Lighting Global Quality Assurance

PRODUCT FAMILIES

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NON-PLUG-AND-PLAY CONNECTORS

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QA FRAMEWORK FOR COMPONENT-BASED SHS
4 DECEMBER 2018

WEBINAR GUIDANCE

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Chris Carlsen
Lighting Global Quality Assurance Team
ccarlsen@clasp.ngo

Webinar Goals and Topics

GOALS

- Strengthen collaboration
- Know where to go for resources and support
- Understand relevance of topics in context of WBG programs
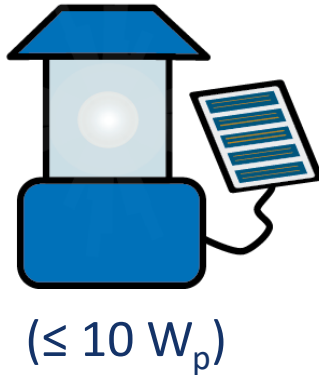
AGENDA

- Introduction & background
- Quality verification of product families
- New connector types allowed for SHS kits
- QA framework for component-based SHS
- Q&A / Discussion

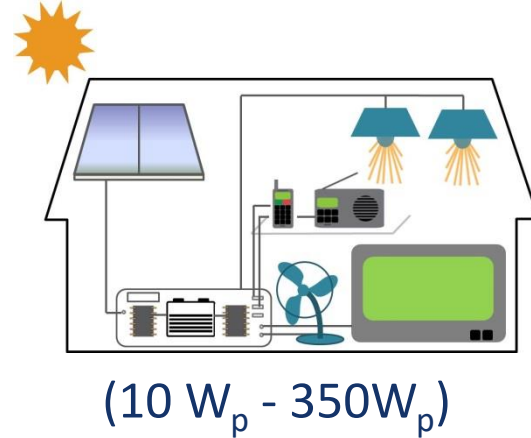# Lighting Global Quality Assurance Primary Program Elements
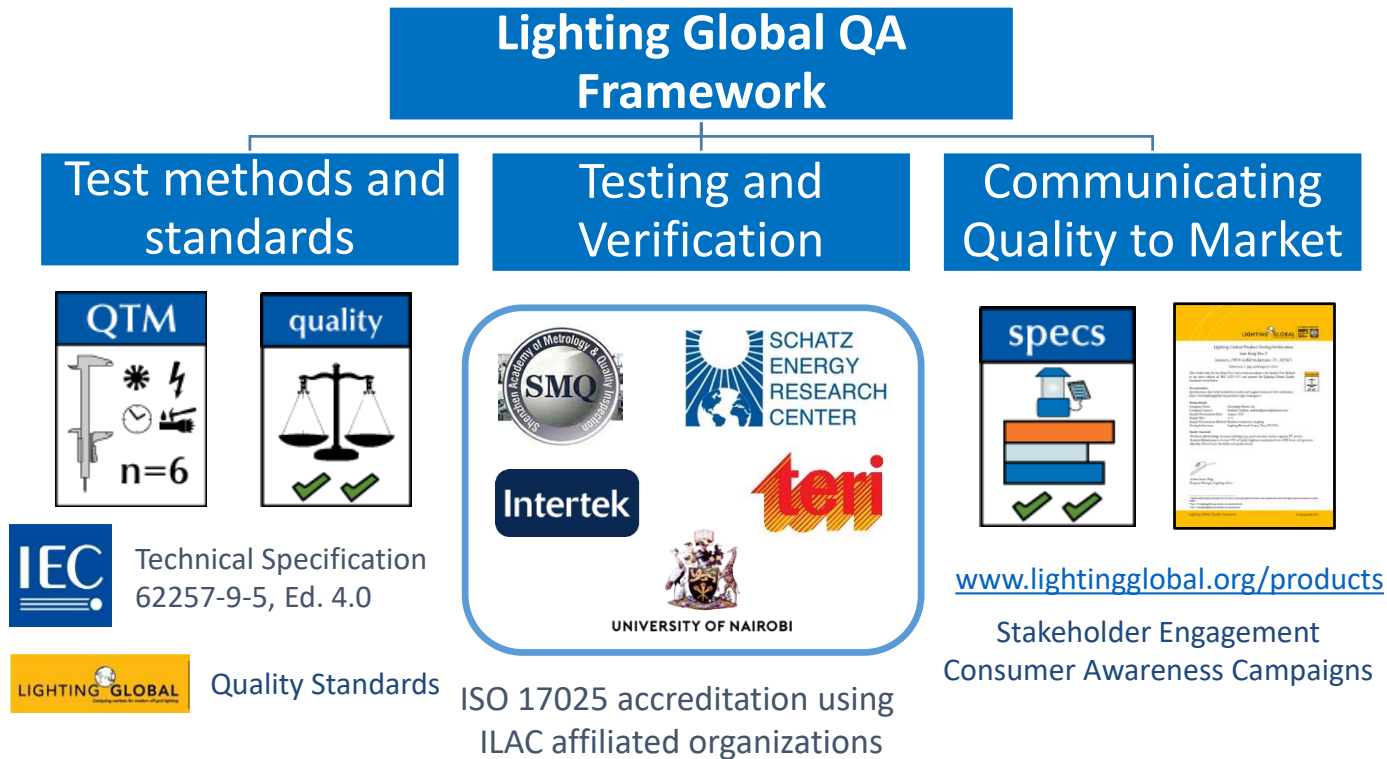
Lighting Global Quality Standards

