



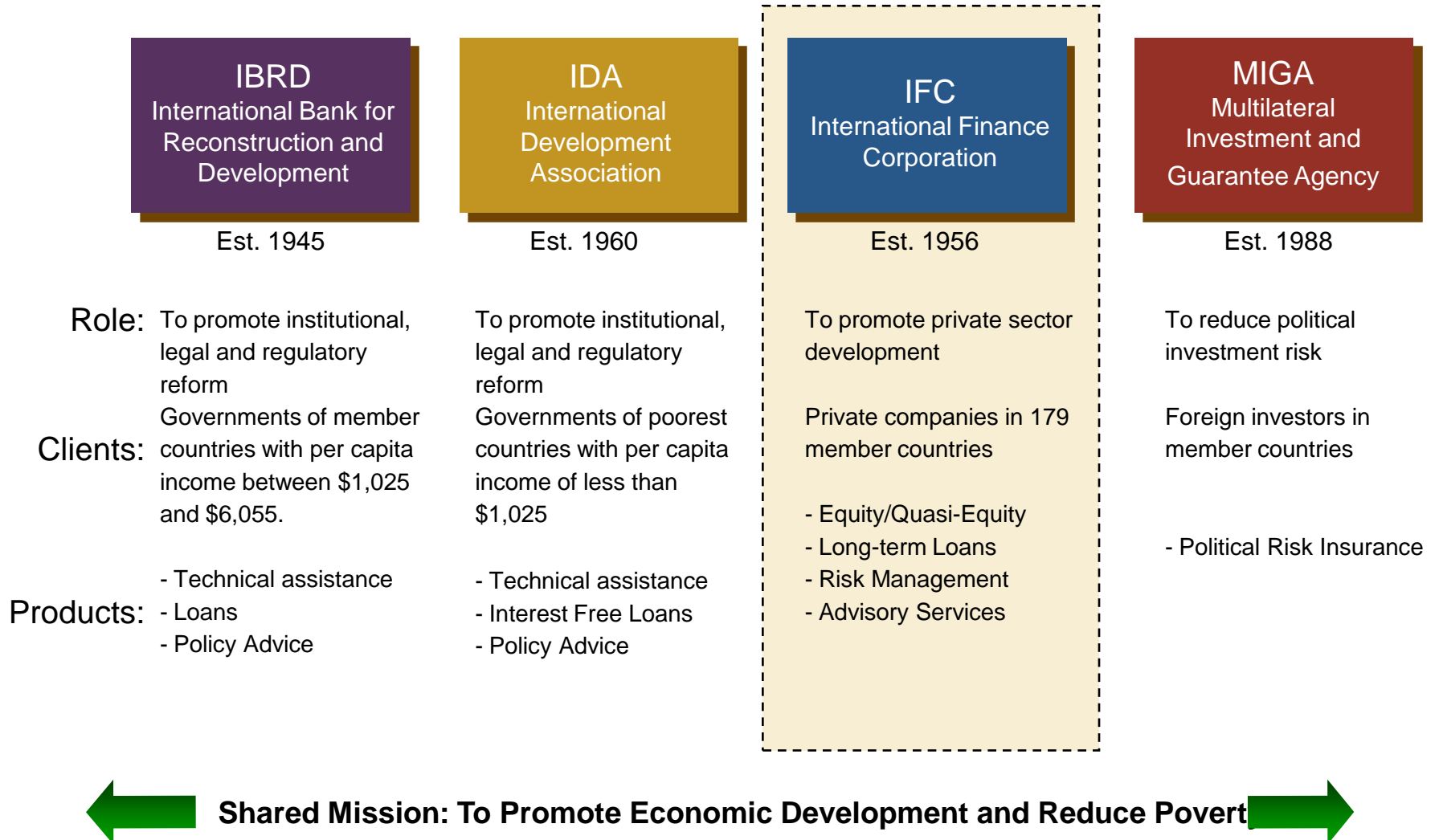
# **IFC's Lighting Asia and Green Building Code Programs**

