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Catalyzing markets for modern off-grid energy

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GOGLA
Global Off-Grid Lighting Association

Quality Assurance for Off-Grid Lighting

Expansion to Cover Solar Home System Kits

Stakeholder Outreach Webinar

15 November 2016

3:30 PM GMT

Presenting Today

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Agenda

- **Brief background** on Lighting Global QA
- Overview of **existing QA framework**
- Summary of **proposed changes**
- Description of **stakeholder feedback**
- **Timeline** for changes to take effect
- Key topics for **future consideration**

We will pause for **questions** throughout and reserve time at the end. Please enter questions in the chat window.

Lighting Global Quality Assurance Program

- Joint initiative of **IFC and World Bank**; supports Lighting Africa and Lighting Asia
- **Testing and verification program** for off-grid energy products
- QA framework for pico-products institutionalized through the **International Electrotechnical Commission** (TS 62257-9-5, Ed. 2.0)
- Developed **test methods and quality standards for SHS Kits**; in use since 2015

Lighting Global Engages With a Coalition of Partners & Stakeholders

Off-Grid Lighting QA Partners

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U.S. DEPARTMENT OF ENERGY

Global LEAP
Lighting and Energy Access Partnership

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IEC

GC GLA

clasp

SCHATZ ENERGY RESEARCH CENTER

Fraunhofer ISE

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Lighting Global Test Laboratory Network

SCHATZ ENERGY RESEARCH CENTER — All Tests

Shenzhen Academy of Metrology & Quality Inspection — SMQ

Fraunhofer ISE — SHS Tests

teri — Pico Tests

UNIVERSITY OF NAIROBI — Pico ISM & MCM

ECAE

Regional Programs

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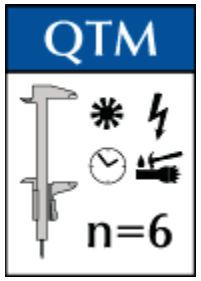
Lighting Global Quality Assurance Primary Program Elements

Lighting Global QA Framework

Test methods and standards



IEC

Technical Specification 62257-9-5, Ed. 3.0

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Quality Standard

Testing, Verification, & Surveillance

SMQ

SCHATZ ENERGY RESEARCH CENTER

Intertek

Fraunhofer ISE

teri

ECAE

QTM and AR testing to IEC TS 62257-9-5 by ISO 17025 accredited laboratories

Communicating Quality to Market

www.lightingglobal.org/products

Consumer Awareness Campaigns

Stakeholder Engagement

GOGLA

d.light

mobisol plug in the world

Off-Grid Solar Sector

DFID Department for International Development

giz

Development Agencies

Governments

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Lighting Global QA Framework Includes Both Pico- Solar Products and Solar Home Systems

	Pico-Solar Product	Solar Home System Kit
Product Type		 *plug-and-play*
Product's PV Power	≤ 10 - 15 Wp	≥ 10 Wp & ≤ 350 Wp
Test Methods	IEC TS 62257-9-5	Lighting Global SHS Test Methods
Quality Standards	Lighting Global Quality Standards	Solar Home System Kit Quality Standards
Products Tested Through Lighting Global Framework	>200	11
Products That Have Met the Quality Standards & Are Listed on the Lighting Global Website	145	8

Solar Home System Kits Listed on the Lighting Global Website


Mobisol


Barefoot Power


Zimpertec


Omnivoltaic Energy Solutions


Off Grid Electric


Fosera


AEG International


SolarWorks!

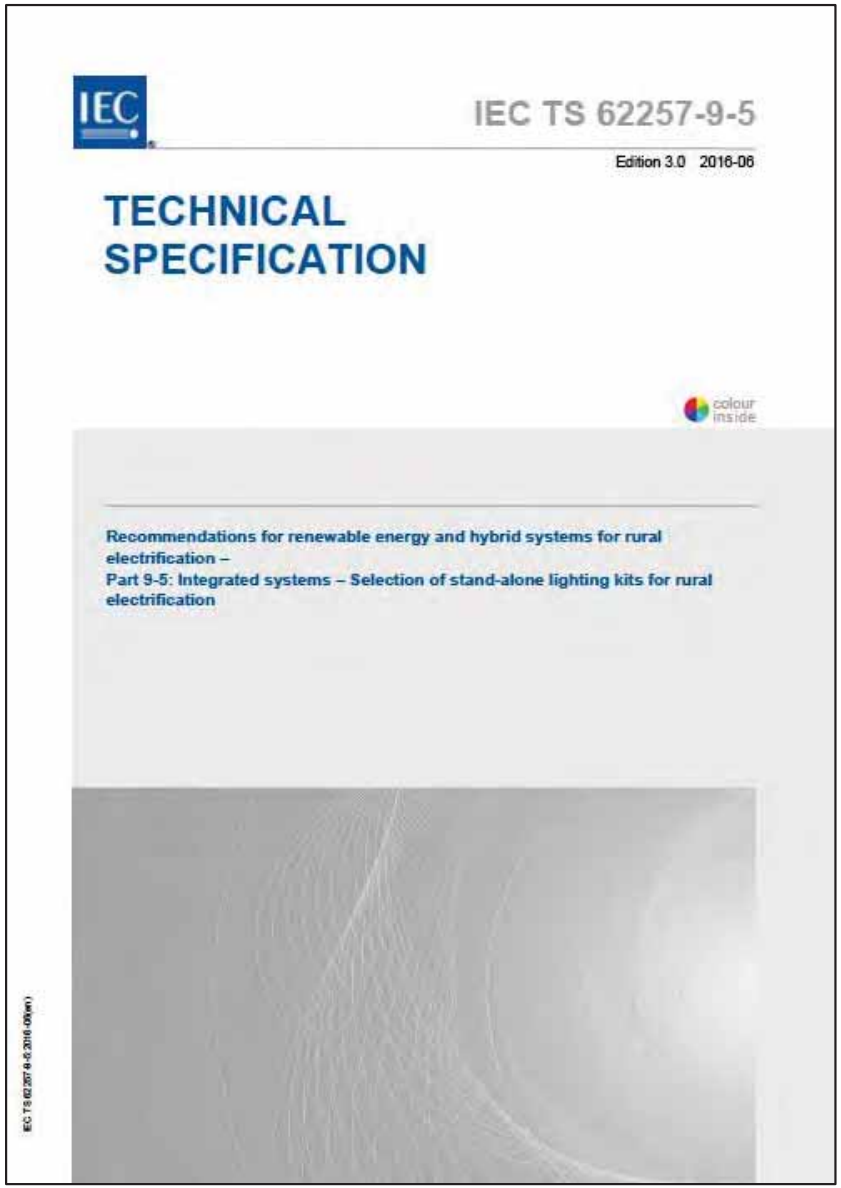
https://www.lightingglobal.org/products/