Pico-PV Quality Standards

($\leq$ 10 W$_p$)

SHS Kit Quality Standards


(10 W$_p$ - 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 mid-2019.

Quality-verified products:
A wide range of sizes, costs and services

	Category by Approx. Power	Category by Services	Corresponding Energy Access Tier (SE4All Multi-tier framework)
Pico PV	< 1.5 Wp	Single Task Light only	Provide a person with basic lighting access Contribute to meeting **Tier 1** electricity access for a person & household
	1.5 – 3 Wp	Single Area Lighting & Mobile Phone Charging	More powerful systems provide **Tier 1** electricity access to at least one person Contributes to meeting a household's **Tier 1** access
	3 – 10 Wp	Solar Multiple Lighting System & Mobile Phone Charging	Provides **Tier 1** electricity access to more than one person, up to a household
SHS	11 – 20 Wp	SHS - Solar Home System, Entry Level (3-4 lights, mobile charging, radio, fan etc)	Provides **Tier 1** electricity access to a household
	21 – 49 Wp	SHS, Basic capacity (as above, plus power for TV & extended capacity)	More powerful systems can provide **Tier 2** electricity access to a household when coupled with high-efficiency appliances
	50 – 100+ Wp	SHS, Medium capacity (as above, plus extended capacities)	Systems provide **Tier 2** electricity access to a household

It all starts with quality...
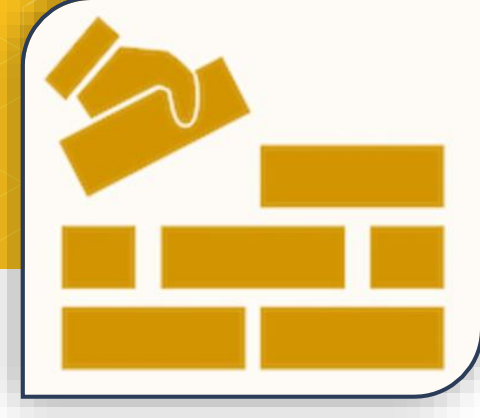
Product quality assurance is the foundation for successful off-grid solar interventions.

By referencing Lighting Global's QA framework, WBG can:

- protect consumers

- support sustainable market development & growth

- encourage product quality and innovation

- reduce programmatic risks

- streamline program development and implementation

- harmonize approach with governments and other programs

Working Together :
How to strengthen our collaboration

WBG

- Involve Lighting Global QA in program development and implementation

- Integrate Lighting Global QA framework into programs

- Take advantage of available resources (internal & external)

- Support Lighting Global QA through local capacity & knowledge

- Keep Lighting Global QA informed about markets and policies

- Support market intelligence and surveillance activities

Lighting Global QA

- Identify products that meet the Quality Standards

- Provide technical guidance

- Support standards development and implementation

- Maintain & develop resources useful for WBG and partners

- Help WBG build capacity to engage with stakeholders on technical and QA topics

- Keep WBG informed about QA activities, policies and products

QA FOR PRODUCT FAMILIES

PICO-PV AND SHS KITS

- The terms "Kit", "System" & "Product" are often used interchangeably

- A kit must include *at least* a battery, solar module, and light source.

- Each kit that is tested and meets the Lighting Global Standards receives:
    - Test results report and cover letter
    - Standard Specifications Sheet (SSS) and Verification Letter (VL) posted to the LG website along with its listing.

