double capped fluorescent lamps – Performance Specifications

for testing functional requirements of

1. Linear fluorescent lamps

[https://www.techstreet.com/cie/standards/iec-60081-ed-5-1-b-2002?product\\_id=960815](https://www.techstreet.com/cie/standards/iec-60081-ed-5-1-b-2002?product_id=960815)

Note: there is currently no IEC performance standard for Linear LED lamps

# Measuring Luminous Flux

1. What equipment does a laboratory use?
2. What is the basic method for measurement?

# Basic Lab Infrastructure, Staff & Recognition Requirements

| Item  | Laboratory Infrastructure  |
|---|--|
| <b>Testing</b>  | <b>Equipment</b>   |
| Luminous flux (inc partial), beam angle, intensity distribution, colour | Far field goniophotometer (spectral)                                   |
| Luminous flux, beam angle, intensity distribution, colour               | Near field goniophotometer   |
| peak intensity  | Illuminance meter  |
| Luminous flux, colour   | Integrating sphere $\geq 2.0\text{m}$ (spectral)                       |
| Luminous flux, colour   | Spectroradiometers   |
| Luminous flux, CCT, x,y   | Sphere photometer  |
| calibrations  | Spectral radiant flux reference and luminous intensity reference lamps |
| calibrations  | Luminance meter & Reference White Tile                                 |
| all   | Power supplies   |
| all   | Power analyser   |
| fluorescent lamp tests  | Reference ballasts (LF and HF)   |
| calibrations  | Optical bench & accessories  |
| all   | Lifetime/Ageing rack   |
| Endurance   | Environment (temperature & humidity) chamber                           |
| Ingress protection  | Salt chamber   |
|   |  |
| <b>Other requirements</b>   | Basic mechanical/electrical workshop (local cost)                      |
|   | External Calibrations  |
|   | Accreditation registration (National AB cost)                          |
|   | 2 technical staff minimum  |
|   | Equipment installation and training with equip                         |

## Excludes:

- Land & building
- Electricity supply (load)
- Management staff
- Equipment upgrades
- Repair & maintenance
- External training of staff

