Standards in Support of Improved Access to Modern Energy Services in Off-Grid Areas

Arne Jacobson
IEC Technical Committee 82 Member
Technical Lead, Lighting Global Quality Assurance Director, Schatz Energy Research Center Humboldt State University

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What does TC 82 do?

- It is charged by IEC to write standards related to photovoltaics
- It does this through six Working Groups:
  - WG 1 - Glossary; WG 2 - Modules; WG 3 - Systems; WG 6 - Balance of Systems; and WG 7 - Concentrator PV
  - JWG 1 - Decentralized Rural Electrification (DRE) projects

George Kelly is the Secretary of TC82
What does JWG 1 do?

- JWG 1 is led by Sivaganthan Jayasingam (Siva), of Malaysia, and Leon Andre Drotsché, of South Africa.

- It has written, over the years, some 20 Technical Specifications in the 62257 series: RECOMMENDATIONS FOR SMALL RENEWABLE ENERGY AND HYBRID SYSTEMS FOR RURAL ELECTRIFICATION. Titles and previews of each are available on the IEC Webstore.

- Discounted pricing is available for documents in the 62257 series (>50% discounts)
Quality Assurance for Energy Access: Key Propositions

- New markets for off-grid energy systems are emerging around the world.
- Quality assured renewable energy products for off-grid applications provide an opportunity to positively affect the lives of hundreds of millions of people globally.
- Programs that effectively ensure the quality of off-grid energy products are needed to realize these benefits.
- Standardized test methods and quality metrics are key elements of successful quality assurance efforts, and the IEC is well positioned to play a leading role through its 62257 series.
- Globally harmonized quality assurance systems such as the World Bank Group’s Lighting Global program, which supports the Lighting Africa and Lighting Asia initiatives, can draw from IEC standards and test methods.
Potential Demand for Off-Grid Energy Systems is Large

- ~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

![Bar chart showing the number of people without access to electricity by region in 2009](chart.png)
Fuel based lighting is baseline technology. It is expensive, unhealthy, and inefficient.

Fuel Based Lighting is a $20+ billion per year industry (UNEP, 2013)
Pico power systems, including LED off-grid lights, are an emerging solution

- LED lights are emerging as a cost-effective substitute for kerosene lighting
- Many products also charge mobile phones
- Variety of system types, prices, and quality levels now available
- Not a substitute for grid power
Market based sales of solar LED lighting systems are growing rapidly.

- > 1 million quality assured solar LED lights sold in Africa in first 6 months of 2013 and > 2.7M since 2009; sales numbers in Asia also large; annual sales growth >100%

- Market for low quality, low cost LED products (mostly AC rechargeable and dry cell powered) is >50 times larger!

- Quality assurance and consumer protection are major concerns; many buyers have difficulty making informed purchasing decisions.
Focus groups and market survey data across multiple countries indicate that rural Africans and Asians are very interested in affordable, good quality lighting systems.

Potential retail customers are very price sensitive.

Data show a strong preference for lights at retail prices < US$ 25.

Quality assurance strategies must involve an appropriate balance between product quality and affordability.

Photos by Evan Mills (bottom) and Jennifer Tracy (top)
Quality Assurance Program Principles

- **Affordability**: Seek an appropriate balance between product quality, performance, and cost.
- **Diversity and Innovation**: Leave space 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.
- 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
- Utilizes IEC standards framework and test methods (TS 62257-9-5)

- Lighting Global Quality Assurance (LG-QA) supports the Lighting Africa & Lighting Asia programs.
- IEC/TS 62257-9-5 is a foundational document for Lighting Global QA

**Lighting Global QA Program**

- **Test methods and standards**
  - **TS 62257-9-5:** test methods & QA metrics
  - Pass thresholds for minimum quality standards and targets

- **Testing and Verification**
  - Sample collection
  - Lab testing to verify quality/performance
  - Market check testing

- **Communicating Quality to Market**
  - Standardized spec sheets
  - Consumer awareness (some countries)
  - Quality seal (in future)
Products are evaluated through rigorous testing. Those that pass may receive support. Products that meet the minimum quality standards receive official verification and may be eligible for further program support.