**Autif Sayyed**

*International Finance Corporation*



# IFC is a Member of the World Bank Group



# LIGHTING ASIA

INDIA PROGRAM

*Catalyzing Markets for Off-Grid Lighting*

AN INNOVATION OF



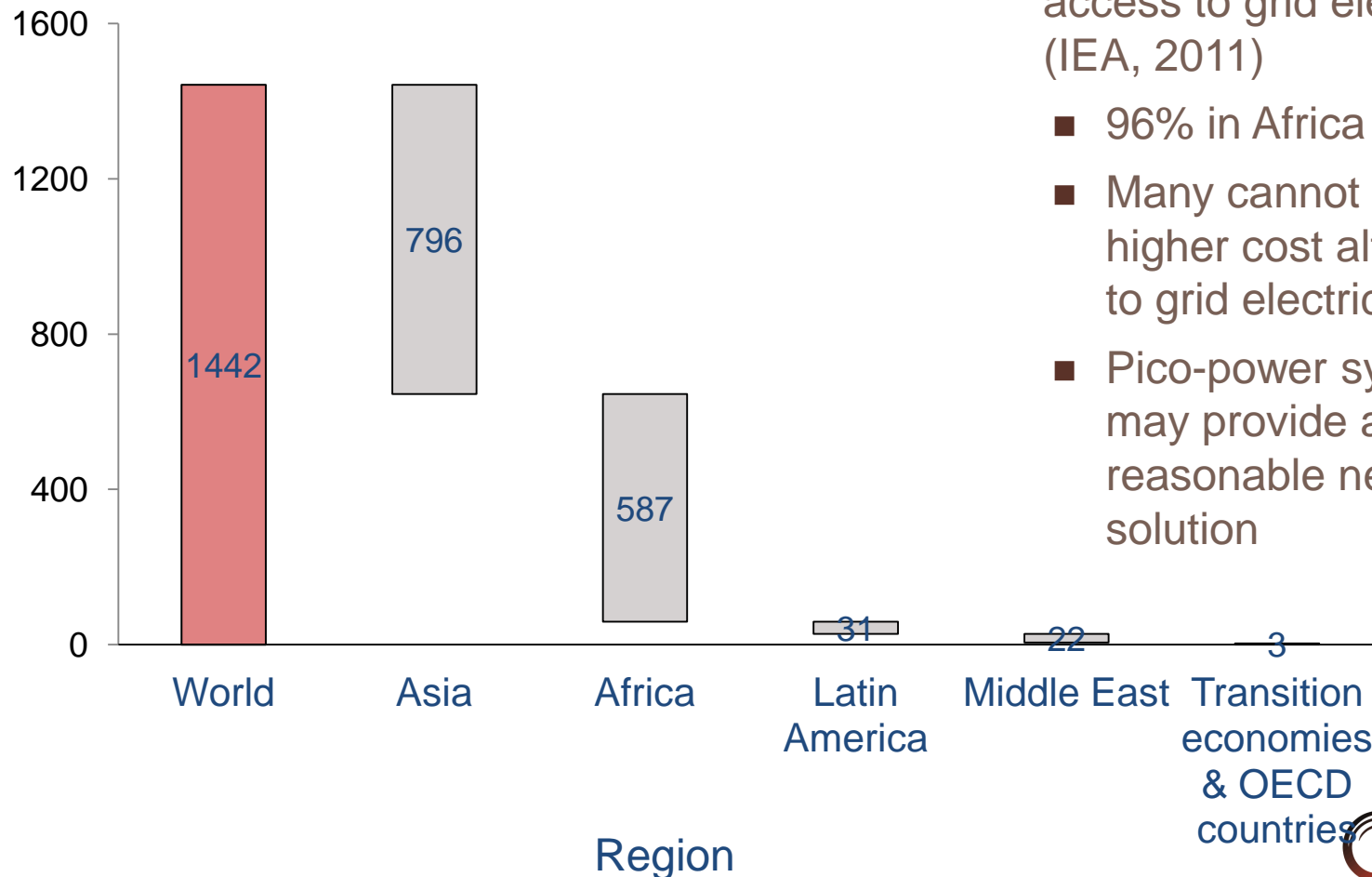
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Corporation**  
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# Large Potential Demand for Modern Off-Grid Lighting and other forms of Pico Power