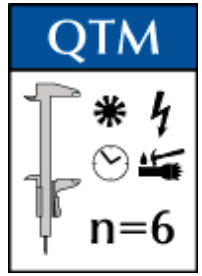
Timeline for SHS Kits Framework

Open for questions

- Developed quality standards and test methods with initial focus on DC kits (June 2014 – now)
  - Developed methods using existing IEC standards and TS 62257-9-5 as a starting point; drew from other existing methods wherever possible
  - Incorporated feedback: Provided stakeholders opportunities to review and comment on drafts
  - Piloted methods: Utilized draft methods on trial basis on 10 products and revised as needed
- Testing is currently available at three labs (in China, US and Germany), and the Lighting Global, Lighting Africa and Lighting Asia programs are offering support for quality-verified SHS Kits
- Plan to include the test methods for SHS Kits in IEC/TS 62257-9-5 to create a single framework for products up to 350 W (publication likely in 2017)

Test Methods & Standards





- Pico products must be:
  - tested 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
- QTM test results are required for Lighting Global's assessment to meet the Quality Standards
  - n=6 for pico products ($\leq 10\ W_p$)
  - 3.5% of the warehouse stock for Pico-QTM (≥ 500 units); random sampling used
- Purchase document from IEC Webstore; 75% “discount” available for eligible stakeholders

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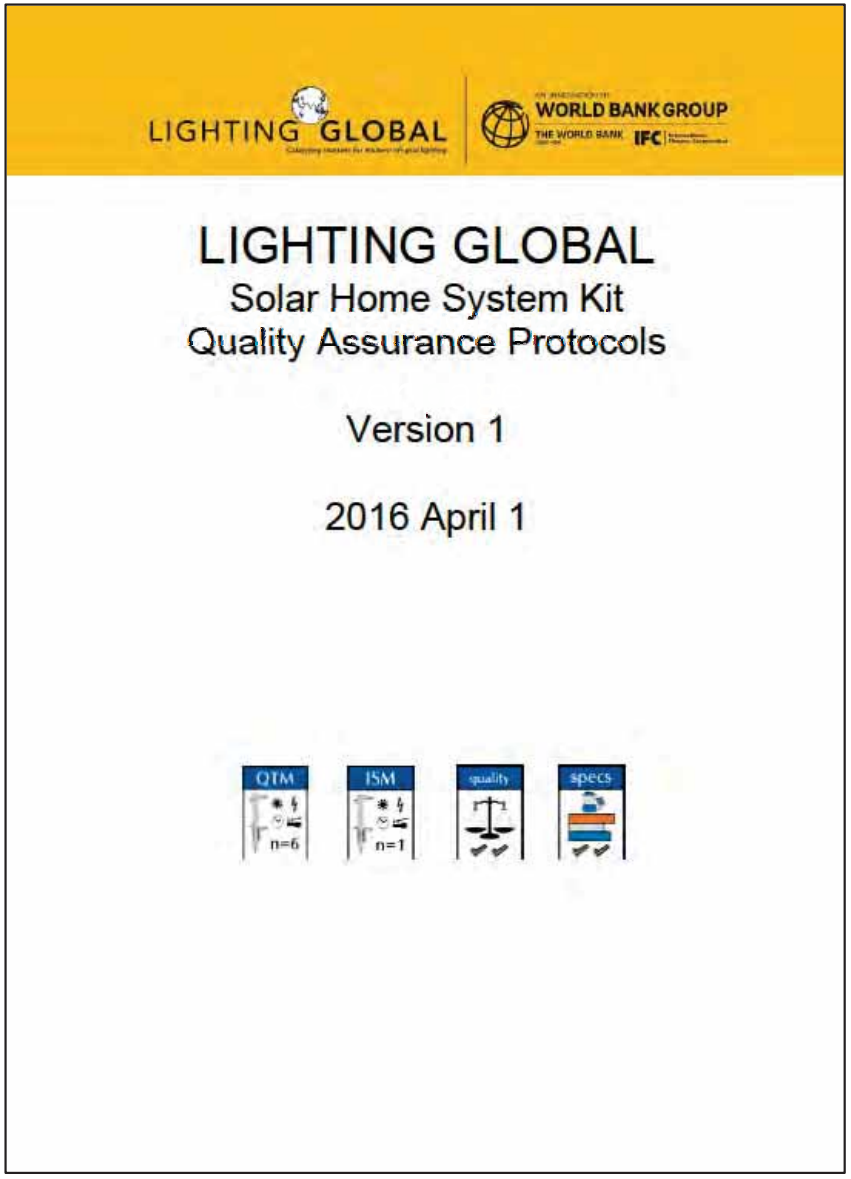
Test Methods & Standards



- SHS products must be:
  - tested to the latest edition of the Lighting Global Solar Home System Test Methods
  - by a test lab that is approved by Lighting Global to conduct the SHS tests
- SHS-QTM test results are required for Lighting Global's assessment to meet the SHS Quality Standards
  - n=4 for SHS products ($\geq 10\ W_p$ & $\leq 100\ W_p$)
  - 8% of warehouse stock for SHS-QTM (≥ 200 units)
- The Lighting Global SHS test methods can be obtained from LG QA upon request