Market check testing is used to ensure that products continue to meet quality requirements over time.
Technical Specification 62257-9-5 Ed 2.0 was published by IEC in April, 2013.

Coverage: off-grid LED lighting products for rural electrification (most relevant products are charged using solar PV, but other charging sources are also covered).
Much of the material in IEC/TS 62257-9-5 Ed2.0 was developed under the IFC and World Bank’s Lighting Africa program. Lighting Asia, launched in May, 2012, also contributed.

U.S. DOE supported integration into IEC/TS 62257-9-5, along with IFC, World Bank and IEC
Development of Lighting Global QA framework is a collaborative effort with many stakeholders.

Participating organizations:
- Lighting Global
- Lighting Global Test Laboratory Network
- UNIVERSITY OF NAIROBI
- CERER of Senegal
- Private sector: over 15 off-grid lighting companies provided input on draft document leading to TS 62257-9-5

Lighting Global Test Laboratory Network:
- Fraunhofer ISE
- UNIVERSITY OF NAIROBI
- CERER of Senegal
IEC/TS 62257-9-5 is being used to support an active and robust quality assurance program.

- **100+** products tested on a commercial basis
- **40+** companies have submitted at least one product for testing
- **42** products currently meet the program’s minimum quality standards
- **>2.7 M** quality assured products sold in Africa; sales numbers in Asia are estimated to be similarly high
Widespread adoption of QA framework will strengthen quality assurance efforts

- A harmonized quality assurance framework based on IEC/TS 62257-9-5 that spans multiple countries and programs provides benefits to multiple stakeholders
  - Companies can have their products tested/verified through a single framework, thereby saving time and money
  - Supply chain actors (wholesale distributors, bulk buyers, financial institutions, etc.) only need to understand one QA framework
  - Buyers benefit from lower product prices, as companies can pass savings of reduced costs for QA verification on to customers.
Key challenges and solutions

- Quality assurance efforts should ideally be based on harmonized test methods and metrics
  - IEC can play a key role through its TS 62257 series

- To enable widespread availability of affordable, quality assured products, testing should be rigorous, low cost, & fast
  - An international network of accredited test labs can help achieve this; test results from any accredited lab should be accepted
  - QA programs must allow companies to bring products to market quickly (e.g. use self-certification with rigorous market check testing)

- Test methods should be revised regularly to keep up with rapidly changing technology and markets
  - Funds are needed to support the revision process; development organizations can play a role if IEC documents meet their needs
What can countries do to engage?

- Participate in Joint Working Group 1 of IEC Technical Committee 82 so that 62257 series documents meet your country’s needs.

- Adopt existing IEC 62257 series documents (e.g. TS 62257-9-5 for solar charged off-grid lighting systems).

- Engage with and support existing efforts such as Lighting Global Quality Assurance (more information available at www.lightingglobal.org)
Thank you

Dr. Arne Jacobson
Schatz Energy Research Center
Humboldt State University
arine.jacobson@humboldt.edu
+ 1-707-826-4302
http://users.humboldt.edu/arne
Annex Slides Follow
Lighting Global QA: Process for maintaining the status of a product

QA Flowchart: Maintaining Status

Trigger for Check Test:
- Initiated at discretion of program without notice

Triggers for Re-Testing:
- Two years after last QTM
- Manufacturer reported changes to design or performance
- Fail Primary Market Check Test

MCM Market Check Test with 3-6+ samples (procured randomly from retail market)

Re-Testing
- Two ISM Tests with 3 samples each (procured randomly)
- QTM Test with 18 samples (procured randomly)
  - If triggered by failed check test, products procured from retail market.

ISM n=2

QTM n=6

Maintain Status:
- Report ongoing quality to market

Revoke Status

Maintain or Improve Status:
- Report ongoing quality to market and eligible for additional benefits

Maintain Status:
- Revoke additional benefits if previously met targets

Maintain Status:
- Report ongoing quality to market

Address with manufacturer & trigger re-testing

Maintain Status:
- Report ongoing quality to market

No

Yes

specs

results

support

If product unchanged

If product updated or new generation

If triggered by failed check test, products procured from retail market.