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## People without Access to Electricity (2009)

Unelectrified Population (in millions)



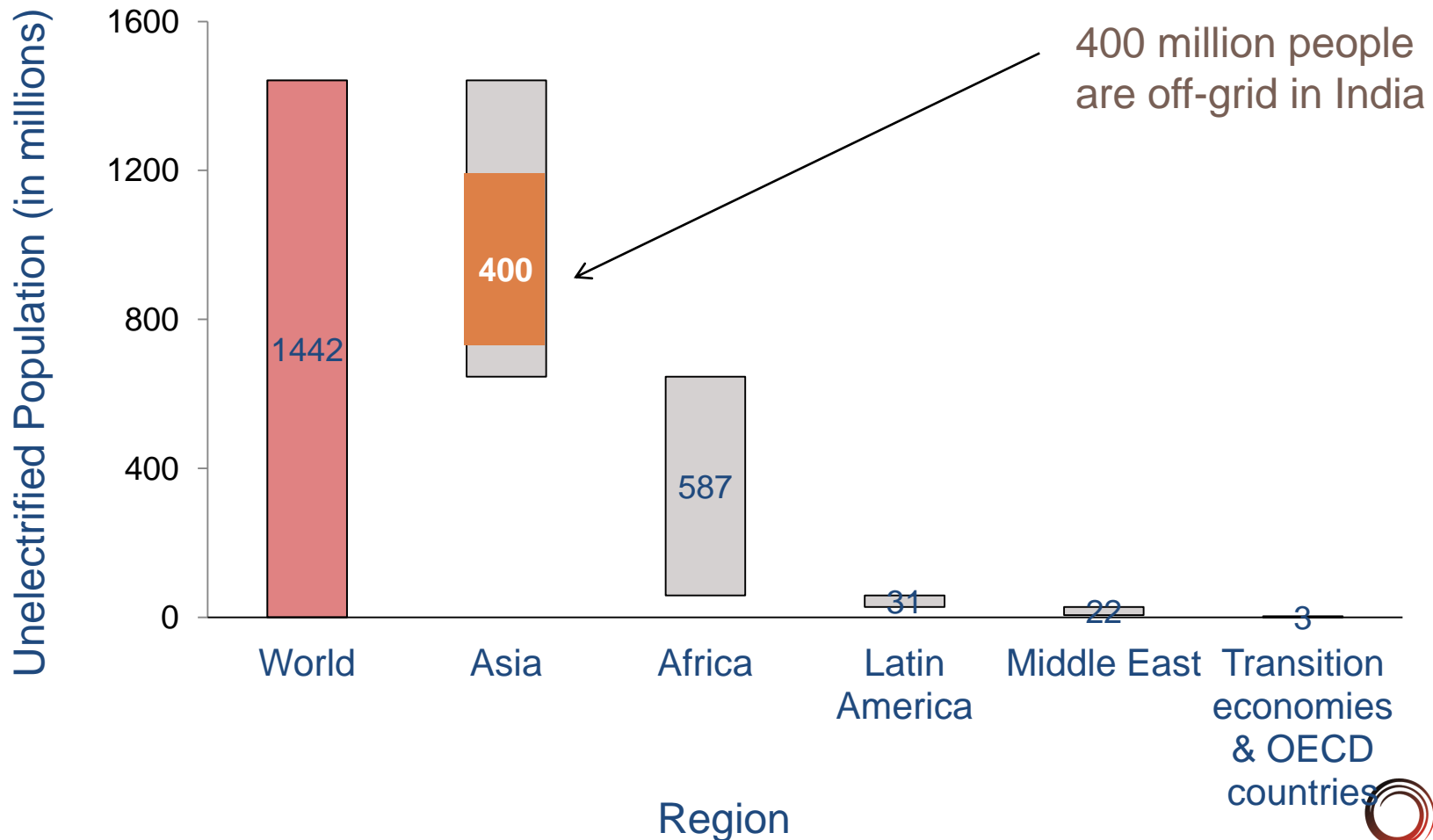
1.4 billion people lack access to grid electricity (IEA, 2011)

