Efficient Lighting MVE
Infrastructure Status Report and Overview

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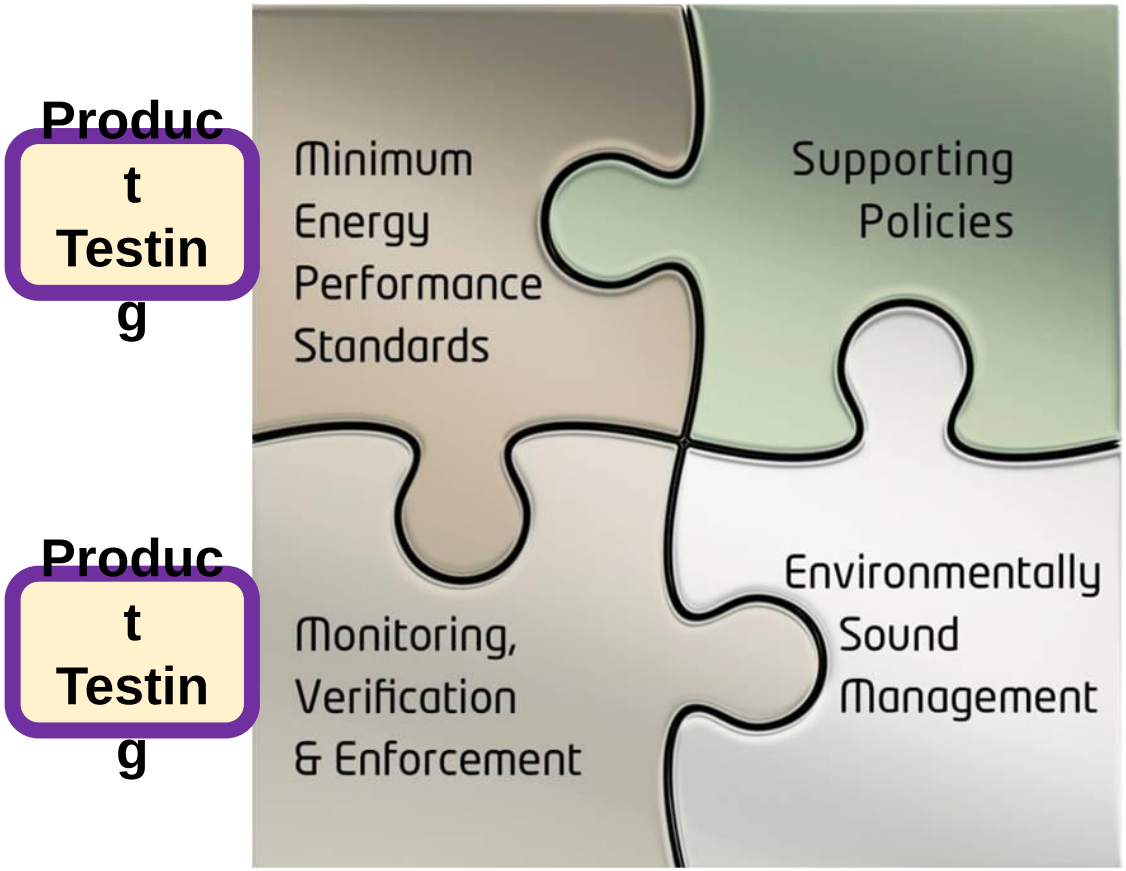