# Measuring Luminous Flux – Key Equipment

## Goniophotometer

- Expensive
- Slow
- Suitable for directional and non directional lamps



## Integrating Sphere

- Relatively inexpensive
- Fast
- Suitable mainly for non directional lamps



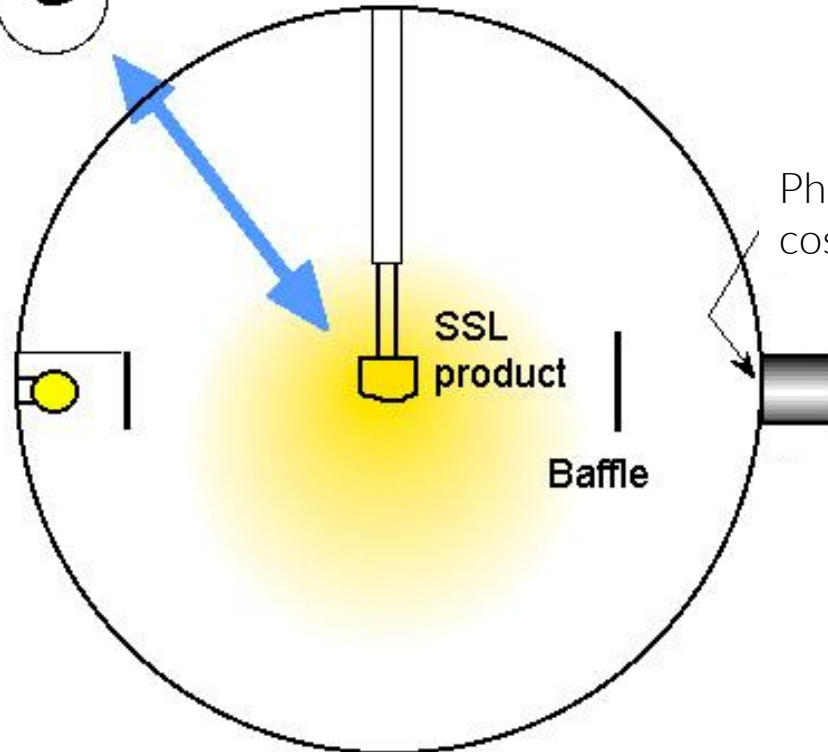


# Measuring Luminous Flux – Integrating Sphere Method

Reference standard lamp (Ref) with known luminous flux



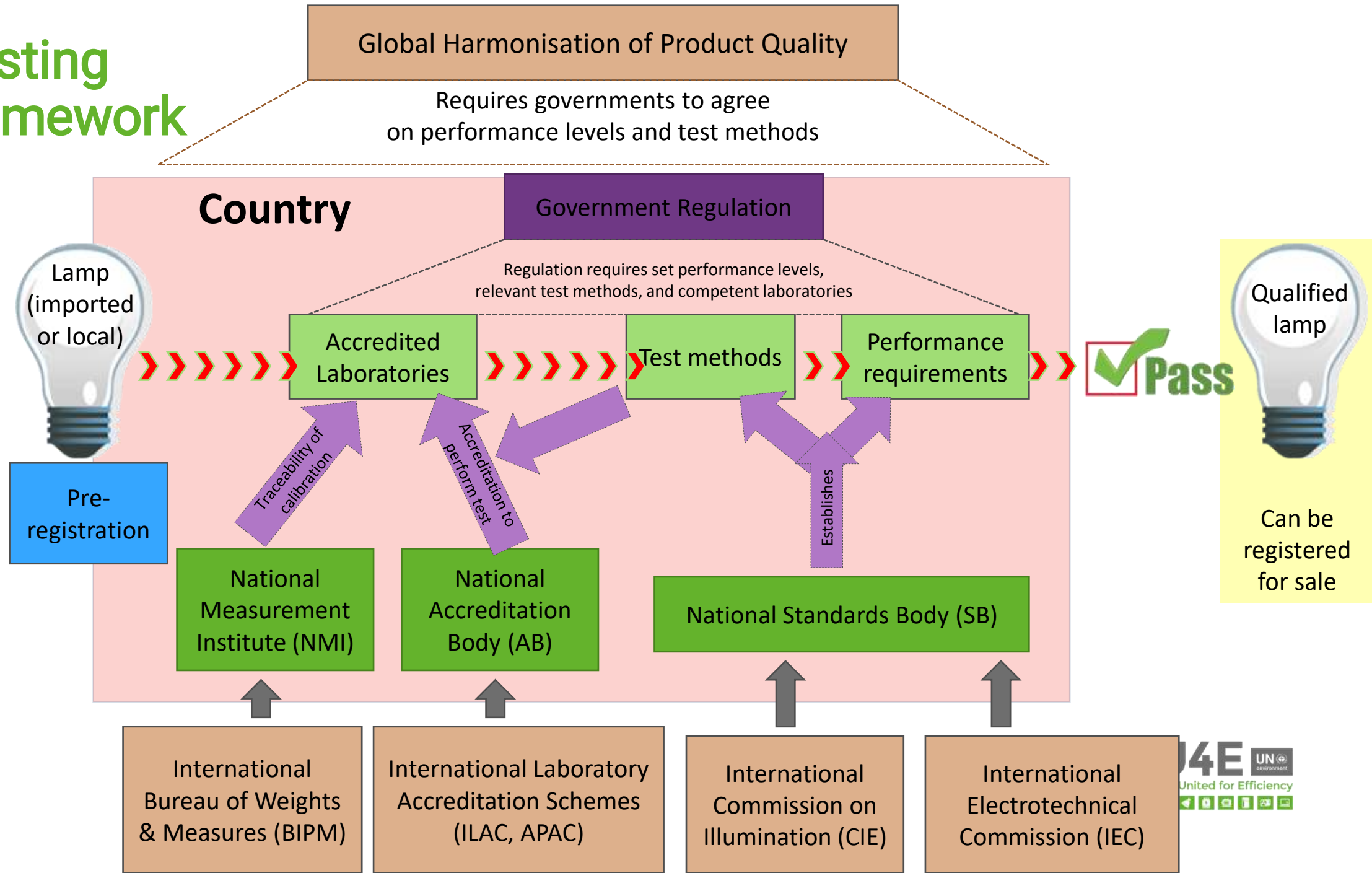
Auxiliary lamp (Aux) for determining variation in absorption between lamps



