Lighting Global Quality Assurance Framework

Past, Present, and Future Support for the Off-Grid Energy Market

Version 2
October 2014

Summary

This document **describes the framework and intentions of the Lighting Global Quality Assurance (QA) program.** It also explains how Lighting Global currently interacts with the regional programs (i.e. Lighting Africa and Lighting Asia) and how the Global and regional programs interact with manufacturers, distributors, customers, and other stakeholders. Following this initial description, this document **identifies challenges that the QA program should address in order to respond to changing market conditions** and **what actions the program is taking to address these challenges**.

The Lighting Global QA program is designed to support the market development of modern off-grid lighting and energy systems. The program provides buyers with reliable technical information and connects them with manufacturers and sellers of quality assured products. Our approach includes testing and verification of quality and performance and engagement with the diverse and fast-growing market for modern off-grid lighting and energy systems, also referred to as pico-power systems, through stakeholder consultation and field research.

The QA program has five **guiding principles**, driven by the needs of the market:

- **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:** Develop rigorous testing standards that can be carried out using reasonably low-cost instruments; provide technically valid test results that can be accepted globally.
- **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.

The QA framework has actively supported the market for modern off-grid lighting and energy systems since 2009. Today (2014), the framework includes a third-party product testing and verification program, minimum product quality standards, a standardized specifications sheet (SSS) communication tool, the technical and eco-design notes series, and an IEC Technical Specification (TS 62257-9-5) that is a basis for wider adoption of the framework.

As the global off-grid lighting QA program enters its fifth year, we anticipate **future improvements** that will expand the framework, thereby ensuring its continued relevance for the rapidly changing off-grid lighting market:

- **More efficient testing:** Create a faster, lower cost process for product testing without diluting the strength and value of the quality assessment.
- **Expand the scope:** Support kit-based systems up to solar home system size (e.g., up to 50 or 100 watts) that have the capacity to support a range of appliances beyond lighting and mobile phone charging. Larger systems are increasingly a priority for the off-grid energy systems market.
- **Long term goals:** Increase our ability to communicate to buyers across the supply chain, expand the network of commercial test laboratories, engage with key stakeholder organizations, and determine a strategy and business model to ensure effective quality assurance services are maintained on a sustainable basis beyond the end of the Lighting Global program.

Program History

Institutional Support: The Lighting Global quality assurance (QA) program was originally developed in support of Lighting Africa, a joint program of the World Bank and the International Finance Corporation. Lighting Africa activities began in September 2007 with the aim of improving access to clean, affordable lighting in Africa. Since then, QA continues to be a collaborative effort that is executed by internal World Bank and IFC staff, external consultants, and a broad set of stakeholders who contribute to and adopt the principles of the QA framework. With the launch of the Lighting Asia/India program in 2012, the Lighting Global program was spun off from Lighting Africa to administer the common, global aspects of the Africa and Asia initiatives, including the QA program. Lighting Global is now supported through collaboration between the International Finance Corporation, the World Bank, and the United States Department of Energy.

Snapshot of Activity: Since the launch of Lighting Africa, the QA programs' network of test laboratories, currently consisting of two labs in the U.S., one in Germany, and one in Kenya, has tested over 100 products using the full Quality Test Method, 59 of which have met the Minimum Quality Standards and received program support. Many additional product tests have been conducted using the Initial Screening Method and the Market Check Test Method. This work has helped enable over 2.7 million units of quality-assured products to be sold in Africa through June 2013. In April 2013, the test methods developed by Lighting Global were published by the International Electrotechnical Commission (IEC) as IEC/TS 62257-9-5, Edition 2.0. Lighting Africa and Lighting Global have also held two Outstanding Product Awards competitions, in 2010 and 2012. In addition to the QA activities, Lighting Global has published a series of 18 Technical and Eco Design briefing notes, providing detailed technical and environmental insights into product components used by the off-grid lighting industry. Further, Lighting Global has conducted field research regarding product availability in the market, consumer preferences for light output and run time, and service and maintenance issues relevant to the off-grid lighting industry.