Sunshine - Kit 1

Results based on test procedures detailed in IEC 62257-9-5, ed. 2.0

Verify Online: www.lightingglobal.com/products/niwa-office
Valid Until: February 28, 2019
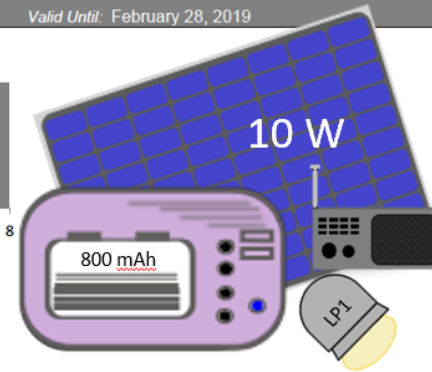
Solar Run Time

Lumens
- 200 High
- 110 Eco

10 W
800 mAh
LP1
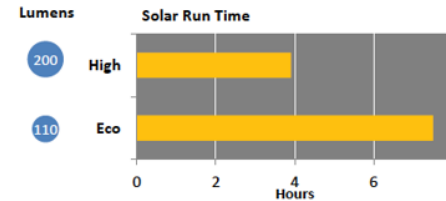
✓ Meets Lighting Global Minimum Quality Standards

📱 Mobile Charging

4 Light Points

Warranty Information
2 year warranty

Performance Details

Performance Measure	Brightness Setting***	
	High	Eco
Full battery run time* (hours)	4.1	7.6
Run time per day of solar charging* (hours)	3.9	7.5
Total light output (lumens)	200	110
Total lighting service (lumen-hours / solar-day)	780	830

* Run time estimates do not account for mobile phone charging or other auxiliary loads; the run time is defined as the time until the output is 70% of the initial, stabilized output.
** Total area with illumination > 50 lux is determined by the maximum area with adequate illumination at a 0.75 m distance and at the distance from which the product would normally provide task lighting service.
*** Additional brightness settings (not tested): Eco Plus

Lighting Details

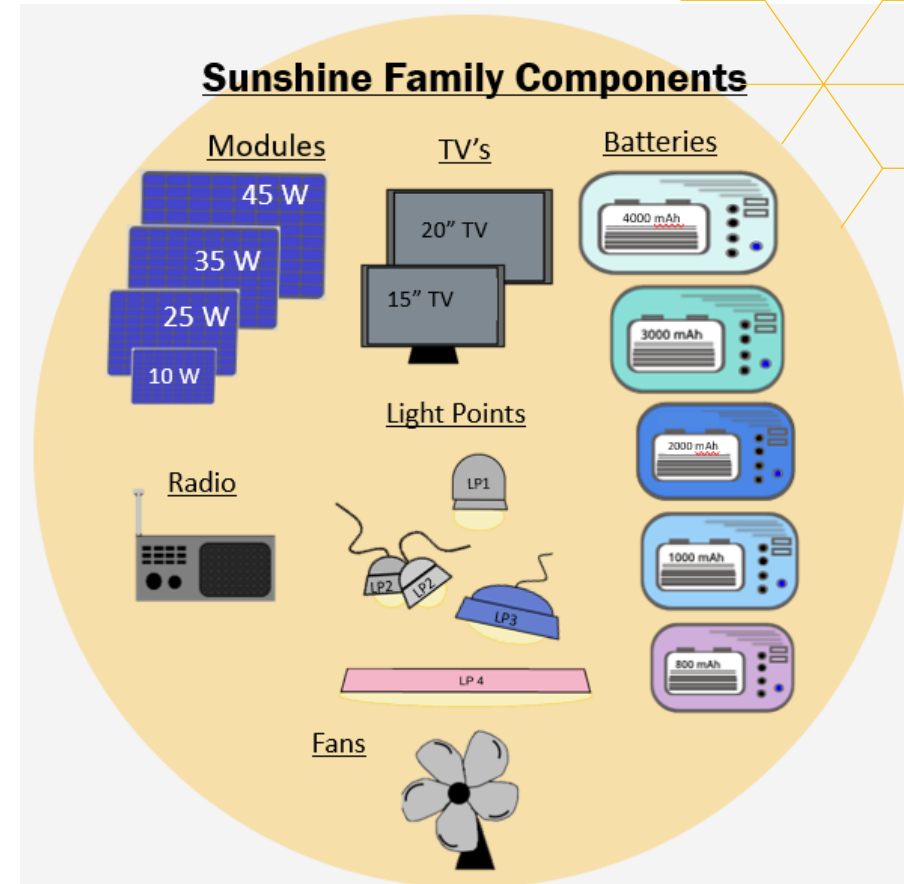|	
Lamp type	LED
Description of light points	Two arrays of two 50 lumen LED light points. Each array has one three-position dimming switch.
Colour characteristics	CRI 87 CCT "Daylight" (>5000 K)
Distribution type	Wide
Lumen maintenance	101% of the original output remains after 2,000 hours run time

KIT VARIATIONS

- The same basic kit may have a variety of configurations that are comprised of interchangeable components.