- 96% in Africa and Asia
- Many cannot afford higher cost alternatives to grid electricity
- Pico-power systems may provide a reasonable near-term solution

# Large Potential Demand for Modern Off-Grid Lighting and other forms of Pico Power

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People without Access to Electricity (2009)



# Fuel Based Lighting: *Expensive, Unhealthy, and Inefficient*

- Fuel-based lighting is a \$US 20+ billion per year industry (UNEP, 2013) - India spend \$US 2.2 bn per year on kerosene for lighting; inclusive of subsidies, is approximately \$US 4 bn (Intellecap)
- Kerosene lighting causes health & environmental problems
- The quality of lighting from fuel-based sources is very low



# The Promise of Modern Off-Grid Lighting from Renewable Energy Appliances

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- LED luminaries are emerging as an affordable substitute for fuel-based lighting for low income families and small businesses





# The Program

CATALYZING MARKETS  
FOR OFF-GRID LIGHTING

Lighting Asia/India

AN INNOVATION OF  
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Corporation  
World Bank Group

- What will IFC program include?
- How will it do it?
- What will it achieve?

## Quality Assurance

- Business Support
- Access to Finance
- Market Intelligence
- Knowledge Management





# The Program – How will it do it?

<b>Business Support</b>	<ul style="list-style-type: none"><li>• Support Private Sector with advisory services/capacity building</li><li>• Develop scalable &amp; replicable business plans attractive to investors</li></ul>
<b>Access to Finance</b>	<ul style="list-style-type: none"><li>• Support A2F Solutions for working, growth capital &amp; end consumer financing</li><li>• Work on outreach with financial institutions to unlock financing</li></ul>
<b>Quality Assurance</b>	<ul style="list-style-type: none"><li>• Product quality is critical in order to ensure sustainable growth</li></ul>
<b>Market Intelligence</b>	<ul style="list-style-type: none"><li>• Detailed market entry mapping of specific regions</li><li>• Analysis on consumer's ability/willingness to pay</li><li>• Overview of regulatory and investment climate in relevant markets</li></ul>
<b>Knowledge Management</b>	<ul style="list-style-type: none"><li>• Consumer awareness campaign dissemination of market intelligence information</li><li>• Conference and website for industry mobilization</li></ul>

# What will it achieve

- By end 2015 the Program will:
  - reach 2,000,000 off-grid individuals and supply them with renewable energy lighting solutions
  - avoid 64,000 GHGs by end 2015
  - generate 12,482 MWh renewable energy

# Access to clean energy

## Household access to clean energy constrained by:

- Lack of awareness of products, benefits and technical aspects for FI staff and households
- Financial constraints at the household level – limited access to formal FIs
- Limited or lack of resources/capacity at FIs to build adequate systems and processes for new lending lines
- More recently, credit crunch in the Indian microfinance sector and restrictions on loan portfolio (income-consumption loan ratios)

# The need for Quality Assurance

## Impact of inferior quality products on loans:

- Impacts PAR: poor product quality/performance can affect loan repayments, even those clients whose products are functional may refuse to repay loans
- Impact future demand for similar products by the same or a different FI
- May affect FI reputation and wider portfolio quality, particularly in cases where the quality/performance failure is on a larger scale
- PAR = Portfolio at Risk



# Quality Assurance for Financial Institutions

## Robust Quality Assurance Framework and Financial Institutions:

- Client retention and loyalty - wider portfolio of products that address their needs
- Diversify revenue streams for the MFI, bundled products can increase ticket size and contribute to reduced operational costs
- May reduce household risks or increase income thereby (indirectly) enhancing portfolio quality

# Off-Grid Lighting with LED Technology

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- LED lights are emerging as a cost-effective substitute for kerosene lighting
- Variety of system types, prices, and quality levels now available
- Quality assurance is needed to protect buyer interests and avoid market spoiling