Lighting Global QA Program Today

Quality assurance (QA) is a key component of Lighting Global and its associated regional programs and benefits multiple stakeholder groups, including manufacturers, standards agencies, distributors, retailers, bulk purchasers, and consumers. Each of these stakeholder groups stands to benefit from the widespread adoption of the Lighting Global QA framework:

- **Manufacturers** can have their products tested and verified through a single framework, thereby saving time and money,
- **Supply chain actors** (wholesale distributors, bulk buyers, financial institutions, etc.) can make more informed purchasing decisions and marketing campaigns, while only needing to understand one QA framework,

- **Standards agencies** can benefit from adopting an internationally recognized QA framework that gives a high degree of legitimacy and alleviates the need for new in-country testing,
- **Consumers** have access to better quality products. Additionally, consumers can benefit from lower product prices, as companies can pass savings of reduced costs for QA verification on to customers.

As shown in Figure 1, the Lighting Global QA framework consists of three key components: test methods and quality standards; testing and verification; and communication to stakeholders. These components are described in more detail below.

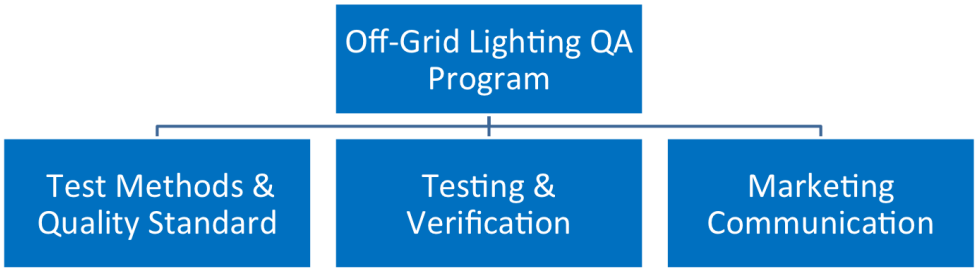

Figure 1. Structure and main components of the Lighting Global QA framework (based on a diagram prepared by Navigant Consulting, Inc., for Lighting Global).

Test methods and quality standards

Lighting Global has developed three test methods to meet the unique needs of stakeholders in the market for off-grid lighting products. These methods are faster and less expensive (lower personnel and equipment costs), but less thorough than other established test procedures for lighting products. The test methods, summarized in Table 1, assess the performance of individual components such as the LED, battery, and PV module, as well as system-level metrics such as run time, physical ingress and water protection, and durability.

Table 1. Summary of the testing framework using by the Lighting Global Quality Assurance Program.

	Sampling	• Randomly selected from warehouse or marketplace
Component Tests	Photometrics	• Luminous flux (lumens—total light output) • Standardized distribution (illuminance)
Component Tests	Battery & Charge Control	• Battery capacity (amp-hours) • Protection (voltage cutoffs and durability)
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	• Modelled 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

The QA framework and test methods have been institutionalized through, and are now based on, IEC/TS 62257-9-5, Edition 2.0, a Technical Specification published by the International Electrotechnical Commission (IEC). Publication of this document through IEC provides a common framework that can be used to enable widespread adoption of a harmonized quality assurance approach. The document was published in a way that enables revision on a reasonably frequent basis (i.e., every one to two years). This was done to help ensure that the quality assurance framework and test methods can be updated to meet the needs of a rapidly changing market.

Lighting Global uses three test methods, all of which are described in IEC TS 62257-9-5:

- The **Quality Test Method (QTM)** is the flagship method for Lighting Global. The results are used to verify if products meet the Lighting Global Minimum Quality Standards, to verify manufacturers' claims, and to provide input information for the Standardized Specification Sheets that are published through the Lighting Global website. Having a product that meets the Minimum Quality Standards is a pre-condition for manufacturers that wish to achieve Associate Status with the Lighting Africa and Lighting Asia programs.