- <u>Similar Product Testing</u> of each variation would be required for each kit to receive a Standardized Specification Sheet and individual listings on the website.

- Similar product testing performed for several variations can be time consuming and costly to manufacturers.
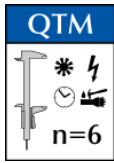
Kit 1

10 W

800 mAh

LP1

Kit 2

25 W

2000 mAh

LP 4

Kit 3

45 W

TV

4000 mAh

LP3
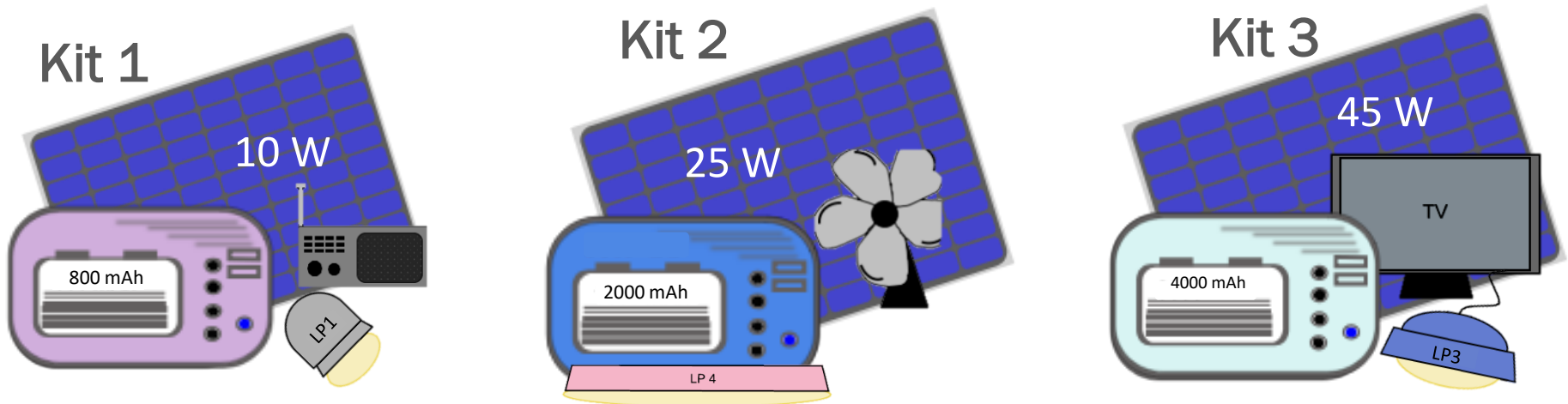
PRODUCT FAMILIES

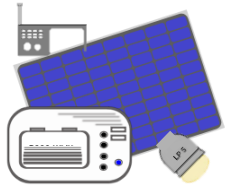Sets of interchangeable components sold on a component-level basis.

- Some manufacturers allow customers to "mix and match" components to create a kit that meets the users' energy and financial needs.

- Lighting Global QA works with manufacturers to develop custom test plans that are used to quality verify the entire family.

- Similar to individual product testing, the following are produced:
  - Test Results Report and Cover Letter (2)
  - Website Listing and VL (2)
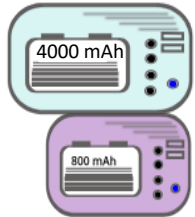 - SSS and Specifications **Book** (Spec book)

Sunshine Family Components

Modules: 45 W, 35 W, 25 W, 10 W

TV's: 20" TV, 15" TV

Batteries: 4000 mAh, 3000 mAh, 2000 mAh, 1000 mAh, 800 mAh

Light Points: LP1, LP2, LP2, LP3, LP 4

Radio

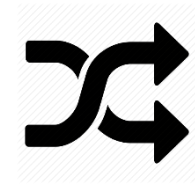Fans

HOW FAMILIES ARE QUALITY VERIFIED

- Quality Test Method (QTM) for at least 1 system or "kit".

- Test at least half of each component subgroup.

