Owoeye Olakunle
Quality Assurance Lead – Lighting Africa, Nigeria
oowoeye@ifc.org

Lighting Global Quality Assurance

Schatz Energy Research Center

clasp

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Catalyzing markets for modern off-grid energy

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Quality Standards for Pico-PV and SHS Kits

SESSION GOALS

Participants will:

- be familiar with the test methods and quality standards for pico-solar and SHS kits
- be aware of the IEC standards adoption process and timing
- understand the importance of international standards harmonization
- discuss application of the standards in ECOWAS and raise any questions or concerns
- know where to go for resources and how to participate in the standards revision process

Quality Standards for Pico-PV and SHS Kits

SESSION AGENDA

- Introduction: Lighting Global Quality Assurance (QA)
- QA Framework and Harmonization
- Adoption by International Electrotechnical Commission (IEC)
- Standards & Test Methods Overview
- Q&A / Discussion

Lighting Global Quality Assurance

For over 10 years, Lighting Global, a World Bank Group program, has developed and maintained **the world's most widely recognized quality assurance (QA) framework for pico-solar products and solar home system kits**.

Lighting Global's QA framework is composed of four main elements:

- **Quality Standards** to set baseline requirements
- **Test methods** to rigorously evaluate quality and performance
- **Test Lab Network** to maintain consistent test results
- **Market Surveillance Testing** to ensure long-term compliance

Lighting Global QA activities include **measuring, benchmarking, and communicating information about product quality and performance.**

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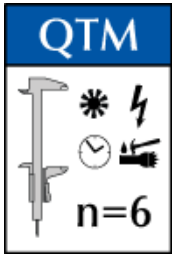
Lighting Global Quality Assurance Framework

Lighting Global QA Framework

Test methods and standards



IEC Technical Specification 62257-9-5, Ed. 4.0

LIGHTING GLOBAL Quality Standards

Testing and Verification

SMQ

SCHATZ ENERGY RESEARCH CENTER

Intertek

teri

UNIVERSITY OF NAIROBI

ISO 17025 accreditation using ILAC affiliated organizations

Communicating Quality to Market

www.lightingglobal.org/products

Stakeholder Engagement
Consumer Awareness Campaigns

Test Methods:
IEC Technical Specification 62257-9-5

Comprehensively addresses pico-PV products and SHS kits:

- Describes and categorizes applicable products, including system components
- Establishes framework for measuring and observing system characteristics and performance
- Provides detailed test methods for evaluating product quality

Testing for conformity assessment must be done:

- according to the latest edition of IEC TS 62257-9-5
- by a test lab that is ISO 17025 accredited for IEC TS 62257-9-5

Official test results are assessed to determine if products meet the Quality Standards

Summary of Test Procedure
IEC TS 62257-9-5

Technical Specification 62257-9-5

	Sampling	• Randomly selected from warehouse or marketplace Pico-PV : 18 samples from stock of at least 500 SHS : 12 samples from stock of at least 150
Component tests	Photometrics	• Luminous flux (lumens—total output) • Standardized distribution (illuminance)
	Battery & Charge Control	• Battery Capacity (Amp-hours, voltage) • Degree of protection (voltage cutoffs)
	Solar Module	• Power output (Watts) • Current-voltage characteristics (I-V Curve)
	Ports and Control Box	• Power capabilities and port efficiencies • Circuit protection
	Non-lighting appliances	• Functionality and durability check • Power consumption • Battery tests as necessary

Summary of Test Procedure (continued)

System Tests

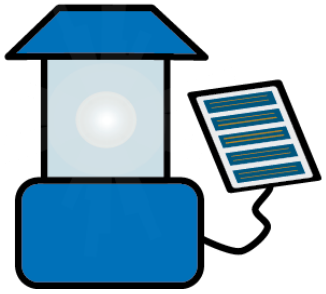
Full Battery Run Time	• Measure single FBRT with lighting appliances as input to Energy Service Calculations
Solar Charge Test	• Measure single solar charge test as input to Energy Service Calculations
Energy Service Calculations	• Modeled estimate (full battery and daily hours of operation in various configurations)
Physical Ingress & Water Protection	• Incorporates enclosure (IP class) and system-level protection (coatings, etc.)
Durability and Safety	• Lumen maintenance ≥90% • Additional safety requirements for Li-ion • PV cables rated for outdoor use (UV) • Declare wire and cable sizing
User Manual and Packaging	• Battery replacement statement • Installation, maintenance and safety • Report PV power on packaging
Warranty	Pico-PV : 1 year SHS : 2 years for system, battery and included light points, 1 year for appliances