Test Methods & Standards

Pico-Solar Quality Standards

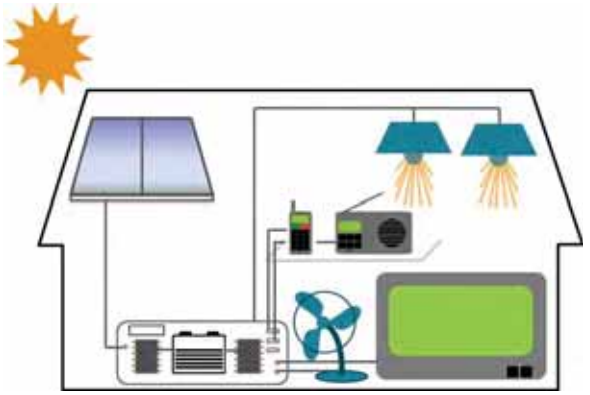
(≤ 10-15 W_p)

Table 1. Lighting Global Quality Standards

Category*	Metric	Quality Standard
Track & Advertising*	Manufacturer, Model # and Product Name	Accurately specified
	Light Output and Solar Run Time	Accurately reported on packaging for the highest setting.* For other settings, if reported, accurately specified. If there are both pay-as-you-go (PAYG) and non-PAYG versions of a product, each must be truthfully advertised with respect to energy services provided.
	Charger Rating	If reported, charger power rating accurately specified (e.g. PV power or mechanical charge time)
	Lamp Type	If reported, accurately specified
	Mobile phone charging	Impact of mobile phone charging on product performance qualitatively described on packaging.*
	Pay-as-you-go (PAYG) metering	The PAYG system should be capable of accurately metering service to consumers so they reliably get the service that is paid for.
	Other Aspects	If reported, accurately specified
Lumen Maintenance	Lumen Maintenance at 2,000 hours	Average relative light output ≥ 85% of initial light output at 2,000 hours with only one sample allowed to fall below 75% CR. All 6 samples maintain ≥ 95% of initial light output at 1,000 hours.* If an unfinished lighting appliance provides ≥ 15 hours, it is subject to the lumen maintenance standard.
Health and Safety	AC-DC Charger Safety	Any included AC-DC charger passes approval from a recognized consumer electronics safety certification organization.*
	Hazardous Substances Ban	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)
Battery	Battery Protection	Protected by an overcurrent charge controller that prolongs battery life and protects the safety of the user. Five out of 6 samples must meet the requirements outlined below.* Batteries of unfinished appliances must also meet this standard. For PAYG systems, appropriate battery protection must remain active regardless of whether the system is in an enabled or disabled state. To avoid damage to a battery during long-term periods of non-payment disabled system states, the solar module must be able to charge the battery even if the product is in a disabled state.
	Battery Durability	The average capacity lost of 6 samples must not exceed 25% and only one sample may have a capacity loss greater than 35% following the battery durability test as defined in IEC 62257-8-1 Annex BB. If an unfinished lighting appliance provides ≥15 hours, it is subject to the battery durability standard. All other appliances are not required to meet this standard.
Design and Durability**	Physical Ingress Protection (for components containing electronics or electrical connections)	Point Emitter: IP5x Other: IP2x All PV Models: IP5x

https://www.lightingglobal.org/qa/standards/

SHS Kits Quality Standards



(10 W_p - 100 W_p)

Table 1. Solar Home System Kit Quality Standards

Category*	Metric	Quality Standard
Track & Advertising	Manufacturer	Accurately specified
	Product Name & Model No.	Accurately specified
	Performance Claims: Light Output, Run Time, Appliance Power Consumption	If reported, accurately specified.* If there are both pay-as-you-go (PAYG) and non-PAYG versions of a product, each must be truthfully advertised with respect to energy services provided.
	Lamp Type, PV Power, Battery Capacity, Charger Rating, Other Aspects	PV power must be accurately reported on the product packaging. All other reports, if reported, must be accurately specified.*
	Pay-as-you-go (PAYG) metering	The PAYG system should be capable of accurately metering service to customers so they reliably get the service that is paid for.
	Ports	Port voltage and current specifications, if provided, must be accurate. Included appliances must function when connected to SHS ports. Power output of ports must be sufficient to power appliances that are advertised but not included. Specific guidelines for USB and 12 V ports are below.* Ports of included appliances are not required to meet this standard.
	Functionality	All advertised features must be functional. Any description of the product that appears on the packaging, inside the package and in any other medium (amount, etc.) should be truthful and accurate. Any statements should enclosed battery to not warn about the features or utility of the product. Any user interfaces (charge indicators, SOC estimates, etc.) must be accurate.
Lumen Maintenance	Lumen Maintenance at 2,000 Hours	Average relative light output of 6 samples ≥ 90% of initial light output at 2,000 hours with only one sample allowed to fall below 80% CR. All samples maintain ≥ 95% of light output at 1,000 hours. If an unfinished lighting appliance provides ≥15 hours, it is subject to the lumen maintenance standard.*
Health and Safety	Circuit and Overload Protection	The system must have an overcurrent and an overload protection. The system must include a resettable or replaceable by the user, or must automatically reset. If replaceable fuses are used for current protection, they must be labeled on the fixture and listed on the user manual, and, if fuses are replaceable by the user, at least one spare fuse must be included with the product. Included appliances are not required to meet this standard.
	AC-DC Charger Safety	Any included AC-DC charger passes approval from a recognized consumer electronics safety certification organization.*
	Wiring and Connector Safety	Wires, cables and connectors must be appropriately sized for the expected current and voltage.*
	Hazardous Substances Ban	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)

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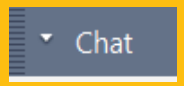
Tests included in IEC 62257-9-5