- Test the smallest and largest of each component subgroup.
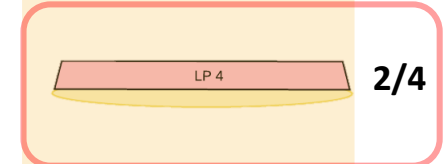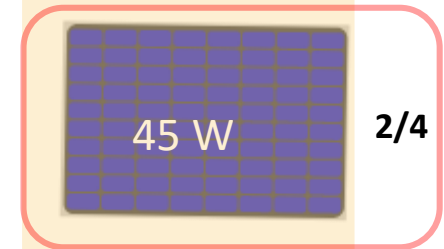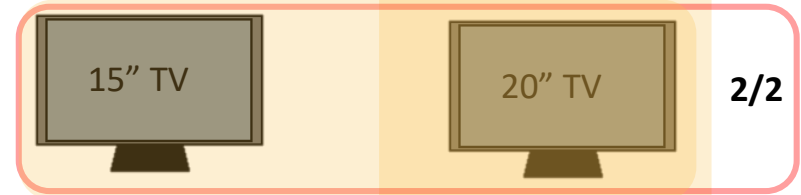
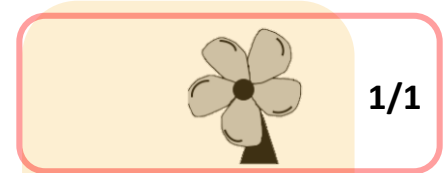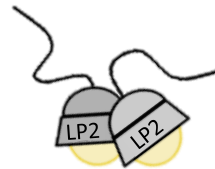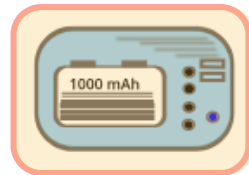- All component and kit samples randomly selected

- Lighting Global has discretion to select which kits must be tested and may require greater than 1 system be tested.

Testing of all components and configurations is not required

EXAMPLE: Rather that system- and component-level testing of all 17 components,

- Full QTM test for Kit 1

- 7 component-level tests

Kit 1

10 W

LP1

800 mAh

1000 mAh

25 W

35 W

45 W

LP2 LP2

LP3

LP 4

2000 mAh

3000 mAh

4000 mAh

15" TV

20" TV

1/1

2/2

2/4

2/4

3/5
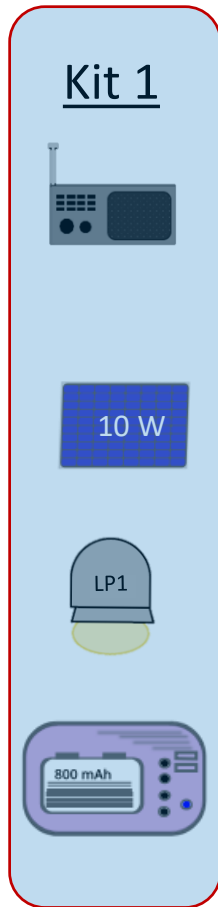
Large

Small

Component Size

FAMILY BENEFITS

- Mix-and-match kits allow consumers to tailor a system to their budget and needs.

- Product families allow kits to be more easily and affordably scaled.

- Testing and quality verification is less costly to manufacturers, which is passed on to consumers.

FROM OUR EXAMPLE :

Similar Products Testing	System Level Tests	Component Level Tests	Total Cost
	5	0	~ $42,000

Family Policy	System Level Tests	Component Level Tests	Total Cost
	1	7	~ $22,000

* Prices will vary with products and labs – the values presented are simplified example estimates*

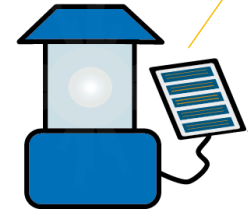| Estimated Savings |
|---|
| ~ $20,000 |

NON-PLUG-AND-PLAY CONNECTORS

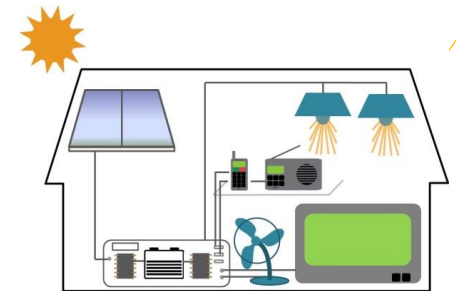# HISTORY OF LIGHTING GLOBAL QUALITY STANDARDS

2010 — First version of Quality Standards and testing of off-grid lighting products
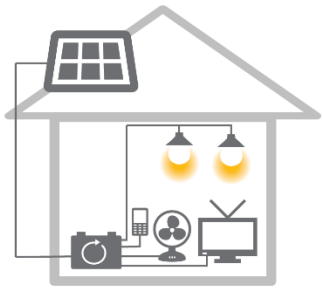
2015 — First version of Quality Standards for <u>plug-and-play</u> SHS kits