Measurement Stages:

1. Ref ON      Aux OFF
2. Ref OFF     Aux ON
3. SSL OFF     Aux ON
4. SSL ON      Aux OFF

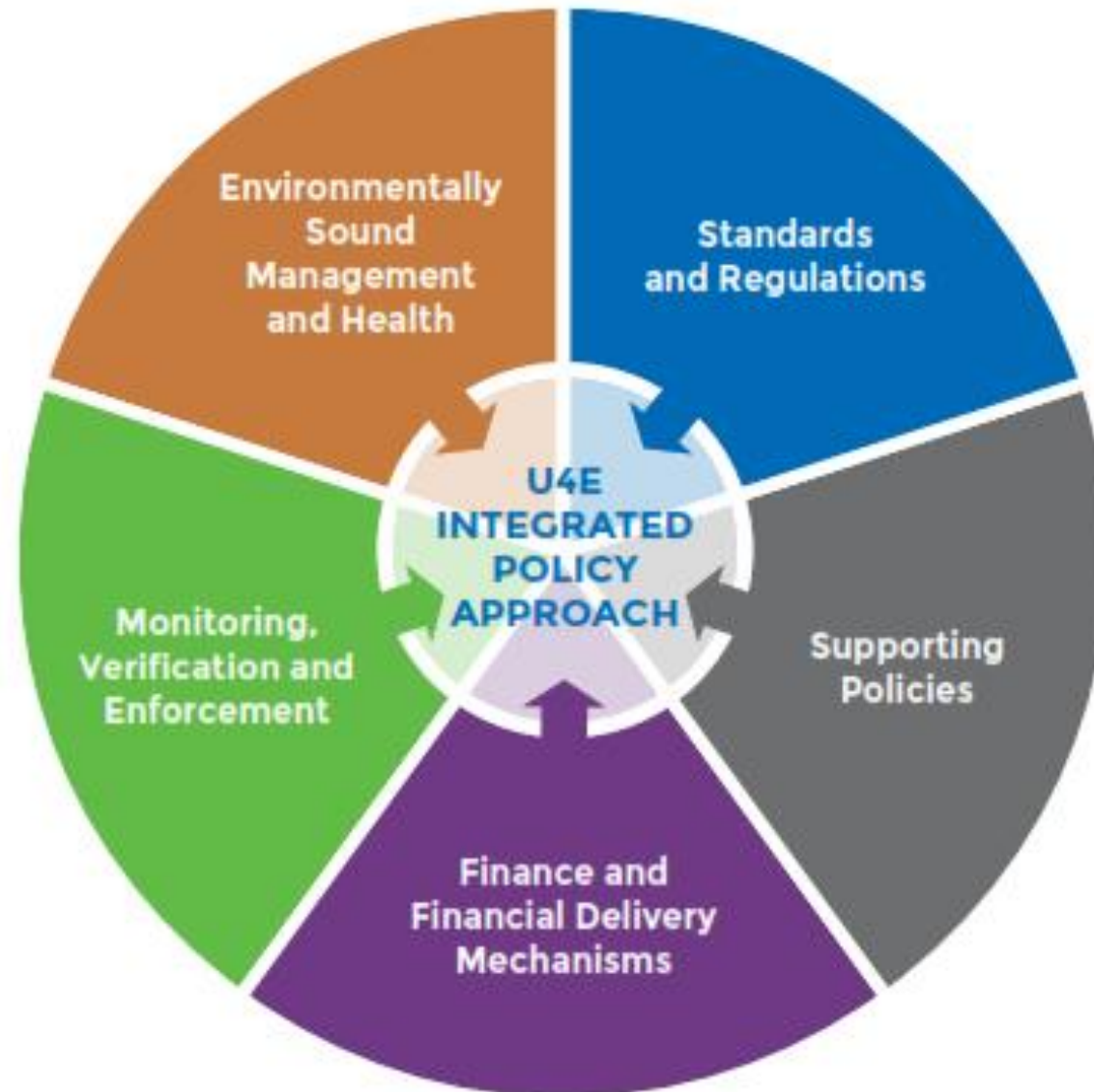
# Testing framework



# Monitoring, Verification and Enforcement

1. Where does MVE fit into the integrated policy approach?