Technical Specification 62257-9-5

Only applicable to products > 10 W [Related to the cost & expected lifetime of the system]

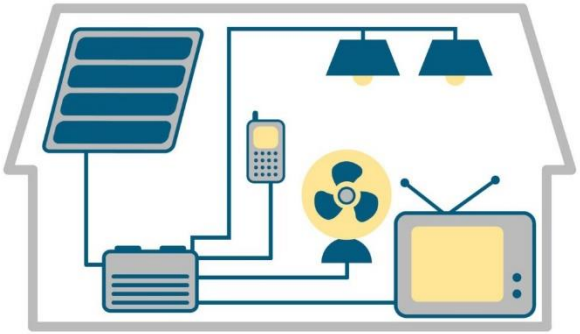
Lighting Global Quality Standards

Pico-PV Quality Standards



≤ 10 W_p

SHS Kit Quality Standards



>10 W_p up to 350W_p

- The Quality Standards are benchmarks that set a baseline level of **quality, durability, and truth-in-advertising** to protect consumers of off-grid lighting products.
- Conformance is evaluated based on results from **laboratory testing** according to International Electrotechnical Commission (IEC) Technical Specification 62257-9-5.
- Tests are conducted at **third-party, approved test centers** that are ISO 17025 accredited.
- The Quality Standards have been submitted to IEC for adoption as IEC TS 62257-13-1. **IEC adoption expected in late 2019.**

Quality Requirements

- **Safety and durability**
  - **Water exposure protection**
  - **Physical ingress protection**
  - **Drop test**
  - **Mechanical durability**
    - Connectors
    - Moving parts
    - Cable strain relief
  - **AC / DC charger safety**
- **Workmanship**
  - **Good quality soldering and electrical connections**

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Quality Requirements

- **Battery**
  - **Protection**

    Charge controller prolongs battery life by maintaining within acceptable voltage levels
  - **Long-term storage durability**

    Limit on permanent capacity loss after storage at high temperature
  - **Composition**

    No battery may contain cadmium or mercury at levels greater than trace amounts (<0.0005% Hg and <0.002% Cd by weight in accordance with the EU Battery Directive)

Quality Requirements

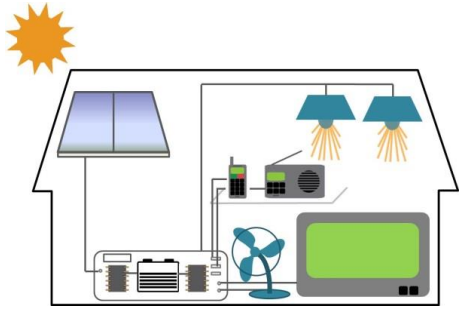
- **Lumen maintenance**

  Limit on permanent loss of light output after long-term use of LED

- **Pay-as-you-go (PAYG)**
  - Capable of accurately metering service to customers
  - battery protection must remain active regardless of whether the system is in an enabled or disabled state

SHS Kits: Additional Requirements (1 of 3)

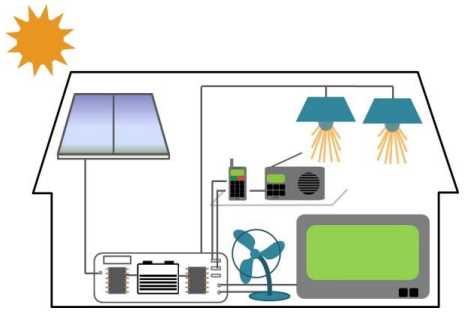
- **Consumer-facing information**
  - PV power on packaging
  - Statement about battery replacement on packaging
  - Port voltage and current accurately specified and compatible with appliances that are charged/powered through the ports.
  - User manual information/instructions
    - PV module placement, orientation & connection
    - How to make permanent & appliance connections
    - How to determine battery state-of-charge
  - Component specifications & replacement methods (during and after warranty period)



SHS Kits: Additional Requirements (2 of 3)