2018 —
- 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

Solar Home System (SHS) Typologies
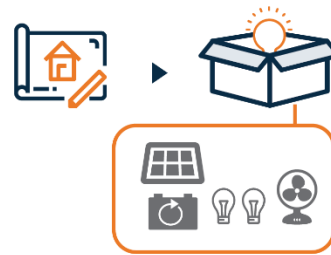

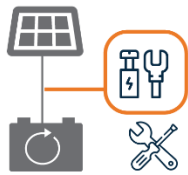|	ELECTRICAL CONNECTIONS	DESIGN PROCESS	INSTALLATION & OPERATION
Plug-and-Play SHS Kit System size limits: 10-350 Wp	All connections made without the use of tools	System is pre-designed and sold as a complete package	Safely installed and operated by a typical consumer without a technician or electrician[‡][1] Instructions provided to allow typical consumers to safely operate
Non-Plug-and-Play SHS Kit System size limits: 10-350 Wp	Permanently installed connections made with tools[†] / Consumer-made connections without the use of tools	System is pre-designed and sold as a complete package *Only DC systems are eligible for Lighting Global program support*	Lighting Global recommends that these kits be installed by qualified technicians or electricians[‡][1][2] Instructions provided to allow a typical consumer to safely operate List of tools and instructions for connections included
Custom Component-Based SHS* System size limits: none	No restrictions — could be any combination of electrical connection types	System is custom-designed for consumers *System can be DC, AC, or combination*	Qualified technicians or electricians install the system and provide guidance on safe usage

* Custom component-based systems are currently not eligible to participate in the Lighting Global program.
† To be eligible to participate in the Lighting Global program, all connections must meet the criteria described in the "Electrical Connection Requirements" section of the Lighting Global Quality Standards.
‡ [1] Companies may choose to exclusively use trained technicians to install their kits. In these cases, the installation instructions may be provided to the technician instead of in the user manual, but are still reviewed by Lighting Global.
[2] Lighting Global verification assesses the performance of the system but cannot assess proper installation of the product.

Connector Examples

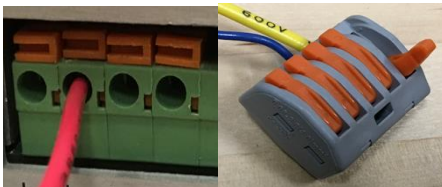## ACCEPTABLE

Select screw terminals
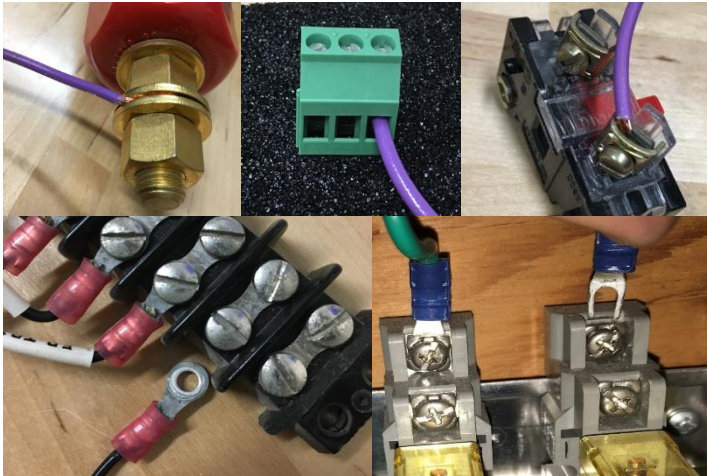
Quick disconnect

Binding posts

Lever-actuated

UNACCEPTABLE

Alligator clips

In-the-field connections

Screw terminals with wrapped wire
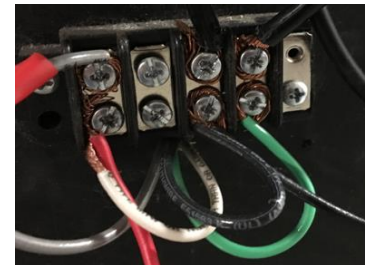
Why is adding new connector types important?