# Market needs drive our Quality Assurance Principles

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- **Affordability:** Seek an appropriate balance between quality and affordability
- **Diversity & Innovation:** allow for product diversity in technology, utility, and price; encourage innovation by using non-prescriptive, performance-based metrics and goals
- **Rigor:** Use rigorous tests that can be carried out using reasonably low cost instruments
- **Stability:** Maintain stable and transparent QA policies so stakeholders know what to expect
- **Insight:** Effectively communicate key product quality and performance information so buyers can make informed purchasing decisions



# Our quality standards are influenced by end-users

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Evening time consumer focus groups  
in Bihar, May 2012

# Lighting Global Quality Assurance Program

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- Lighting Global QA serves Lighting Africa and Lighting Asia initiatives
- QA program originally developed under Lighting Africa, a joint IFC-World Bank initiative
- Now supported through collaboration between IFC, World Bank, U.S. DOE
- Working with International Electrotechnical Commission (IEC) to create harmonized int'l quality assurance system



## Lighting Africa Program:

- Quality Assurance
- Consumer Awareness
- Access to Finance
- Market Intelligence
- Policy and Regulatory Reform



U.S. DEPARTMENT OF  
**ENERGY**

# Our international team for off-grid lighting quality assurance has deep experience

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## Off-Grid Lighting QA Partners



## Lighting Global QA Team Expertise

### Core Team Leadership

Russell Sturm, Arthur Itotia, Chandra Govindarajalu (IFC), Dan Murphy & Dana Rysankova (World Bank)

### Technical Team Lead

Arne Jacobson

### Energy Systems Experts

P. Alstone, K. Radecsky, R. Hosbach, T. Quetchenbach, P. Lai, N. Pfanner, G. Bopp, and others...

### Lighting and LED Experts

Erik Page, Kevin Gauna

### QA Strategic Planning

Shannon Graham, Paul Waide

### Industry Liaisons

Rodd Eddy, Leo Blyth

### End user Liaisons

Jenny Tracy, Meg Harper

## Regional Teams

### East Africa Team

N. Asamoahmanu, V. Ogega ...

### West Africa Team

C. Carlsen, Abdoulaye Ba ...

### India Team

Naomi Bruck, Anjali Garg, Dr. TC Tripathi, Brendon Mendonca ...

# Our international team for off-grid lighting quality assurance has deep experience

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## Off-Grid Lighting QA Partners



## Lighting Global Test Laboratory Network



UNIVERSITY OF  
NAIROBI

CERER  
of Senegal





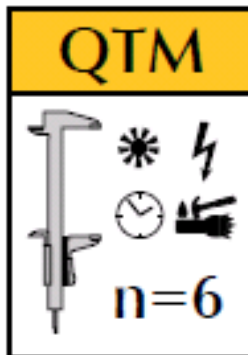
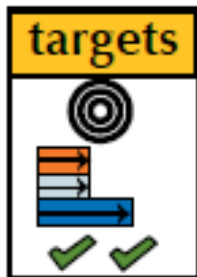
# Quality Assurance Program Structure

## Off-Grid Lighting QA Program

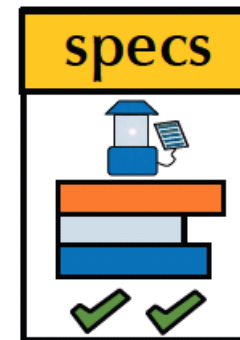
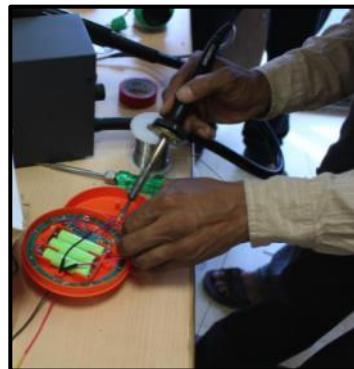
Quality Standards  
and Test Methods

Testing  
Verification  
Enforcement

Marketing  
Communication



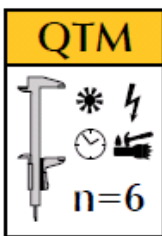
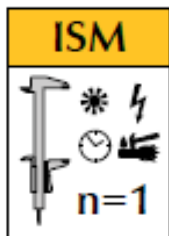
test  
methods



consumer  
awareness  
campaign

# Lighting Global QA Program Elements

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## Standardized Testing Methodologies (multi-level)