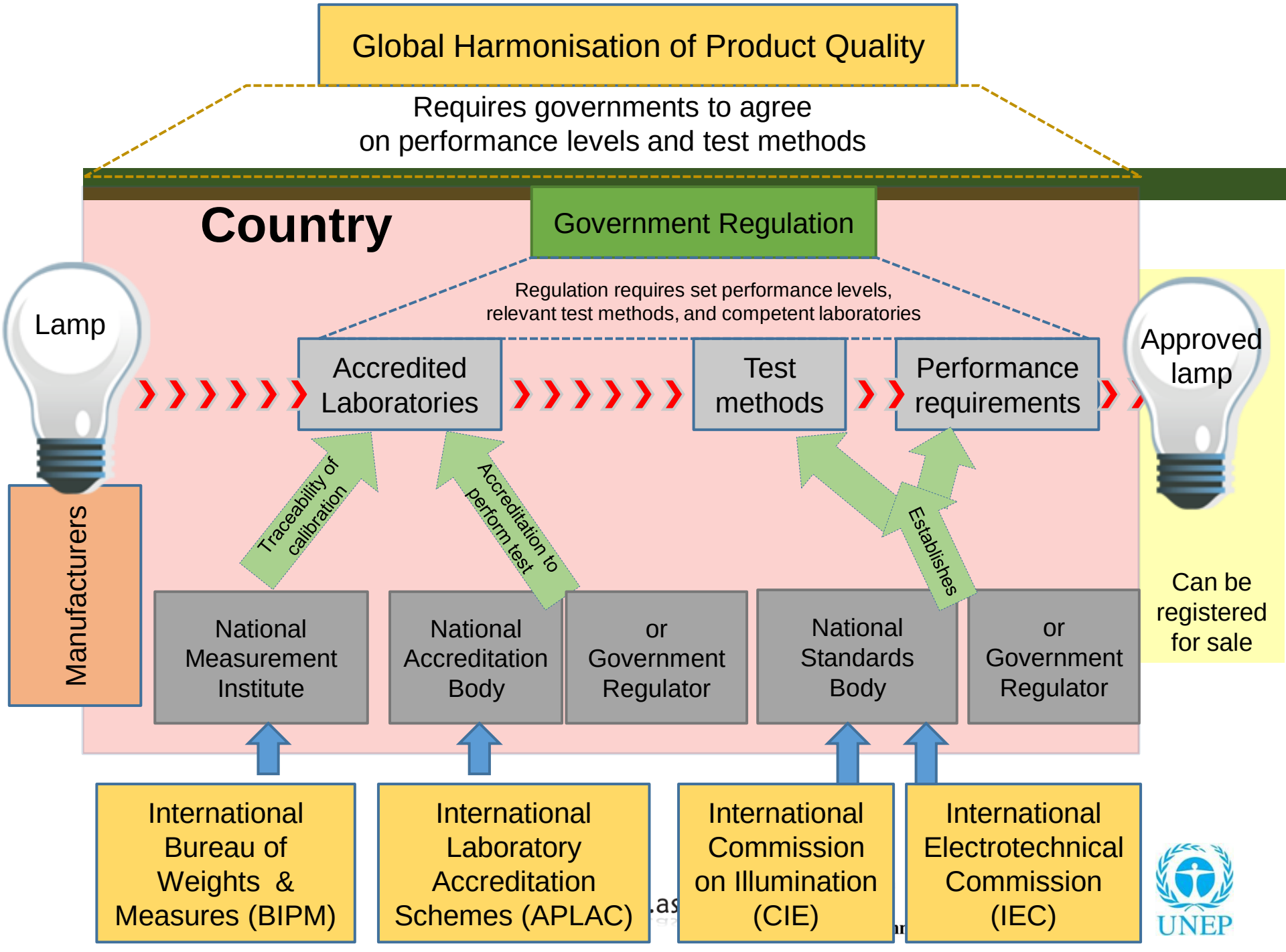
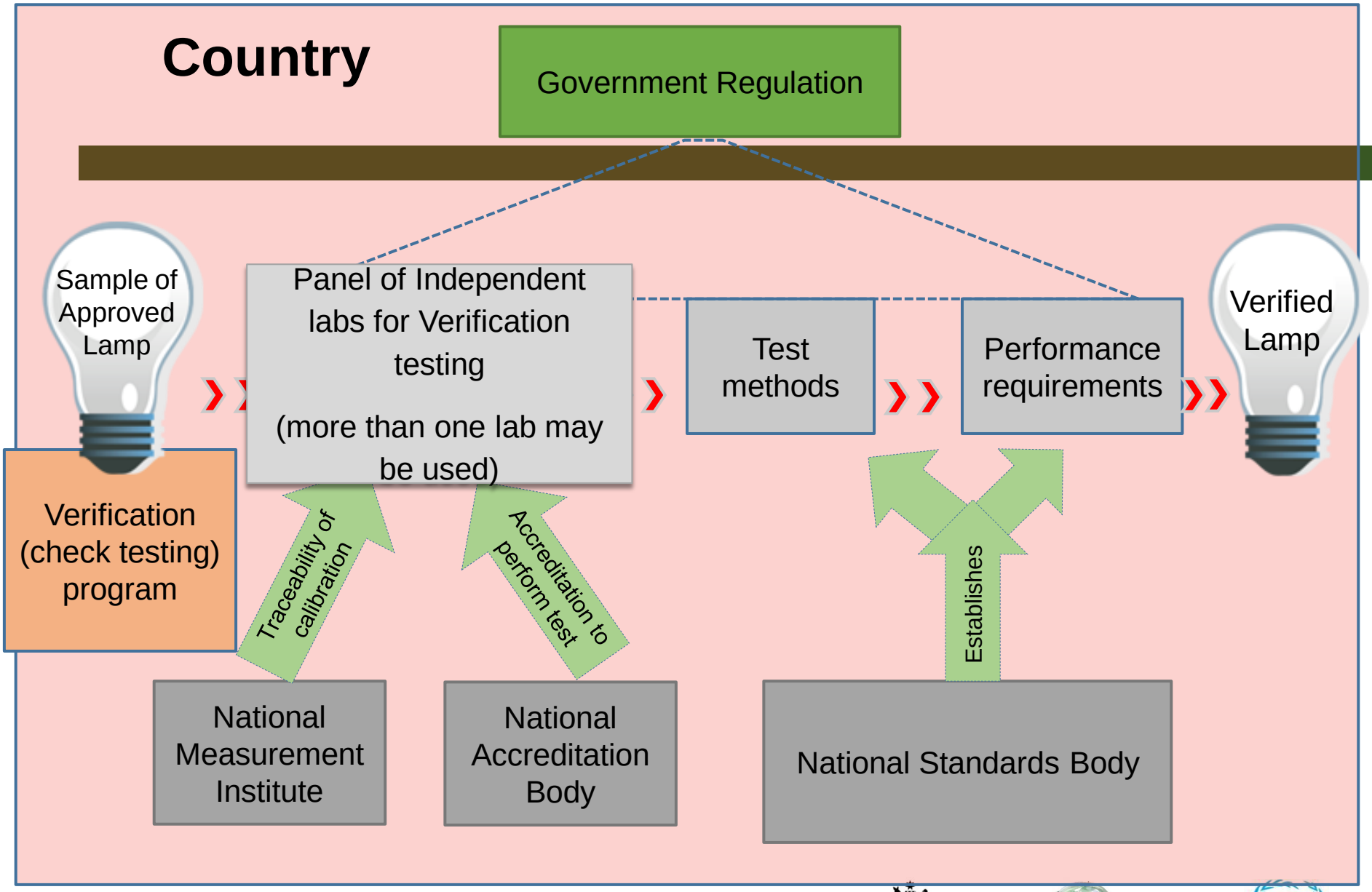
UNEP