- **New opportunities**
  - Attracting new companies
  - Supporting different business models
  - Encouraging diverse and innovative products
  - Programs can reference a single QA framework for a wide range of product types and sizes

- **New challenges**
  - Understanding applications & limitations
  - Engaging with suppliers and manufacturers
  - Getting buy-in from partner organizations

QA FRAMEWORK FOR COMPONENT-BASED SHS

Solar Home System (SHS) Typologies

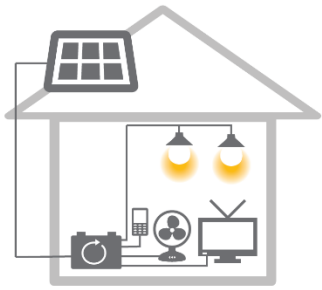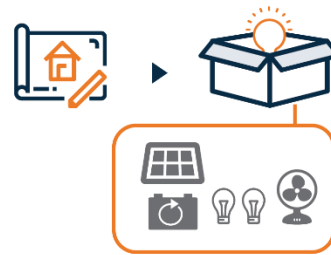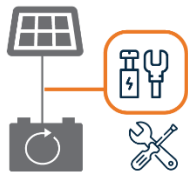|	ELECTRICAL CONNECTIONS	DESIGN PROCESS	INSTALLATION & OPERATION
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Why do we need *another* QA framework?

- In the absence of a QA framework, poor quality components, inferior system design, and incorrect installation can lead to early system failure.

- Custom-designed component-based systems don't fit into the existing QA framework for SHS kits.

- National governments need standards and compliance programs for rural electrification efforts.

- Development organizations need quality requirements for energy access programs.

- Lack of a harmonized QA framework creates market and regulatory inconsistencies that hinder sustainable growth of the sector.
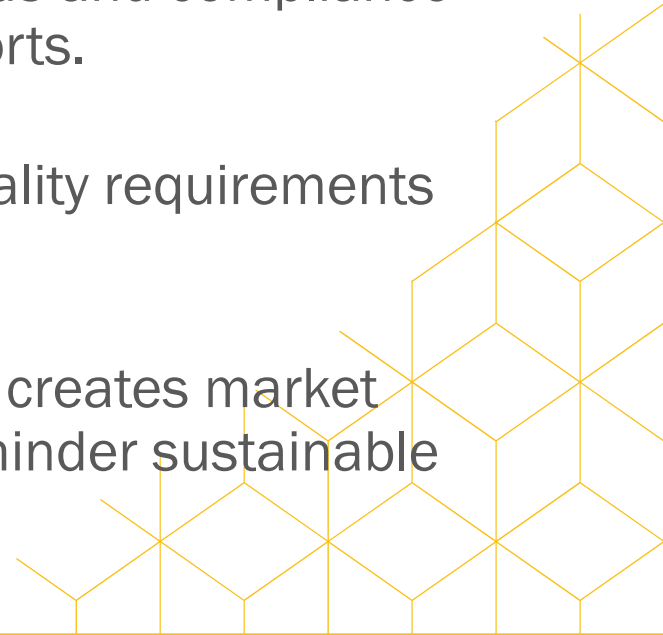
QA for Component-based SHS: KEY ELEMENTS

WHAT EXISTS

- Component test methods
- Component standards
- System design & installation guidelines
- Installer certification schemes (in some countries)

WHAT'S MISSING

- Institutional capacity for QA framework implementation
- Routine use of existing component test methods & standards for some components
- Harmonization / International recognition
  - Design guidelines
  - Installation requirements
- System-level test methods
- Requirements for reporting system performance, truth-in-advertising & warranty
- Framework for validating installation & service delivery
- After-sales service requirements   (not necessarily part of QA framework)

QA for Component-based SHS : OPPORTUNITIES
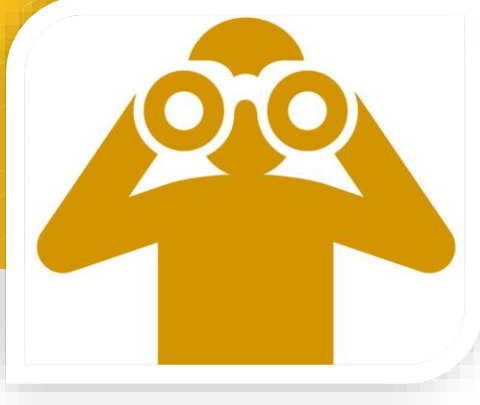
- **Appetite** – Programs and governments want QA framework

- **Building on existing elements**
    - Component test methods & standards
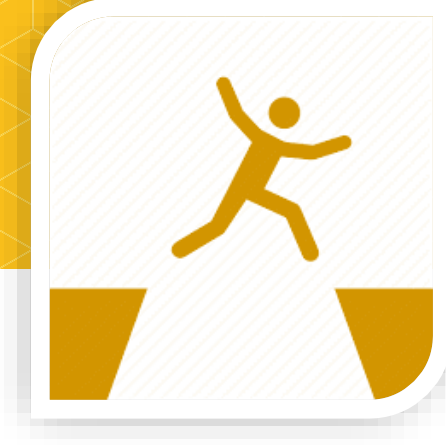   - Lighting Global QA framework