    - 18 product units are randomly selected from a warehouse at the product's assembly location or in the commercial market.
    - A sample size of 6 is used for most tests; Lighting Global aims to provide results from these tests in approximately 4 months from the time that samples arrive at the test laboratory.
- The **Initial Screening Method (ISM)** is an abbreviated version of the QTM that is designed to provide a lower cost and faster turnaround than QTM testing. The ISM provides rapid feedback about emerging products for manufacturers, distributors, government agents, and NGOs and offers a low-cost assessment of a new product's likelihood of passing the full QTM. This screening can also assist companies with ongoing product research and development. The ISM is not designed as an end in itself.
    - 3 product units are selected by companies themselves and are provided for screening.
    - A sample size of 1 is used for each test; Lighting Global aims to provide results from these tests in approximately 6 weeks from the time that the samples arrive at the test laboratory.
- The **Market Check Method (MCM)** uses test methods that are very similar to the ISM, but samples are obtained from the retail market and the sample size for each test can range from 1 to 6, depending on the objective of the test. This test is used to confirm whether products that have met the Lighting Global Minimum Quality Standards according to QTM testing continue to provide the same level of performance over the two year validity of the test results.

The **Minimum Quality Standards** define requirements for truth-in-advertising, durability, quality, lumen maintenance, and warranty terms. Products must meet the Minimum Quality Standards to be eligible for services from Lighting Global and the associated regional programs. As of January 2014, the Minimum Quality Standards comprise the following requirements:

- **Truth-in-advertising:** accurate consumer-facing labeling (e.g., rated run time, battery capacity, PV power)
- **Lumen maintenance:** after 2,000 hours, the product's light output must not drop below 85% of the initial value (alternatively, products may meet this requirement by achieving 95% of the initial light output after 1,000 hours).
- **Battery:** must be durable and adequately protected
- **Health and Safety:** batteries may not contain mercury or cadmium; products are safe
- **Durability and quality:** products are designed and manufactured to avoid early failure
- **Warranty:** products have a consumer facing warranty with at least one year of coverage

Further, effective October 1, 2014 or by program announcement, manufacturers will be required to report performance information, such as run time and light output, on the product packaging. Reporting guidelines will be determined through an upcoming stakeholder engagement in coordination with consumer/market research.

Testing and verification

The testing and verification activities carried out by Lighting Global are based on the test methods described above. Tests are currently conducted at four independent test laboratories, with two additional labs in the process of being added to the network (Table 2).

Table 2. Test labs in Lighting Global network

Test Lab and Location	Approved Tests and Roles
Schatz Energy Research Center (SERC) **Arcata, California, USA**	*Conduct QTM, ISM, MCM tests *Manage test lab network *Train new labs *Coordinate development of test methods/updates to IEC specification
Lighting Research Center (LRC) **Troy, New York, USA**	*Conduct QTM, ISM tests *Aid in development of test methods/updates to IEC specification
Fraunhofer Institute of Solar Energy (FISE)	*Conduct QTM, ISM tests *Train new labs *Aid in development of test methods/updates to IEC specification
University of Nairobi Lighting Laboratory **Nairobi, Kenya**	*Conduct ISM, MCM tests
The Energy and Resources Institute (TERI) **New Delhi, India**	*Conduct ISM, MCM tests *Plan to conduct QTM tests
Center for Study and Research on Renewable Energies (CERER) **Dakar, Senegal**	*Soon will conduct ISM, MCM tests

Figure 2 illustrates how the QTM and ISM tests are used when a company wishes to test a new product. The manufacturer has the option of purchasing the QTM test at full price or obtaining initial screening using the lower-cost ISM tests. If the ISM test results indicate that the product is likely to meet the Lighting Global Minimum Quality Standards following QTM testing, the manufacturer is eligible for QTM testing at a discounted price (note, however, that this discount will be phased out over time). If the QTM testing shows that the product meets the Minimum Quality Standards, the product receives a Standardized Specification Sheet (SSS) and is listed on the Lighting Global website.