MVE needs Test Laboratory Infrastructure




Global Harmonisation of Product Quality
Requires governments to agree
on performance levels and test methods
Country
Government Regulation
Regulation requires set performance levels,
relevant test methods, and competent laboratories
Lamp
Manufacturers
Accredited Laboratories
Test methods
Performance requirements
Approved lamp
Traceability of calibration
Accreditation to perform test
Establishes
Can be registered for sale
National Measurement Institute
National Accreditation Body
or Government Regulator
National Standards Body
or Government Regulator
International Bureau of Weights & Measures (BIPM)
International Laboratory Accreditation Schemes (APLAC)
International Commission on Illumination (CIE)
International Electrotechnical Commission (IEC)
UNEP



Purpose of Test Methods

- Create a level playing field
- Allow manufacturers to specify performance of products
- Provide information for designers and consumers
- Allow benchmarking of product categories for regulation
- Allow specification of product performance requirements for regulation
- Allow product verification of regulation compliance (check testing)

Requirement of Test Laboratories

To create repeatable and reproducible test results in accordance to specified test methods.

- Repeatable:
  - conditions where independent test results are obtained with the same method on identical test items in the same laboratory by the same operator using the same equipment within short intervals of time

- Reproducible
  - conditions where test results are obtained with the same method on identical test items in different laboratories with different operators using different equipment

Requirement of Test Laboratories

- Test equipment must be capable of:
  - Accommodating the scope of products and
  - Measuring the performance parameters

  specified in the regulations.

- Laboratory staff must be capable of competently:
  - Operating and maintaining the test equipment
  - Understanding and following laboratory test procedures without fault
  - Conducting sensitivity and uncertainty analysis
  - Maintaining awareness of potential issues which may compromise the outcomes of tests

Key light collecting measurement equipment

- Integrating Sphere
  - hollow sphere, the interior of which is formed from, or coated with, a diffusely-reflecting material that is as spectrally non-selective and as spatially uniform as possible
- Goniophotometer
  - photometer for measuring the directional light distribution characteristics of sources, luminaires, media or surfaces

Key light measurement detector

- Photometer
  - instrument for measuring photometric quantities, such as luminous flux and luminous intensity
- Colorimeter
  - instrument for measuring colorimetric quantities, such as Correlated Colour Temperature and the tristimulus values of a colour stimulus (x, y)
- Spectroradiometer
  - instrument for measuring radiometric quantities in narrow wavelength intervals over a given spectral region, such as Colour Rendering Index

Equipment for measuring Performance Parameters

Parameter	Sphere	Goniometer	Photometer	Colorimeter	Spectroradiometer
	Collector		Detector		
Luminous flux	√	√	√	√	√
Intensity distribution		√	√	√	√
Zonal flux		√	√	√	√
Colour and Colour temp	√	√	√	√	√
Colour rendering index	√	√			√
Spatial colour uniformity		√			√

MVE infrastructure - Test Laboratories

- Target Countries
  - Cambodia – no laboratories
  - Indonesia
  - Laos PDR– no laboratories
  - Philippines
  - Thailand
  - Viet Nam

- Information drawn from previous reports and a current survey which has had limited response.

Survey – requested info on test products and equipment

III. Testing Capabilities

7. Select the lighting products which the laboratory has experience in performance testing on a regular basis?	Incandescent lamps (Inc)	LED modules	High Intensity Discharge (HID) lamps
	Halogen lamps (Hal)	LED lamps	Voltage converters
	Compact fluorescent lamps (CFL)	Linear fluorescent lamps (LFL)	Lamp Ballasts
	Other products		

8. Select the current test equipment capabilities of the laboratory.	Photometry	with Integrating Sphere	with goniometer
	Colorimetry	with Integrating Sphere	with goniometer
	Spectral power distribution	with Integrating Sphere	with goniometer
		visible region	ultra-violet region
	Electrical	Basic parameters (eg Voltage, current, power, power factor)	
		Total harmonic distortion (THD)	
		Electro-magnetic compatibility (EMC)	
		Swtiching test	
		Other electrical test capabilities	
	Environment chamber	Thermal test	
		Salt	
		Other environmental test capabilities	

Indonesia

Testing laboratory facilities and capabilities

1. Centre for Material and Technical Product – B4T
2. Centre for Research and Technological Development of Electricity, Energy, Renewable, and Energy Conservation – P3TEK
3. Central Laboratory Operations Cibitung, Sucofindo PT (Persero)
4. Product Quality Testing Center of Jakarta (BMPBEI) under PPMB
5. Lab. Kalibrasi Baristand Industri
6. Balai Besar Teknologi Energi (B2TE) (Not yet accredited)

Indonesia

Centre for Material and Technical Product (Balai Besar Bahan dan Barang Teknik - B4T

- Gov test lab engaged in product testing and calibration
- accredited through the national accreditation body, the Komite Akreditasi Nasional (KAN) for lighting test methods
- capability to test incandescent, compact and linear fluorescent, and LED modules and lamps
- capability to test a wide range of electrical, environmental and mechanical parameters (total harmonic distortion, electromagnetic compatibility, switch test, insulation, thermal, ingress protection, salt, humidity, vibration).