QTM = quality test method; ISM = initial screening method



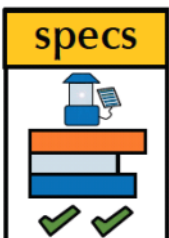
## Minimum Quality and Durability Standards

Metrics and thresholds for ensuring truth in advertising and minimum product quality



## Program Specific Performance Targets

Program-specific performance levels that go beyond minimum standards; used to determine access to specific program services

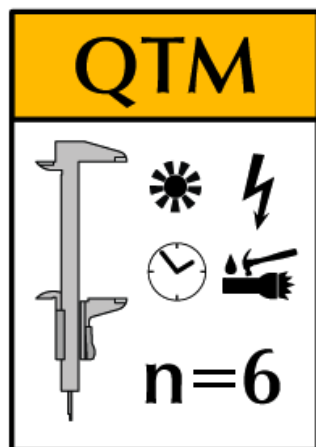


## Standardized Specification Sheets

Standardized framework for reporting verified performance for products that meet minimum quality standards; available at [www.lightingafrica.org/specs](http://www.lightingafrica.org/specs)

# Lighting Global Quality Test Method

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Test methods designed to deliver accurate results using relatively low cost equipment.

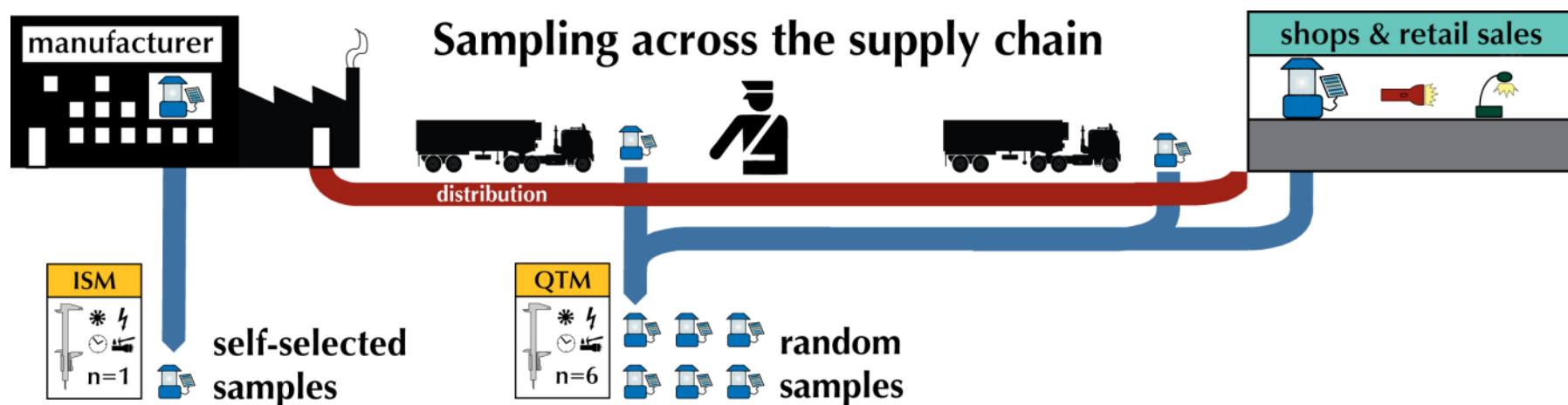
Component Tests	Sampling	<ul style="list-style-type: none"><li>Randomly selected from warehouse or marketplace</li></ul>
	Photometrics	<ul style="list-style-type: none"><li>Luminous flux (lumens—total output)</li><li>Standardized distribution (illuminance)</li></ul>
	Battery & Charge Control	<ul style="list-style-type: none"><li>Battery Capacity (Amp-hours, voltage)</li><li>Degree of protection (voltage cutoffs)</li></ul>
	Solar Module	<ul style="list-style-type: none"><li>Power output (Watts)</li><li>Current-voltage characteristics (I-V Curve)</li></ul>
System Tests	Full Battery Run Time	<ul style="list-style-type: none"><li>Measured using standardized cycle (hours of operation)</li></ul>
	Solar Charge Run Time	<ul style="list-style-type: none"><li>Modeled estimate (daily hours of operation after solar charging)</li></ul>
	Physical Ingress & Water Protection	<ul style="list-style-type: none"><li>Incorporates enclosure (IP class) and system-level protection (coatings, etc.)</li></ul>
	Durability	<ul style="list-style-type: none"><li>Drop test from one meter (pass/fail)</li><li>Switch and connector durability</li><li>Internal wiring and solder inspection</li><li>Lumen maintenance</li></ul>