	Sampling	• Randomly selected from warehouse or marketplace
Component Tests	Photometrics	• Luminous flux (lumens—total output) • Standardized distribution (illuminance)
Component Tests	Battery & Charge Control	• Battery Capacity (Amp-hours, voltage) • Degree of protection (voltage cutoffs)
Component Tests	Solar Module	• Power output (Watts) • Current-voltage characteristics (I-V Curve)
System Tests	Full Battery Run Time	• Measured using standardized cycle (hours of operation)
System Tests	Solar Charge Run Time	• Modeled estimate (daily hours of operation after solar charging)
System Tests	Physical Ingress & Water Protection	• Incorporates enclosure (IP class) and system-level protection (coatings, etc.)
	Durability	• Drop test from one meter (pass/fail) • Switch and connector durability • Internal wiring and solder inspection • Lumen Maintenance • Battery durability storage test

Existing differences in test methods for SHS Kits

Open for questions



Component tests	Ports and Control Box	• Power capabilities and port efficiencies • Circuit protection	Additional tests, such as ports, miswiring , PV overvoltage and overcurrent protection included
	Non-lighting appliances	• Functionality and durability check • Power consumption • Battery tests as necessary	Balance rigor with cost of testing
System Tests	Full Battery Run Time	• Measure single FBRT with lighting appliances as input to Energy Service Calculations	Only required for one setting, rather than multiple
	Solar Charge Test	• Measure single solar charge test as input to Energy Service Calculations	Only required for one setting, rather than multiple
	Energy Service Calculations	• Modeled estimate (full battery and daily hours of operation in various configurations)	Mainly to support truth in advertising assessment
	Durability and Safety	• Lumen maintenance ≥90% • Additional safety requirements for Li-ion • PV cables rated for outdoor use (UV) • Declare wire and cable sizing	Included to address concerns about larger products with longer expected lifespans
	User Manual and Packaging	• Battery replacement statement • Installation, maintenance and safety • Report PV power on packaging	
	Warranty	• 2 years for system, battery and included light points, 1 year for appliances	

Methods in IEC 62257-9-5 were originally designed in 2008 - 2009 for simple lighting products with at most one port for mobile phone charging

Market now full of products with multiple light points, multiple ports and appliances, below the 10-15 W range

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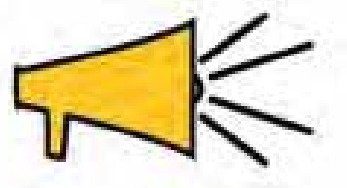
Proposal Circulated for Stakeholder Comment: Extend tests to pico-products with ports

Component tests	Ports and Control Box	• Power capabilities and port efficiencies • Circuit protection
	Non-lighting appliances	• Functionality and durability check • Power consumption • Battery tests as necessary
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)
	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	• 2 years for system, battery and included light points, 1 year for appliances

The ports tests, protection tests, and energy service calculations would apply to all products with ports, and the lumen maintenance threshold and Li-ion requirements would be aligned for all products.

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

Stakeholder Process



- Received and incorporated feedback on draft SHS Kit Test Methods and Quality Standards in September 2015
- Requested additional feedback on proposal to integrate SHS Kit methods into IEC 62257-9-5 in June 2016
- Compiled comments and provided responses in a Stakeholder Feedback Document released last week
- Plan to incorporate proposed changes:
  - Changes to the SHS kit test methods will be made in the existing Lighting Global Quality Assurance Protocols for SHS Kits and will be submitted for inclusion in IEC TS 62257-9-5
  - Changes that influence pico-solar product testing will not go into effect until the next edition of IEC TS 62257-9-5 is published, likely sometime in the 2nd half of 2017
- Plan to continue to engage with stakeholders regarding changes to the QA framework. Updates will be posted regularly on the Lighting Global website: www.lightingglobal.org/qa/stakeholder-engagement/

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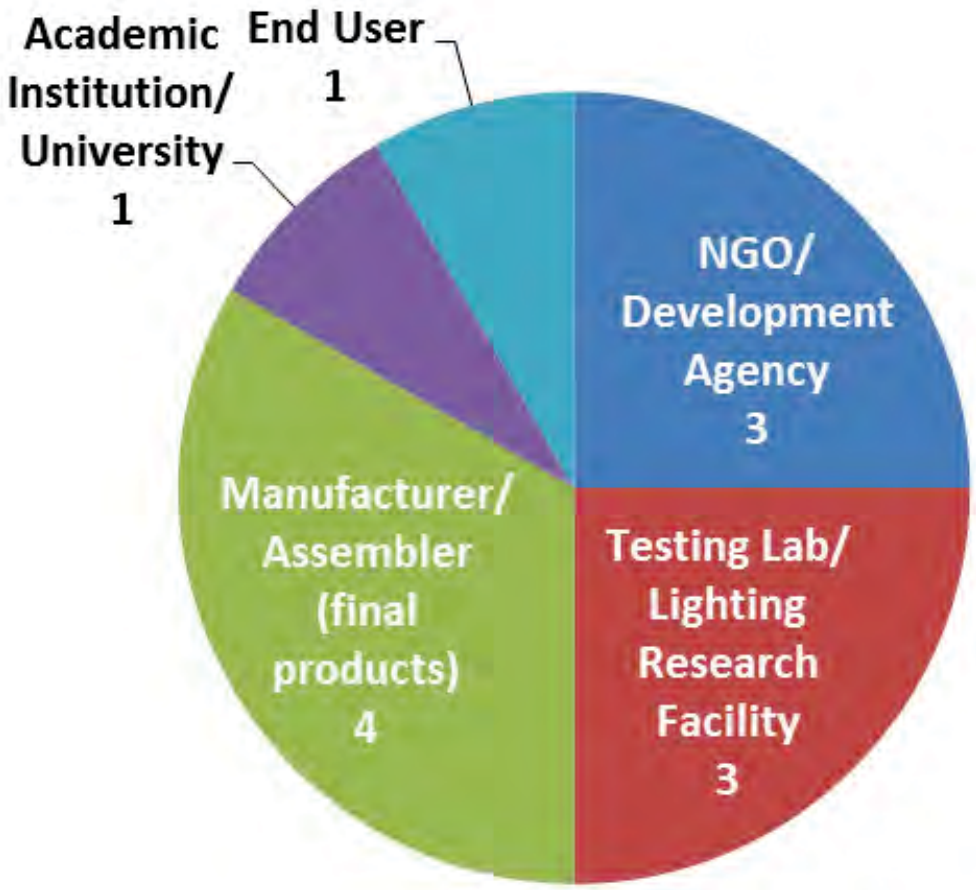
Thank you for your feedback!