Regardless of whether the product meets the Standards or not, the manufacturer receives a detailed test report with qualitative and quantitative test results and feedback on how the product could be improved. If the product does not meet the Minimum Quality Standards, Lighting Global will work with the manufacturer to resolve the issue. Depending on the nature of the failure, this process may be as simple as changing product labeling and advertising materials. If technical design changes are necessary, depending on the extent of the changes, the manufacturer may be able to resubmit their product for partial re-testing. In some cases, depending on the nature of the design changes, full re-testing may be required.

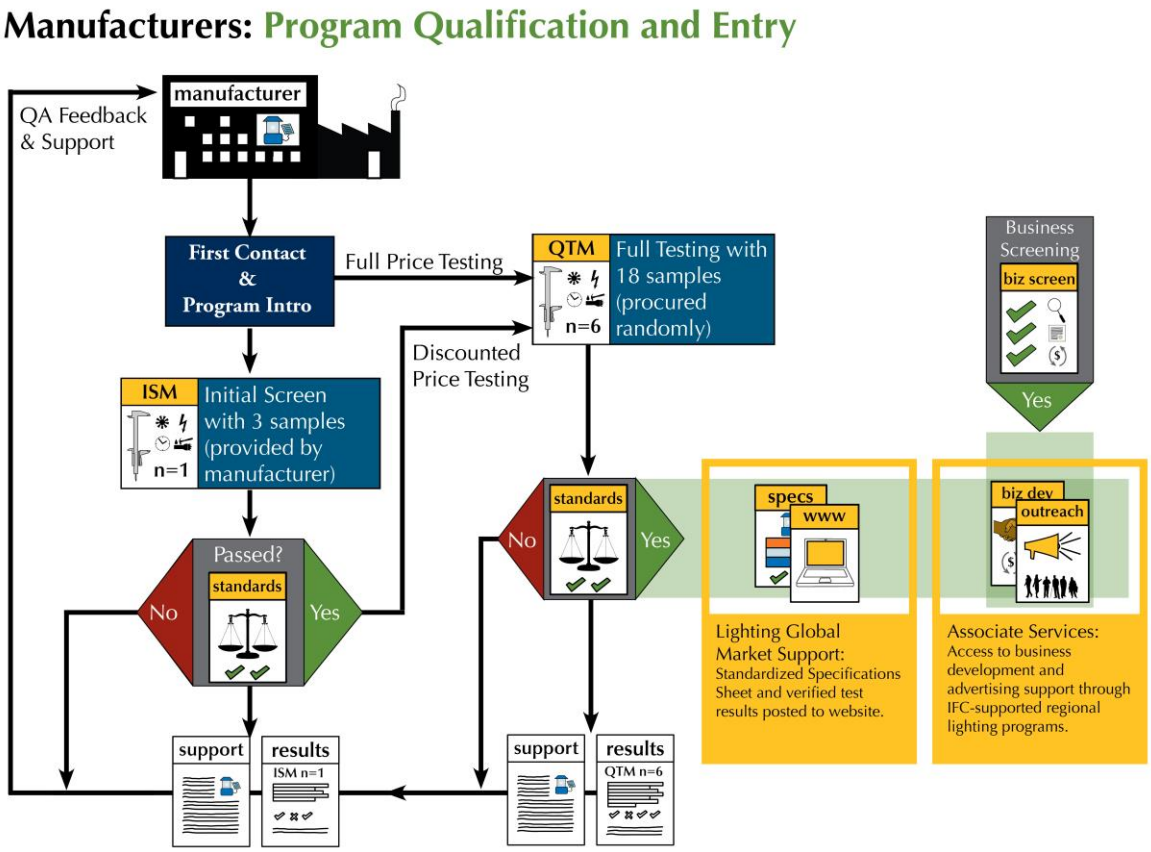

Figure 2. Process for manufacturer engagement and new product testing.