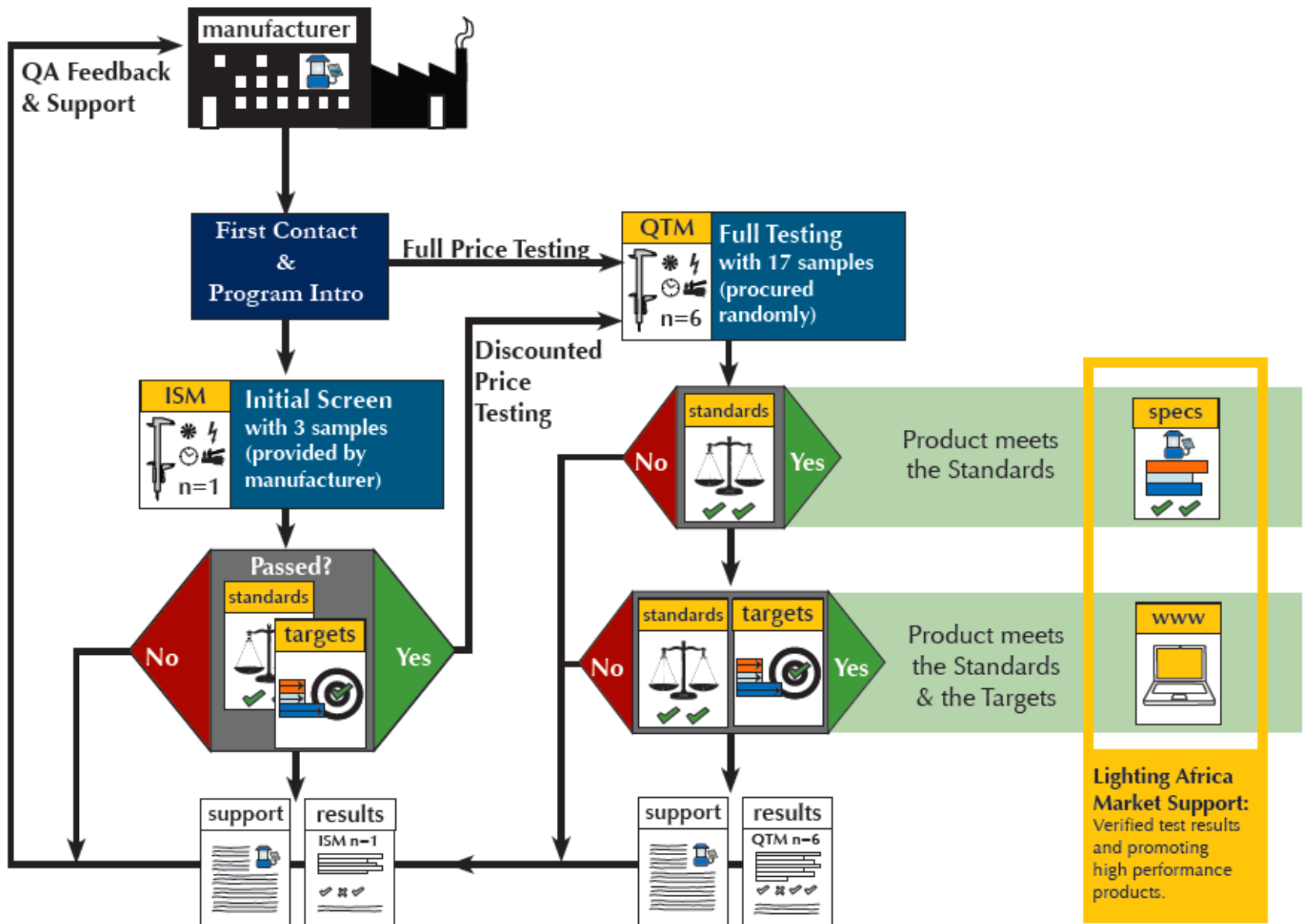
# Rigorous Product Sampling Protocol

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- **Random procurement** ensures that the test samples are unbiased and representative
- **Multiple samples** increases accuracy and validity of the test results



# Lighting Global QA Product Testing Flow Chart



# Standardized specifications sheets communicate key information to the market

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# Greenlight Planet Sun King Pro

Verify specs at:  
[www.lightingafrica.org/specs/glp-sunkingpro](http://www.lightingafrica.org/specs/glp-sunkingpro)

**Overall Performance**

**"Turbo" setting: 110 lumens for 6 hours after one day of solar charging**

**"Normal" setting: 44 lumens for 15 hours after one day of solar charging**

**General Information**

Manufacturer	Greenlight Planet Inc.	
Product Name	Sun King Pro	
Model Number	SK-301	
Contact	sales@greenlightplanet.com	
Website	www.greenlightplanet.com	
Warranty	1 year	

**Run Time**

Autonomous Run Time (full battery)	6 hours "Turbo"	15 hours "normal"
Lighting hours per solar day (PV only)	6 hours "Turbo"	15 hours "normal"

**Lighting System**

Lamp type	LED	
Light output	110 lumens "Turbo"	44 lumens "Normal"
Light output at 2000 hours	110 lumens "Turbo"	

Light Distribution

**Color Appearance**

**Color Rendering**

CRI: 59

**Charging System**

Charge type(s)	PV
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**Storage System**

Storage Type	LiFePO <sub>4</sub> (LFP) Rechargeable Battery
Nominal Battery Voltage	6.6 Volts DC
Battery Capacity	1450 milliamp-hours
Battery Protection	Active HVD and LVD, Individual Cell Balancing
Easily Replaceable Battery?	No

**Additional Information & Special Features**

Phone charging cables	Includes six common mobile phone adapters
Battery Life / Charging Display	Displays solar charging strength on a scale of 1 through 5, and displays remaining battery capacity during use.