2. What are the key elements of an MVE framework?
3. What are the main activities within MVE program?
4. Not every product can be checked, so how to choose what to check?

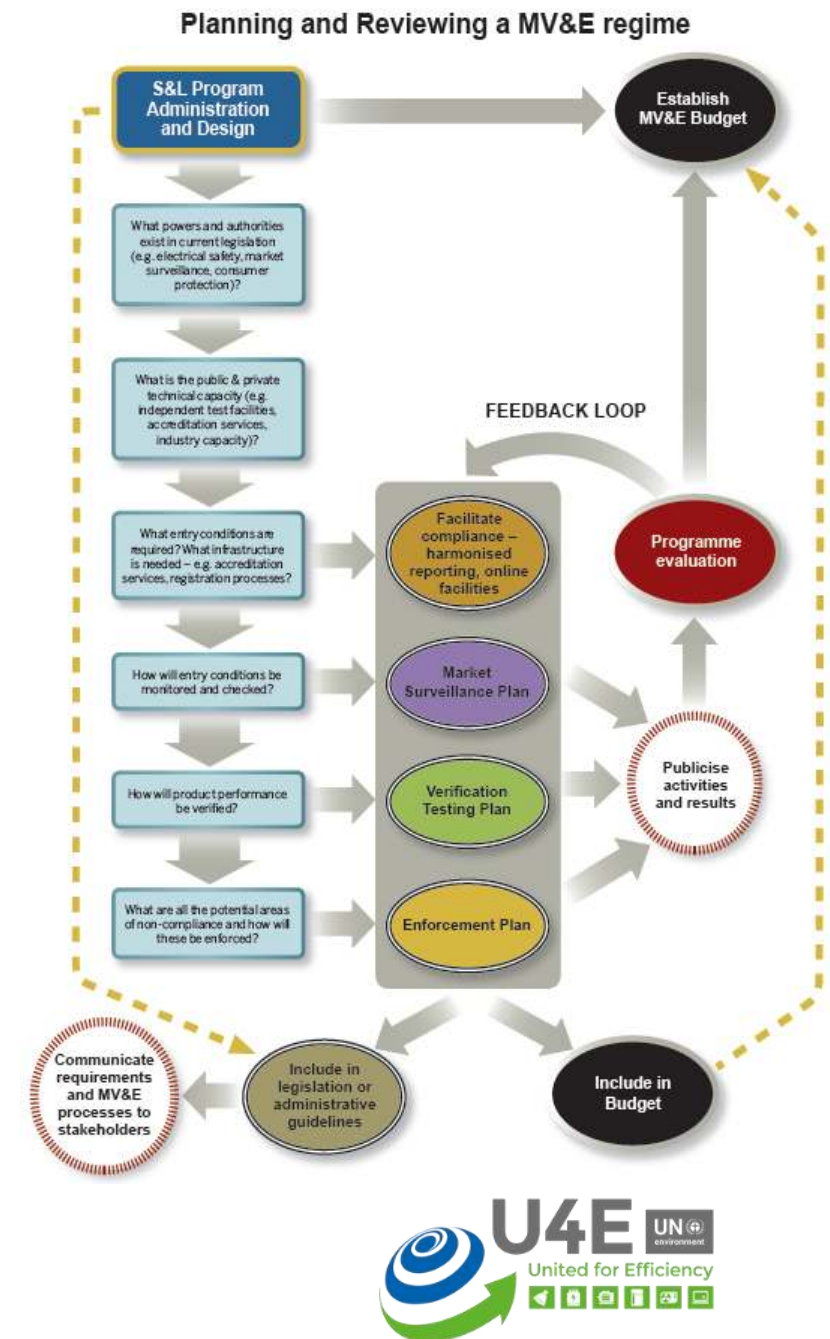
# MV&E is a critical component of the integrated policy approach