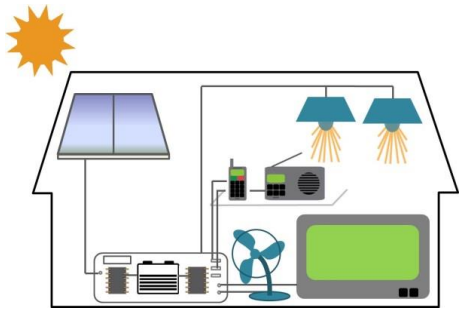
- **Warranty**
  - Accurately specified and consumer facing
  - Minimum of two years for main control unit, battery and PV module
  - Minimum of one year for accompanying appliances

- **Battery**
  - Lithium batteries must carry UN38.3 certification and have circuit protection for individual cells or sets of parallel-connected cells.

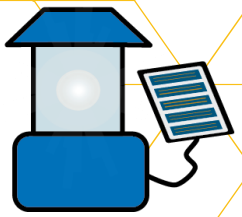


SHS Kits: Additional Requirements (3 of 3)

- **Safety & Durability**
  - Circuit and overload protection must be part of the system
  - Wires, cables and connectors must be appropriately sized for the expected current and voltage
  - PV overvoltage protection
  - User interface must be designed such that the user cannot make improper or reversed polarity connections
  - Any cable intended to be placed outdoors (e.g. PV module cables) must be outdoor-rated and UV resistant.



TEST METHODS & STANDARDS HISTORY

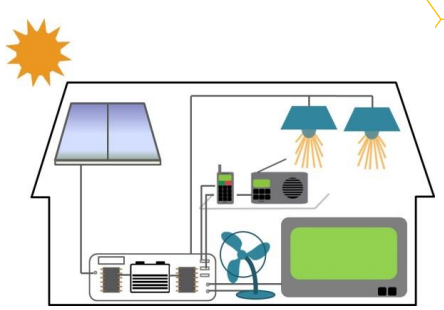


2010

First version of Quality Standards and testing of off-grid lighting products

2013

IEC adopts Lighting Global test methods as IEC TS 62257-9-5



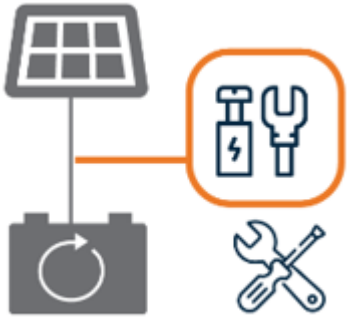
2015

First version of Quality Standards for plug-and-play SHS kits

- Edition 4 of IEC TS 62257-9-5 published, now includes test methods for SHS kits

2018 - 2019

- v2.4 of SHS Kit Standards – Non-plug-and-play connectors allowed at installation
- v8 of Pico-PV Standards – Updates including alignment with SHS Kit standards
- Pico-PV & SHS Kit Standards submitted to IEC



Standard-Setting Activity for Off-Grid Solar Products

National governments and regional groups with large markets for pico-PV and SHS kits are adopting quality standards.

Referencing the IEC test methods and standards facilitates international harmonization