Lamp Housing	Polycarbonate and ABS Shell, Steel Stand
Factory Certification	ISO 9001:2000

**Date of Sample Procurement for Testing**

May, 2011

Revision 2011.01

- Provide quality baseline: only products that meet the standards can participate.
- Focus on communicating system-level performance and features that impact end-users (run time, brightness, etc.)
- Available at <http://www.lightingafrica.org/specs.html>

# GREEN BUILDING REGULATION

Indonesia| Vietnam |Philippines|  
China  
Bangladesh | Colombia



# Green Building Codes: Typical Approach

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- Most countries do not have functioning energy efficiency/  
Green Building Codes
- Proposed mandatory requirements are:
  1. Simple to comply with and to enforce
  2. Based on detailed sensitivity and cost analysis for local  
conditions and market preparedness
  3. Only high impact measures included

# Codes: Typical Lighting Requirements

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- Minimum Lighting Power Density (W/m<sup>2</sup>)- space by space method
- Automated daylighting control in some perimeter spaces
- Occupancy sensor control of lights in irregularly occupied spaces such as restrooms, storage rooms etc.

# Lighting Requirements Not Mandated Yet

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- Lamp Efficacy (Lumens/ watt)
  - Will be regulated through energy equipment labeling program
- Mercury Content in Lamps
  - Hopefully will be regulated through energy equipment labeling program
- Mandatory shutoff of all non-emergency lights in commercial buildings



# Lighting Requirements Not Mandated Yet

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- Exterior lighting power
- Full cutoff exterior lighting
- Optimum sizing of windows for daylighting



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