Stakeholder Feedback

- We received responses from 12 different and diverse stakeholder organizations



- The feedback inspired over 30 distinct changes to the QA framework and the proposed plan

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Process to Incorporate Comments

When we receive comments, we:

- Read, summarize and, where needed, ask clarifying questions
- Discuss comments with QA team, including collaborators at the Fraunhofer Institute for Solar Energy Systems
- Discuss issues with IFC / World Bank program managers
- Conduct research where needed
- Follow up with individual stakeholders, GOGLA, and/or IEC technical committee members as needed
- Present responses in a feedback document
- Present and discuss key issues in this webinar
- Incorporate decisions in Quality Standards and Test Methods

Extra, Extra, Read all about it!

Comments on Integration of the Quality Assurance Frameworks for Pico-solar Products and SHS Kits

1 Comments regarding the plan to incorporate the SHS Kit test methods into IEC 62257-9-5:

Stakeholders across the sector agreed that incorporating the test methods for pico-products and SHS kits into a single document is appropriate. Respondents suggested that a single document would simplify government engagement regarding the regulation of SHS kits and that a single document would make the methods easier to reference during testing.

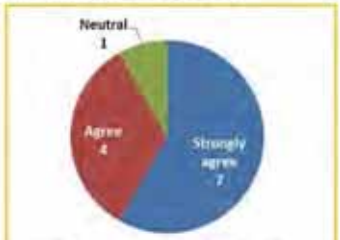

Figure 1. Do you agree with the plan to incorporate the SHS Kit test methods into IEC 62257-9-5? Of the twelve respondents, eleven agreed and one remained neutral.

Several respondents commented on the eligibility criteria; one noted the need to test systems [with variable components] instead of only fixed kits including fixed lamps and panels, while others noted that the upper bound for eligibility based on wattage is too low. One respondent suggested that the upper limit should be 500 Wp.

One respondent recommended that solar panels larger than 10 W be tested according to IEC 61215 and IEC 61730, and that factories which produce the modules should have the ISO 9001/14001/OHSAS 18001 to guarantee minimum production standards.

RESPONSE: Based on the positive feedback, we plan to move forward with incorporating the test methods for SHS kits into IEC 62257-9-5. In response to requests in this most recent stakeholder process and prior conversations, we plan to extend the scope of the test methods to cover SHS kits up to 350 Wp with a maximum nominal system voltage of 24 V. This limit will enable the inclusion of some common commercial modules, while minimizing risks due to high voltage or arcing. We do still plan to require that the products be sold as distinct kits; however, the energy service calculations make it easier for additional appliances to be included or removed from a kit. Additionally, we offer the "Family of Products" policy, which enables the verification of an entire product line following evaluation according to a custom test plan that covers at least half of the components in the line.

In an effort to minimize the cost and time required for testing, we have decided not to require that panels larger than 10 W meet the performance standards of IEC 61215. However, we acknowledge that these are rigorous tests for PV modules and therefore have included procedures to use results from IEC 61215 in lieu of, or as inputs to, the test methods included in IEC 62257-9-5. Currently, the methods in IEC 62257-9-5 do not include safety tests for PV modules, such as those described in IEC 61730, or requirements for factory certifications. The methods in IEC 62257-9-5 only assess performance, workmanship and durability. With the inclusion of larger modules, it may be appropriate for Lighting Global to require IEC 61730 and/or factory certifications. These requirements will not be added at this time, but may be discussed in future stakeholder outreach.

Responses to all comments are presented in the stakeholder feedback document on the Lighting Global stakeholder page:

www.lightingglobal.org/qa/stakeholder-engagement/

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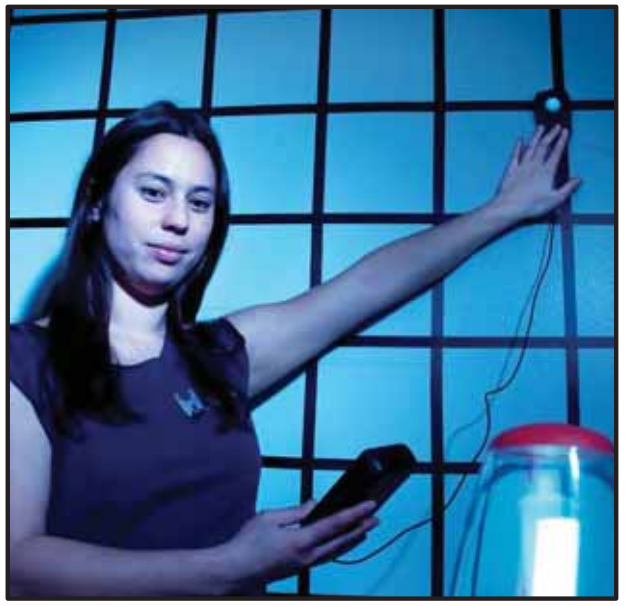
Major Changes

- **Increased peak power limit to 350 W**
- Require the Assessment of DC Ports, the Energy Service Calculations (ESC), and related tests for all products with ports and allow the **Energy Service Calculations** to be used in place of multiple solar run time tests.
- Require **the miswiring test, PV overvoltage, and output overload tests** for all products with ports, regardless of size. Additionally, included appliances would undergo an assessment of operating **voltage range compatibility**.
- **Set the dividing line between product classes at 10 W based on the PV panel rating.** This dividing line would apply to the required sample sizes and the additional Quality Standards for SHS kits, such as the wire and cable sizing declaration, the battery replacement statement, user manual requirements, and warranty terms.