Once a manufacturer has a product that meets the Minimum Quality Standards, they may begin seek to become an Associate. Associates are eligible for business development services and outreach campaigns conducted by the regional programs (such as Lighting Africa and Lighting Asia). To become an Associate, the company must pass a business screening which evaluates the business's potential, integrity, sustainability, as well as its framework for offering warranty protection provided to consumers.[1] Associate services are determined by the regional programs and tailored to the specific needs of local markets. These services may include:

- Publicity on the program website
- Business-to-business matchmaking:
    - Introduction of Associates to potential country-level partners through profiling and business-to-business links with trade groups, distributors, intermediaries, etc.
    - Facilitation of access to finance. While finance is not guaranteed, the program makes introductions and channels grant, investment, and/or loan opportunities to Associates.
- Trade fair or exhibition invitations and associated promotions

[1] Some elements of the business screening may be required before companies engage with the Lighting Global testing program.

- After-sales service and maintenance training, provided for wholesalers and retailers to enhance capacity to provide after-sales service and honor warranties
- Matching funds for business plan development, market intelligence, marketing support, supply-chain strengthening, and subsidized product testing
- Consumer outreach services, including
    - Promotion on the program website
    - Invitation to participate in marketing and consumer awareness programs
    - Access to negotiated media discounts

Figure 3 illustrates how a manufacturer maintains their products' quality-assured status. Periodically, without notice to the manufacturer, each product may undergo market check testing, in which samples are procured from the local retail market and tested using the Market Check Method. The test results are compared to the product's advertising materials and the Lighting Global Standardized Specifications Sheet; any discrepancies result in a re-test with a sample size of six per test to confirm the problem. The samples for retesting may be obtained from the retail market or random warehouse sampling at the discretion of the Lighting Global program. In addition, re-testing with randomly selected products is required after two years for products that have met the Minimum Quality Standards if the manufacturer wishes to maintain the status of the product. If the product under consideration for renewal is identical to the original product (i.e. no significant design changes have been made), then a renewal test with a sample size of two may be used (six units of the product are required to complete this testing). If significant changes have been made to the design, full QTM testing is required. In any case, if re-testing shows that the product no longer meets the Minimum Quality Standards, the product loses its status.