- **WB programs**
    - Efforts already underway
    - Facilitates harmonized approach

- **Future home** – Possibility of adoption by IEC
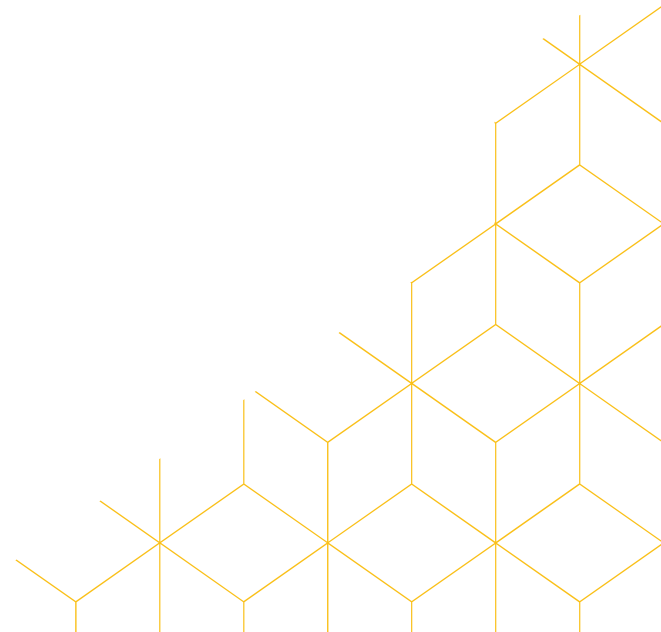
QA for Component-based SHS : CHALLENGES

- **Timing** – Programs want QA framework now

- **Transferability** – Building a QA framework that's broadly applicable

- **Alignment** – Encouraging unified approach among programs & countries

- **Local capacity** – Currently relying heavily on a few experts

- **Balance** – Finding balance between rigor, cost and ease of implementation

- **Sustainability** – Transitioning from program-led effort to institutionalized national or regional framework

- **Technology** – Developing QA framework that can adapt to innovation; e.g. remote monitoring, energy storage, grid integration

- **Market dynamics** – Meeting needs of the market while considering likely trajectory over next 5-10 years

QA for Component-based SHS : WORK UNDERWAY

VANUATU

WB project providing subsidies to large range of systems:
pico-PV, SHS kits, component-based SHS, micro-grids (up to 5250 Wp)

- Vendors apply for specific system configurations to be approved for subsidy. Compliant products registered in "Product Catalogue"

- Program-specific design principles document that must be used by vendors

- Two component-based SHS types allowed:
  - Pre-assembled SHS installed by beneficiaries
  - SHS installed by vendor

- Technical requirements for component-bases SHS
  - Components tested and certified against international standards at ISO 17025 accredited labs
  - Specify daily energy output
  - Specify days of autonomy
  - System electrical safety
  - User manual
  - Warranty

- Vendor required to have certified system designer(s), solar installer(s), electrical technician(s)

QA for Component-based SHS : WORK UNDERWAY

UGANDA

Project: Energy for Rural Transformation – third phase (ERT-3)

Supporting the Government of Uganda to increase access to electricity in the country's rural areas

QA Component : Develop national QA framework for pico-PV, SHS kits & component-based SHS

QA for component-based SHS

- Implemented in collaboration with REA, UNBS and UECCC
- Eligible companies selling compliant systems will have access to credit facility managed by UECCC
- Will build upon approach and lessons learned in Vanuatu
- Comprised of interim QA framework for credit facility, and development of long-term framework

Expected Timeline

Underway – Hiring consultant to lead QA framework development

Early-mid 2019 – Preliminary field work and inception report

Late-2019 – Begin implementation of interim QA framework

QA for Component-based SHS : WORK UNDERWAY

ROGEP

+4

WB project to increase electricity access using modern off-grid technology through a <u>harmonized regional approach</u>

19 West & Central African countries: ECOWAS, Cameroon, Chad, CAR & Mauritania

Component 3: Solar Installations at Public Facilities

Develop new approach for procurement, installation and long-term maintenance of off-grid solar systems for health clinics, schools, public offices and water pumps

1. Develop draft quality assurance and service delivery framework
2. Pilot installations in Niger & Nigeria
3. Revise framework following input from stakeholders and experience from pilot installations
4. Utilization of framework in other projects across Africa & beyond

Component 3 Expected Timeline

Early 2019 – Draft QA framework

Late 2019 – Installation of 30 pilot systems; follow-up visits & data monitoring

2020 – Revision of QA framework for use in future installations in sub-Saharan Africa

Q&A

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DISCUSSION