Other Key Changes

- Increase the lumen maintenance threshold for all products from 85% to 90%.
- Stop measuring the “usable surface area with illumination greater than 50 lux.”
- Decrease the warranty requirement for SHS Kits to 2 years for the system and battery, and 1 year for all appliances. We plan to revisit the warranty requirements for larger systems in the future given that the same warranty requirements may not be appropriate for the entire 10 W - 350 W range.
- Amend the passing thresholds for the switch, gooseneck, connector, moving parts, and strain relief durability tests to no longer allow for any failures.



Implementation Timeline

Open for questions

Chat

Most changes will take effect after the revision of IEC 62257-9-5 is published, likely in the 2nd half of 2017

The following changes will take effect immediately:

- Increase limit to 350 W
- Decrease warranty requirement for SHS Kits from 3 years to 2 years
- Strengthen passing thresholds for durability tests

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Future consideration: Extend outdoor cable requirements to pico-products

- Our current policy: **The outdoor cable policy requires cables to be rated or tested for water and UV resistance. This policy will go into effect for SHS Kits February 28, 2017.**
- Several stakeholders suggested this policy should be extended to products <10 W as well
- Key questions:
  - Is this a significant issue for smaller products?
  - Are manufacturers able to meet this requirement?

The policy can be found here:
www.lightingglobal.org/resources/policies-and-guidelines/

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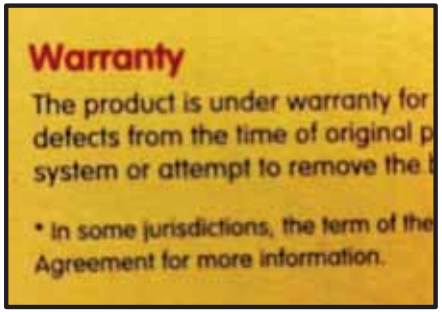
Future consideration: Determine warranty periods for large SHS Kits

- Our current policy: **All SHS Kits up to 350 W will have the same warranty policy: 2 years for the system, battery and included light points, 1 year for appliances.**



- In our stakeholder feedback and internal discussions, this warranty period seemed appropriate for the low end of SHS Kits, but may not be providing enough protection for larger products
- Key questions:
  - Is this too short of a warranty for a 350 W product?
  - Where should the dividing line be?

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Future consideration: Performance Reporting Requirements for SHS Kits

- Our current policy: **SHS Kits must report the PV power on their packaging.** (Pico-products must report light output and solar run time on highest setting. Note, in the future, we will likely only require products without appliances to report light output and solar run time.)

- Stakeholders emphasized the importance of providing consumer information to manage user expectations of kits
- Key questions:
  - Are there additional metrics that should be consistently reported across all SHS Kits (for example, Wh/day)?

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Technical question: Voltage limits for USB ports

- Our current policy: **USB ports must provide between 4.5 – 5.5 V** at all battery voltages (except the deep discharge protection voltage)
- These limits exceed the recommendations of the USB Battery Charging Specification (4.75-5.25 V), but they address concerns regarding Nokia phones and some popular smart phones charging at higher voltages. The change also allows output voltages to be pulled down under load to improve charging efficiency in phones that use linear charging.
- Key questions:
  - Are these limits acceptable even though they exceed the USB Battery Charging Specification?

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Future consideration: More durability tests for switches and connectors

- Our current policy: **All switches and connectors must be cycled 1000 times. (Those only used during installation may be cycled only 100 times).**
- Reports from the field and stakeholders suggest these cycle tests are not catching all issues
- Key questions:
  - We plan to develop additional methods to address these issues, does anyone have recommendations from their experience?
  - Are there other key failures in the field we need to investigate?

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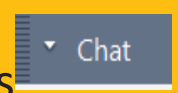
Any initial questions or comments?

Open for questions



- Outdoor cable requirements for pico-products
- Appropriate warranty for larger systems
- Durability tests for switches and connectors
- Performance reporting requirements for SHS kits
- Upper voltage limit for USB ports
- Other key topics?

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Immediate Next Steps

- Make immediate updates to Quality Standards (350 W, 2 year warranty for SHS Kits and durability passing thresholds)
- Finalize validation testing of energy service calculations on pico-products
- Submit revised test methods with proposed changes to IEC
  - Expect revised version to be published in the 2nd half of 2017
- Continue researching and collecting feedback on select topics
  - j.keane@gogla.org
  - qa@lightingglobal.org

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GOGLA
Global Off-Grid Lighting Association


Open for questions
Chat
Thank You For Participating!
Questions?

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Table 1. Summary of changes made in response to stakeholder feedback (1 of 2)

Change based on stakeholder feedback	Where will the change be made?	When will the change be made?
Increase the upper bound of the peak PV module power covered by the test methods to 350 W.	•Test methods: - Clause 1: Scope •SHS Kit Quality Standards	Immediately for SHS Kits, and later included in IEC 62257-9-5
Merge the methods for pico-products and SHS kits into a single document that covers off-grid energy products from less than 1 W up to 350 W.	•Throughout test methods	When revision of IEC 62257-9-5 is published, likely after May 2017
Consider requiring factory certifications or safety tests for large PV modules, such as those described in IEC 61730.	--	No change now, but will consider in future
Require the Assessment of DC Ports, the Energy Service Calculations (ESC), and related tests for all products with ports and allow the Energy Service Calculations to be used in place of multiple solar run time tests. [This was proposed by Lighting Global and largely supported by stakeholders.] As suggested by a stakeholder, we are conducting additional validation testing to ensure that the ESC adequately assess the solar run time for small products. We are in the process of making minor changes to the ESC methods to address issues identified during this validation testing. Once the issues are addressed, we intend to submit the revisions to the IEC.	•Test methods: - Clauses 6 – 9: QTM, MCM, ISM, AVM - Annex EE: Assessment of DC Ports - Annex FF: Appliance Tests - Annex GG: Energy Service Calculations •Standardized Specifications Sheet	When revision of IEC 62257-9-5 is published, likely after May 2017