Indonesia

Centre for Material and Technical Product (Balai Besar Bahan dan Barang Teknik - B4T

- Photometric and colorimetric measurements are presently accomplished using an integrating sphere, although the laboratory is in the process of acquiring a goniophotometer.
- Staff members are technically qualified, and hold degrees in sciences and engineering.

Indonesia

Centre for Research and Technological Development of Electricity, Energy, Renewable, and Energy Conservation - P3TEK

- Gov test lab engaged in product testing and calibration
- accredited through the national accreditation body, the Komite Akreditasi Nasional (KAN) for lighting test methods
- scope of accreditation for lighting products is for testing performance of self-ballasted compact fluorescent lamps (CFL) for general lighting service.
- Awaiting accreditation for self-ballasted LED products
- Their capability to test extends to incandescent lamps, linear fluorescent, and lamp ballasts. (But not accredited)

Indonesia

Centre for Research and Technological Development of Electricity, Energy, Renewable, and Energy Conservation - P3TEK

- Photometric and colorimetric measurements are presently accomplished using an integrating sphere coupled with a colorimeter.
- They have the capability to test a basic range of electrical parameters and electrical safety tests
- plans to expand to a new laboratory site by 2016, which will include a goniophotometer and a photovoltaic test laboratory
- Staff members have no official qualifications

Indonesia

Unit Laboralorium Cibitung, PT. Sucofindo (PERSERO)

- Accredited by KAN for CFL and incandescent lamp performance testing as well as safety for CFLs.

- **Product Quality Testing Centre of Jakarta**
- Accredited by KAN for CFL and incandescent lamp performance testing as well as safety for CFLs.

Indonesia

Laboratory Training Opportunities Suggested

- critical priority for training in performance testing of self-ballasted lamps as based on IEC 60969
- high priority for training in performance testing of self-ballasted LED lamps
- medium priority for training in performance testing of miscellaneous luminaire products.

Philippines

Testing laboratory facilities and capabilities

1. IIEE Foundation Inc. Testing Laboratory
2. Scientific Environmental & Analytical Laboratory and Services, Inc. (SEALS)
3. Lighting and Appliances Testing Laboratory (LATL) (requires re-accredited due to relocation)

Philippines

Energy Research and Testing Laboratory Services (ERTLS)

- nationally and ISO accredited Government test laboratory
- currently accredited to test photometric and safety characteristics of compact and linear fluorescent lighting products and associated ballast equipment.
- They do not presently have accreditation to test LED lighting products.
- in the process of moving premises and are not projected to be operational until the end of 2014

Philippines

IIEE Foundation Inc. Testing Laboratory

- private non-profit organisation located within the University of the Philippines
- accredited by the Philippine Accreditation Office (PAO) for lighting test methods
- has participated in proficiency testing programs; in 2012 & 2013 on Luminous flux measurement of a standard lamp
- accredited to test photometric and safety characteristics of compact and linear fluorescent lighting products,
- awaiting accreditation on various IEC test methods specific to testing linear fluorescent lamps and associated ballast equipment.

Philippines

IIEE Foundation Inc. Testing Laboratory

- intend to apply to test self-ballasted LED lamp products.
- capability for photometric and colorimetric measurements using an integrating sphere; electrical parameters including total harmonic distortion (THD), switching, waveform analysis; thermal testing; and durability and torsion testing
- capability to undertake uncertainty budget calculations for the test methods carried out
- Staff members have technical qualifications; all are required to hold a bachelor degree in engineering.