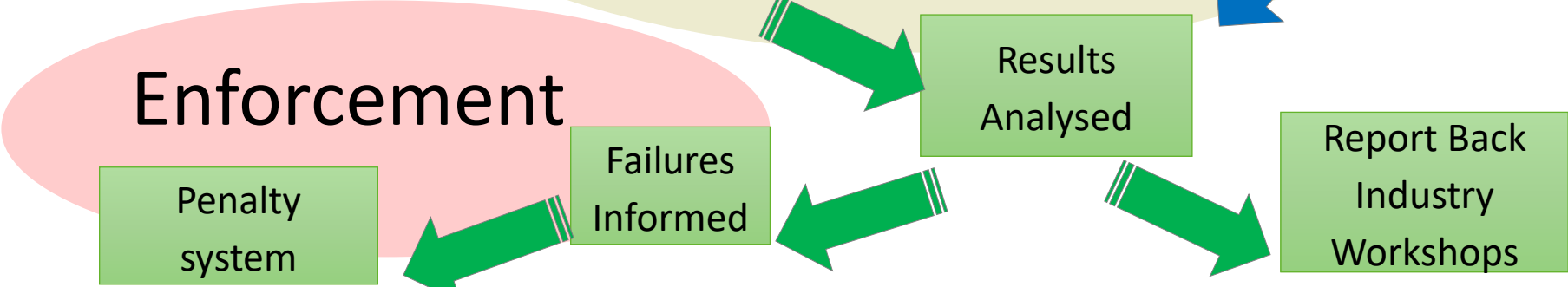
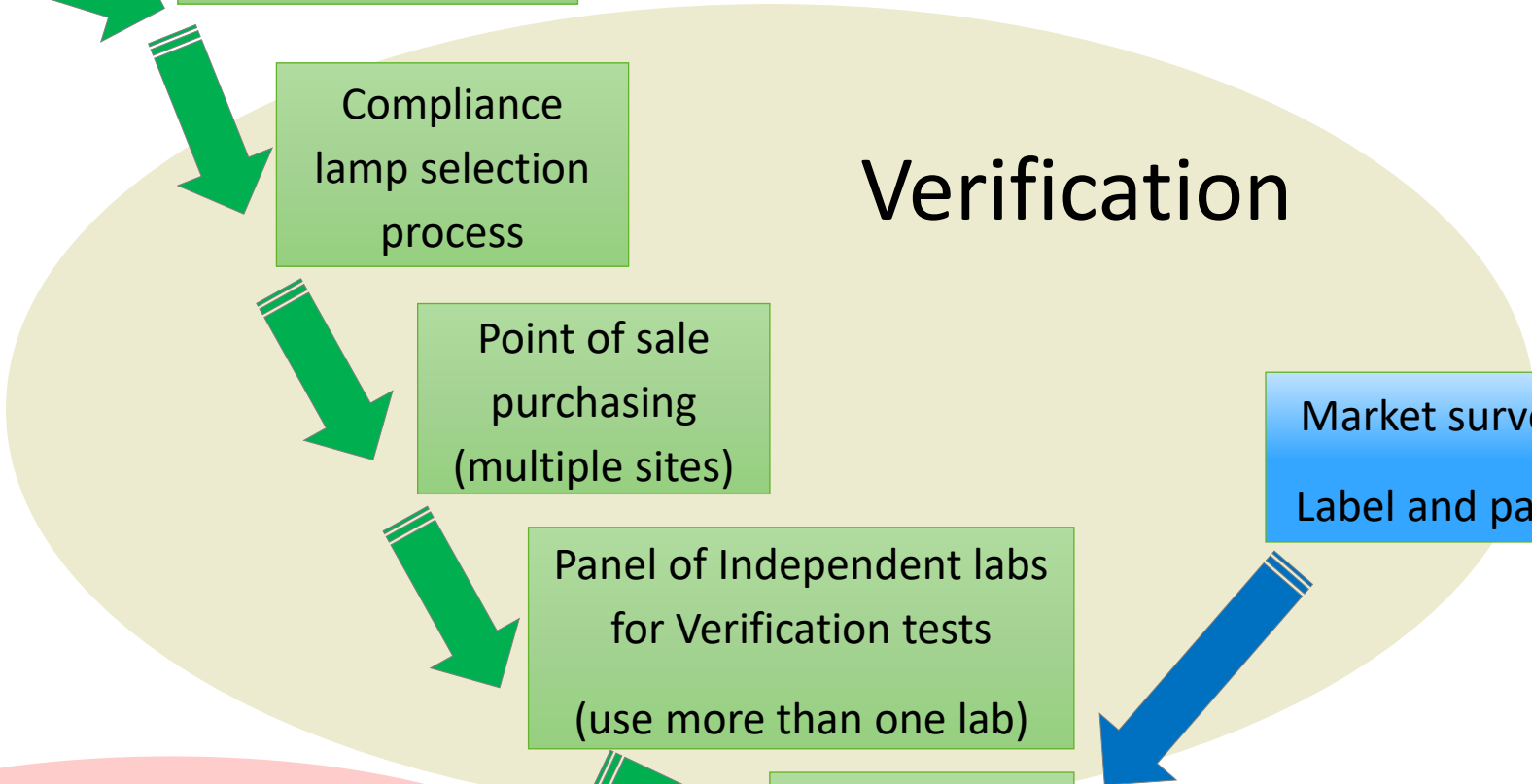