ECOWAS

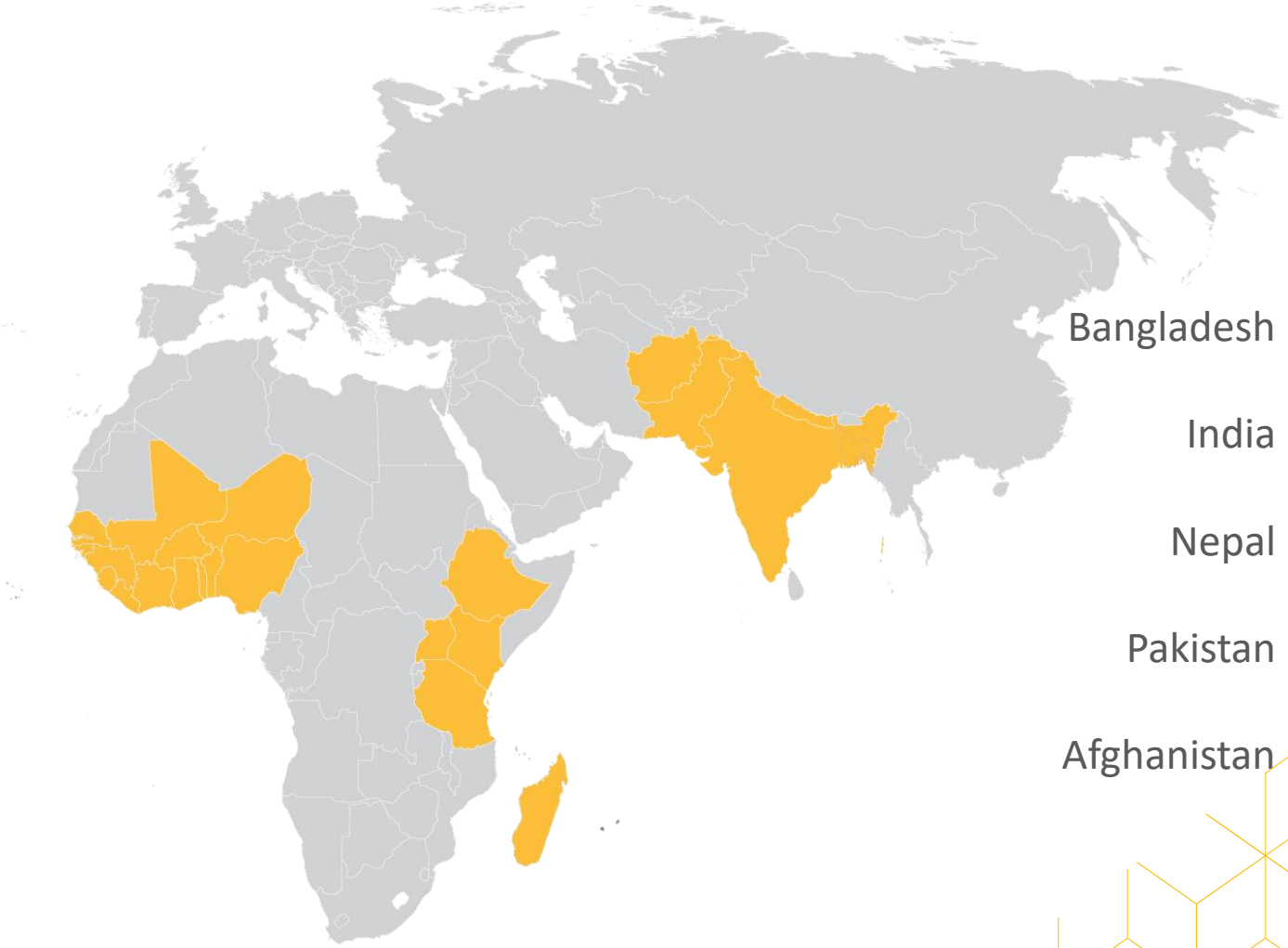
Ethiopia

Rwanda

Kenya

Tanzania

Madagascar



Bangladesh

India

Nepal

Pakistan

Afghanistan

Benefits of International Standards Harmonization

Harmonized pico-PV and SHS kit standards more effectively reduce the prevalence of sub-standard products while fostering innovation and maintaining consistency across international markets.

CONSUMERS & MARKETS

- Increased market consistency
- Reduced market spoilage
- Increased sales and market growth
- Greater variety of high quality products available
- Reduced cost of doing business and product prices

STANDARDS AGENCIES, CUSTOMS & CONFORMITY ASSESSMENT PROGRAMS

- Increased confidence in standards
- Minimal investment required
- Increased ease of standards adoption
- Simplified regulations

OTHER STAKEHOLDERS BENEFITTING FROM HARMONIZED STANDARDS

- Bulk procurers
- Development agencies
- Manufacturers
- Importers
- Financial institutions
- Finance programs
- Investors

STANDARDS ADOPTION PROCESS

- Lighting Global pico-solar & SHS kit Quality Standards submitted to IEC Technical Committee 82 for adoption as **IEC TS 62257-13-1**
- Initial round of comments from IEC country representatives completed November 2018
- IEC project team **now revising document** to address comments received, including
  - Strengthened PV and battery safety
  - Additional labeling and performance reporting
- IEC Joint Working Group 1 to discuss revised draft on May 27
- Expected re-submission through CDV (committee draft and vote) process in June, with completion in October 2019
- **If document is accepted, IEC could publish the standards by the end of 2019**

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Q&A

DISCUSSION

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