Require the miswiring test, PV overvoltage, and output overload tests for all products with ports, regardless of size. Additionally, included appliances would undergo an assessment of operating voltage range compatibility. [This was proposed by Lighting Global and largely supported by stakeholders.]	•Test methods: - Clauses 6 – 9: QTM, MCM, ISM, AVM - Annex DD: Protection Tests	When revision of IEC 62257-9-5 is published, likely after May 2017
Stop measuring the "usable surface area with illumination greater than 50 lux." The test could still be conducted if necessary to evaluate advertising claims, but the only required element would be to determine the "full-width half-max" angle which is used to classify a light as being narrow, wide or omni-directional. [This was proposed by Lighting Global and largely supported by stakeholders.]	•Test methods: - Clauses 6 – 9: QTM, MCM, ISM, AVM - Annex T: Light Distribution •Standardized Specifications Sheet	When revision of IEC 62257-9-5 is published, likely after May 2017
Continue to require small (pico) products to be tested with a sample size of six and larger (SHS kits) products to be tested with a sample size of four. [This was proposed by Lighting Global and largely supported by stakeholders.]	•Quality Standards •Test methods: - Clauses 6 – 9: QTM, MCM, ISM, AVM - Annex E: Product Sampling	This is the current practice, though the dividing line will change when revision of IEC 62257-9-5 is published
Set the dividing line between product classes at 10 W based on the PV panel rating. This dividing line would apply to the required sample sizes and the additional Quality Standards for SHS kits, such as the wire and cable sizing declaration, the battery replacement statement, user manual requirements, and warranty terms.	•Quality Standards •Test methods: - Clauses 6 – 9: QTM, MCM, ISM, AVM - Annex E: Product Sampling	When revision of IEC 62257-9-5 is published, likely after May 2017

Table 1. Summary of changes made in response to stakeholder feedback (2 of 2)

Change based on stakeholder feedback	Where will the change be made?	When will the change be made?
Extend the Quality Standards for Ports, PV Overvoltage Protection, Miswiring Protection, Circuit and Overload Protection, and additional Battery Protection for Lithium Batteries to pico-products with ports. [This was proposed by Lighting Global and largely supported by stakeholders.]	•Quality Standards •Test methods: - Annex D: Manufacturer self-reported information - Annex DD: Protection Tests	When revision of IEC 62257-9-5 is published, likely after May 2017
Clarify the overvoltage protection limits for individual cells of lithium batteries. Clarifications include: Manufactures must declare that the battery has overcharge protection for individual cells or sets of parallel-connected cells. The voltage limit for the individual cells can be higher than the per-cell voltage limit for the entire pack; as always, we will typically accept limits specified by the battery manufacturer in lieu of our recommended values.	•Quality Standards	Immediately for SHS Kits; change will also apply to pico-products after revision of IEC 62257-9-5 is published
Consider extending UV protection requirements for PV (and other outdoor) cables to pico-products.	--	No change now, but will consider in future. The Outdoor Cable Policy will be enforced for SHS kits in early 2017.

Table 1. Summary of changes made in response to stakeholder feedback (2 of 2)

Change based on stakeholder feedback	Where will the change be made?	When will the change be made?
Extend the Quality Standards for Ports, PV Overvoltage Protection, Miswiring Protection, Circuit and Overload Protection, and additional Battery Protection for Lithium Batteries to pico-products with ports. [This was proposed by Lighting Global and largely supported by stakeholders.]	•Quality Standards •Test methods: - Annex D: Manufacturer self-reported information - Annex DD: Protection Tests	When revision of IEC 62257-9-5 is published, likely after May 2017
Clarify the overvoltage protection limits for individual cells of lithium batteries. Clarifications include: Manufactures must declare that the battery has overcharge protection for individual cells or sets of parallel-connected cells. The voltage limit for the individual cells can be higher than the per-cell voltage limit for the entire pack; as always, we will typically accept limits specified by the battery manufacturer in lieu of our recommended values.	•Quality Standards	Immediately for SHS Kits; change will also apply to pico-products after revision of IEC 62257-9-5 is published
Consider extending UV protection requirements for PV (and other outdoor) cables to pico-products.	--	No change now, but will consider in future. The Outdoor Cable Policy will be enforced for SHS kits in early 2017.
Increase the lumen maintenance threshold for all products from 85% to 90%. [This was proposed by Lighting Global and largely supported by stakeholders.]	•Quality Standards	When revision of IEC 62257-9-5 is published, likely after May 2017