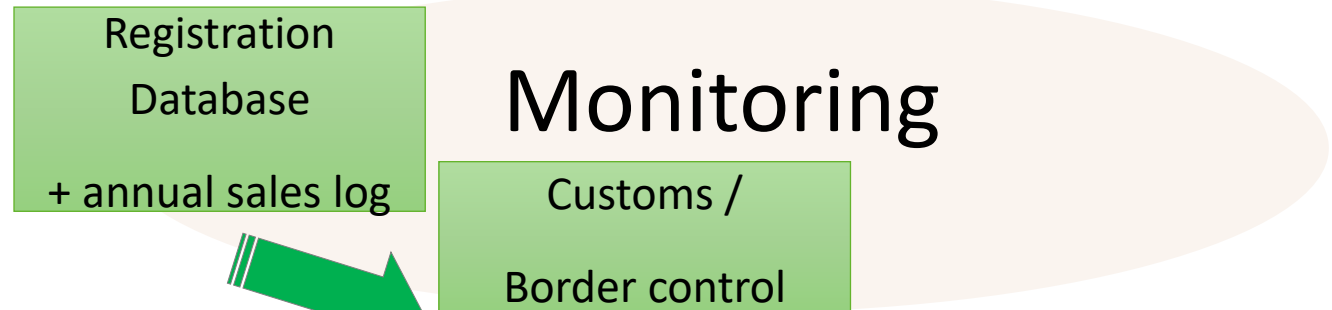
# Key elements of compliance regimes