Philippines

Scientific Environmental & Analytical Laboratory and Services, Inc

- currently accredited by POA to test photometric and safety characteristics of compact and linear fluorescent lighting products and associated ballast equipment.
- do not presently have accreditation to test LED lighting products

Philippines

Laboratory Training Opportunities Suggested

- critical priority for training in performance testing of lighting products (in general) in accordance with PNS/IEC standards
- medium priority for training in good laboratory practices
- low priority for instrumentation servicing training

Thailand

Testing laboratory facilities and capabilities

1. Industrial Foundation Electrical and Electronics Institute (EEI)
2. L & E Manufacturing

Thailand

L & E Manufacturing

- public for-profit test laboratory which mainly provides testing services to their lighting manufacturing company
- scope of NSC-ONSC accredited activities covers photometric parameters for luminous flux and intensity distributions, and light output ratios for luminaires as well as electrical parameters
- intending to obtain accreditation for testing solid state lighting (SSL) products
- Key staff members have advanced qualifications in relevant areas; predominantly holding Bachelor of Science (BSc) degrees

Thailand

Intertek Testing Services (Thailand) Ltd

- private for-profit organisation
- Accredited by NSC-ONSC for testing product electrical characteristics, in particular electro-magnetic compatibility (EMC) and electrical safety testing
- do not conduct photometric testing of lighting products

Thailand

Laboratory Training Opportunities Suggested

- Proficiency testing for luminous flux

Viet Nam

Testing laboratory facilities and capabilities

1. Quality Assurance and Testing Center Number 1, Directorate for Standard Metrology and Quality
2. Quality Assurance and Testing Center Number 2
3. Quality Assurance and Testing Center Number 3 (Calibration lab, not accredited for testing by BOA)
4. Laboratory for Quality Control , Rang Dong Light Source and Vacuum Flask Joint Stock Company
5. Testing Laboratory of Lighting Equipment, Dien Quang Lamp Joint Stock Company

Viet Nam

Quality Assurance and Testing Center Number 1

- Government test laboratory
- accredited by the BoA for lighting test methods
- accredited to test photometric and safety characteristics of compact, linear fluorescent, incandescent lamps, MH and HPS lamps
- capability for photometric and colorimetric measurements using an integrating sphere

Viet Nam

Quality Assurance and Testing Center Number 2

- Government test laboratory
- accredited by the BoA for lighting test methods
- accredited to test photometric and safety characteristics of compact lamps
- capability for photometric and colorimetric measurements using an integrating sphere

Viet Nam

Quality Assurance and Testing Center Number 3

- Government test laboratory
- accredited by the BoA for lighting test methods
- accredited to test photometric and safety characteristics of compact lamps
- capability for photometric and colorimetric measurements using an integrating sphere and spectroradiometer

Viet Nam

Laboratory for Quality Control , Rang Dong Light Source and Vacuum Flast Joint Stock Company (RALACO)

- For profit public company
- accredited by the BoA for lighting test methods
- accredited to test photometric, electrical and safety characteristics of GLS lamps (CFLs), double capped linear fluorescent, incandescent lamps, luminaires, and solid state lighting products
- capability for photometric and colorimetric measurements using an integrating sphere and spectroradiometer

Viet Nam

Testing Laboratory of Lighting Equipment, Dien Quang Lamp Joint Stock Company

- For profit public company
- accredited by the BoA for lighting test methods
- accredited to test photometric, electrical and safety characteristics of GLS lamps (CFLs), double capped linear fluorescent, incandescent, MV, MH and HPS lamps
- capability for photometric and colorimetric measurements using an integrating sphere and spectroradiometer

General training opportunities

Suggestions (for discussion):

- Proficiency testing of CFL (self-ballasted GLS lamps) – total flux
- Comparison testing of LED integrated lamps – total flux
- Laboratory good practices and internal instrumentation calibrations
- Uncertainty measurement and sensitivity analysis