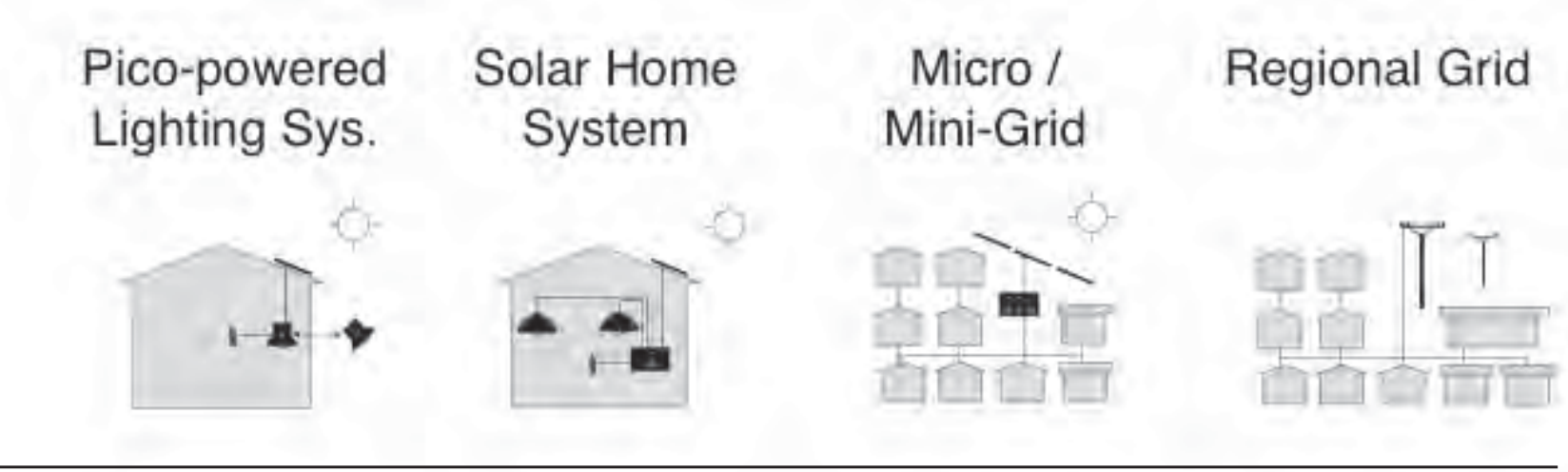
Decrease the warranty requirement for SHS Kits to 2 years for the system and battery, and 1 year for all appliances. Plan to revisit the warranty requirements for larger systems in the future given that the same warranty requirements may not be appropriate for the entire 10 W - 350 W range.	•Quality Standards	Immediately for SHS Kits; change will also apply to all products ≥ 10 W after revision of IEC 62257-9-5 is published
Clarify that USB charging adapters are only required to be covered by a 1-year warranty.	•Quality Standards	Immediately for SHS kits
Amend the passing thresholds for the switch, gooseneck, connector, moving parts, and strain relief durability tests to no longer allow for any failures. [This was proposed by Lighting Global and largely supported by stakeholders.]	•Quality Standards	Immediately for all products
Investigate and develop test methods for assessing connector strain relief, evaluate connectors that break when pulled sideways, and improve the switch test so that it more realistically evaluates switches in the field.	--	No change now, but will consider in future
Explore the issue of voltage collapse to determine if a standard or additional test is warranted.	--	No change now, but will consider in future
Continue to develop test procedures and policy for assessing mobile device charging claims.	--	No change now, but will consider in future
Continue to determine ways to minimize difficulties associated with sample selection while still ensuring the test samples are representative of the products in the market.	--	No change now, but will consider in future
Develop an Eco Design Note that provides a list of recommendations for the design and manufacture of repairable products.	--	No change now, but will consider in future; Developing an Eco Design Note on topic

Table 2. Changes made to Test Methods and Quality Standards for SHS Kits based on prior stakeholder feedback

Change based on stakeholder feedback	Where was the change made?
Improve the introductory text to clarify what types of SHS Kits are covered by the Quality Standards.	•Introduction in Quality Standards
Change the wording of the eligibility criteria to: "All components required to provide basic energy services are **sold/installed** as a kit."	•Eligibility Criteria in Quality Standards •Test methods: - Clause 1: Scope
Decrease the allowable nominal system voltage to 24VDC.	•Eligibility Criteria in Quality Standards •Test methods: - Clause 1: Scope
Remove battery replaceability requirement and instead require that the manual clearly state either: (i) specifications for replacement batteries and directions for replacing them, (ii) how someone can get their battery replaced at service centers, or (iii) that the batteries are not replaceable. Further, the packaging must include a short statement regarding whether the battery is replaceable. [Based on feedback from many manufacturers, we do not feel comfortable requiring that batteries be replaceable. Some PAYG companies were concerned about this requirement because they seal the battery compartment and all electronic components to prevent tampering. To address this while still responding to end-user interest to have systems that are repairable (this has been a common sentiment expressed by end-users in multiple focus groups and in other venues), we believe that it is important to provide consumers with clear information about whether batteries are replaceable and, if so, how to get them replaced.]	•Quality Standards

Adjust the USB requirements to a max of 5.5 V and allow for voltages to drop to 4.5 V under load [These limits exceed the recommendations of the USB Battery Charging Specification (4.75-5.25 V), but they address concerns regarding Nokia phones charging at higher voltages. The change also allows output voltages to be pulled down under load to improve charging efficiency in phones that use linear charging.]	•Quality Standards
Change 12 V port requirement to: "All ports advertised or reasonably expected to provide 12 V must maintain a voltage between 10.5 – 15 V during normal operation. In cases where special features reduce the voltage below 10.5 V, the feature must be clearly described in the user manual and the port must be marked to indicate that the port is not a standard 12 V port (removable stickers are acceptable)."	•Quality Standards
Add that the battery warranty requirement assumes that batteries will maintain 80% capacity at 2 years. [A respondent noted that the battery warranty did not cover capacity loss, which is the primary function of the battery.]	•Quality Standards
Provide more guidance in the Quality Standards as to which switches/connectors may be cycled only 100 times.	•Quality Standards
Provide more guidance on the requirements for PV and other outdoor cables.	•Quality Standards •Lighting Global Outdoor Cable Policy

Electricity Access Continuum



Scale (~Watts)	1 – 10's	10's – 100's	100's – 1000's	10^6 - 10^{11}
Topology	DC Only	DC – some AC	Mostly AC	Nearly all AC

Loads

Lighting and Phone Charging

Television and Fans

Range of **Appliances**

Industrial Power

Lighting Global has covered pico-products since 2008

Lighting Global has expanded to cover plug-and-play solar home system kits, now up to 350 Wp

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