Effective compliance regimes include:

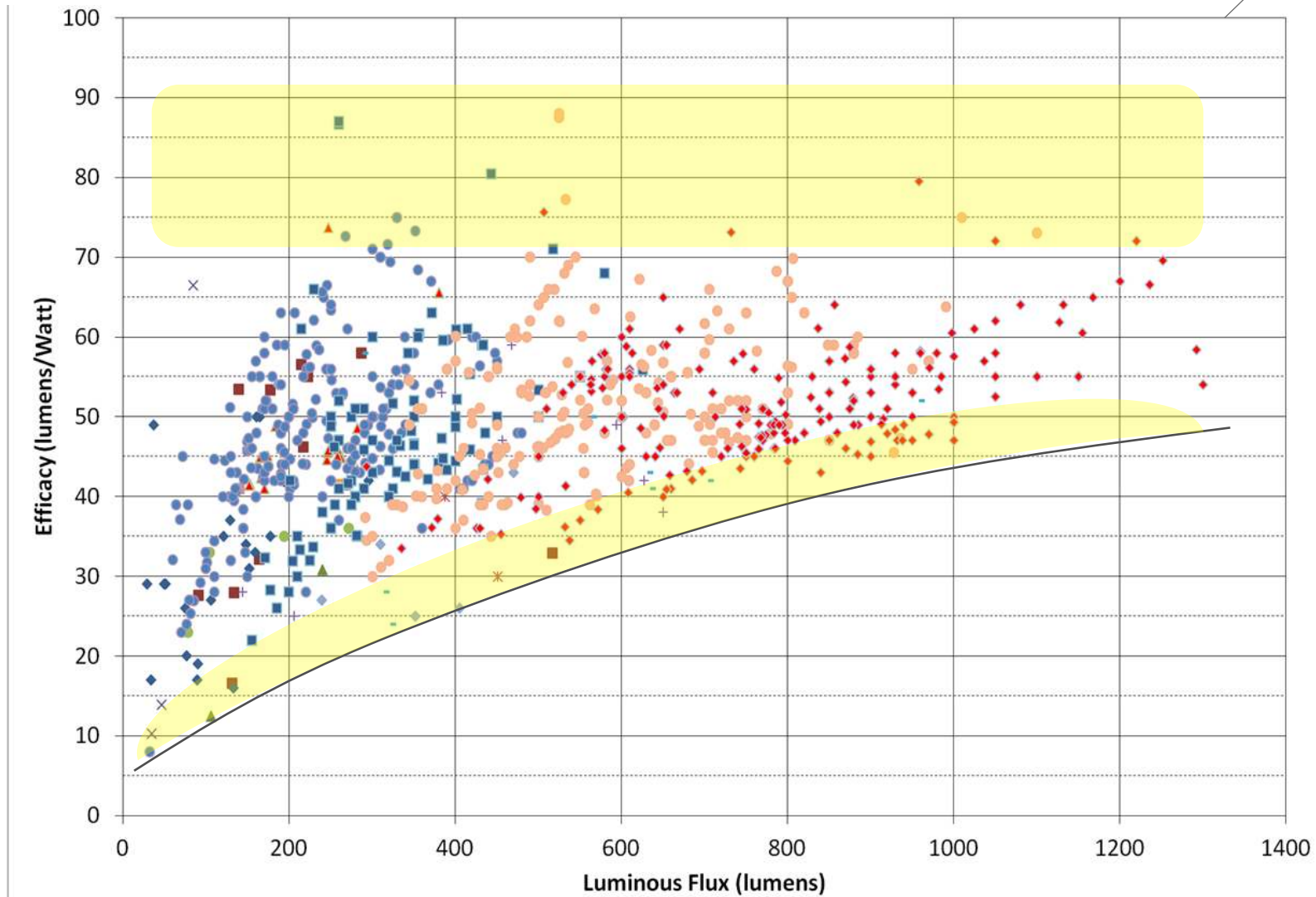
- Legal and administrative framework
- Mechanism to facilitate compliance
- Budget and resource allocation
- Market surveillance
- Verification testing
- Enforcement
- Communication, reporting, feedback
- Evaluation processes



# MVE Activities



# Possible compliance Lamp Selection Process



- + a % highest claims
  - + b % random
  - + c % borderline
  - + d % new entries
  - + e % previous offenders
- = 100%

# Questions



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# Contact

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## PHONE

+33 1 44 37 42 56



## EMAIL

U4E@un.org



## WEBSITE

[united4efficiency.org](http://united4efficiency.org)