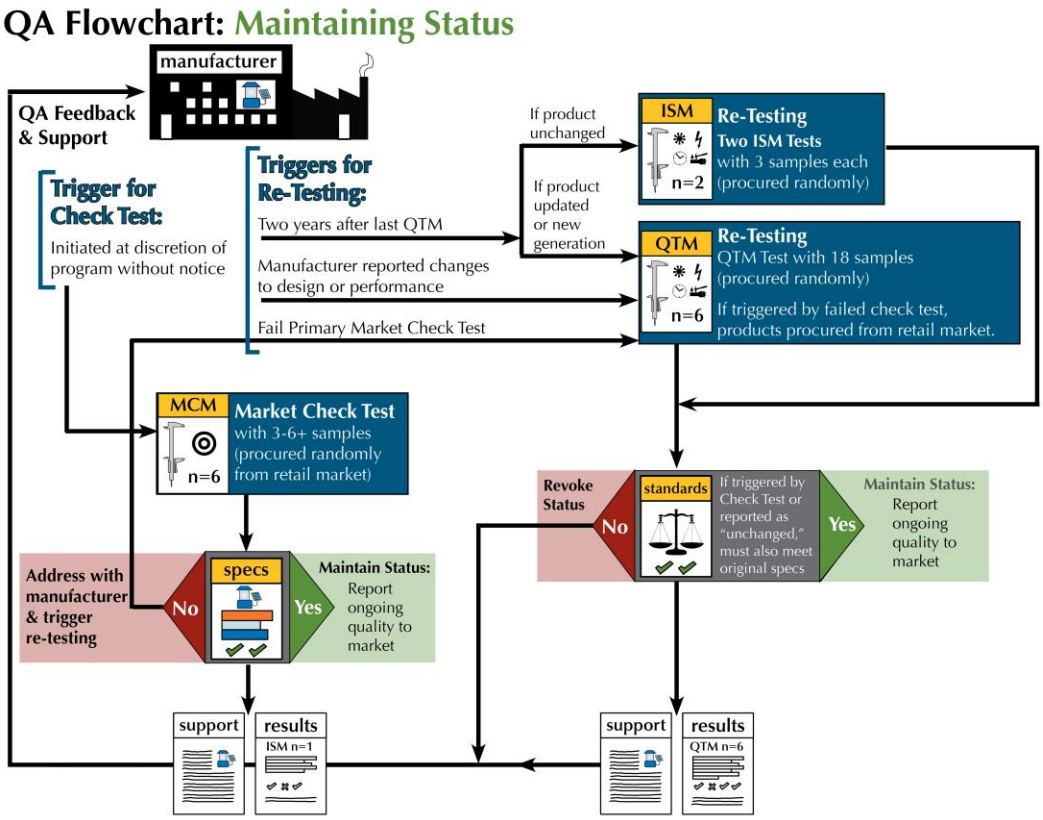

Figure 3. Process for maintaining product status, including Market Check Testing and re-testing due to expiration of results.

Communication

The Standardized Specifications Sheet (SSS) is a key tool used to communicate the results of product testing. The SSS summarizes the Quality Test Method (QTM) results for a product in an easy-to-read format and allows comparisons between products from different manufacturers. Participating manufacturers can use the SSS to provide verified performance data to potential buyers. For distributors, bulk-purchasers, and end-users, the SSS offer a trusted resource for performance verification. As part of the SSS implementation process, Lighting Global has conducted awareness campaigns and informed users and distributors about this means of quality verification.

Only products that have met the Lighting Global Minimum Quality Standards and have valid test results receive an SSS. In addition, products that have met the Standards receive a Lighting Global Verification Letter; this document can be used as proof that a product meets the Minimum Quality Standards. The SSS and Verification Letters are posted to the Lighting Global website, and users are encouraged to use the website to verify the authenticity of these documents. In addition to the Lighting Global website, the regional programs maintain websites with information about region-specific market interventions to overcome barriers within the off-grid lighting market (e.g., consumer awareness campaigns, workshops for microfinance and finance institutions, and market intelligence reports). Table 3 lists the methods that are used by Lighting Global and the regional programs to communicate with stakeholders.

Table 3. Summary of methods used by Lighting Global and regional programs to communicate with key stakeholders.

Stakeholder	Communications method
Consumers	Advertising campaigns and consumer education conducted by regional programs; SSS and website in cases where consumers have access
Manufacturers	Test reports, SSS, direct outreach by personnel associated with the Lighting Global, Lighting Africa, and Lighting Asia programs
Distributors, finance and microfinance, retailers, bulk purchasers, NGOs	SSS, website, direct outreach by personnel associated with the Lighting Global, Lighting Africa, and Lighting Asia programs
Governments (e.g., customs officials)	Verification Letters, SSS, website, direct outreach by personnel associated with the Lighting Global, Lighting Africa, and Lighting Asia programs

The Future of Global Quality Assurance

The Lighting Global QA framework is designed to balance stability with change. Stable test methods, processes, and thresholds for quality are important for maintaining clarity and relevance, both for those who offer products to the market and the buyers and institutions that need trusted information on quality and performance to drive investment and support decisions. However, as the market (quickly) grows and evolves, the Lighting Global QA framework continues to change as well. The process for updating the framework is based on stakeholder

feedback, new information from end-users and supply chain actors, and careful analysis of technology trends in the context of our growing database of test results.

Lighting Global has identified several key challenges associated with adapting and scaling the Lighting Global QA program during the coming years as the program continues to transition from a small scale effort that matched the needs of the early market to a larger program that involves increased testing volumes and engagement with greater numbers of people and institutions who rely on timely and trusted information from the program.

Challenge 1: Create a **faster, lower cost process for product testing** without diluting the strength and value of the quality assessment.

Two guiding principles of the Lighting Global QA program are *rigor* and *affordability*. The Lighting Global test methods are designed to incorporate low-cost, yet reliable procedures to seek a balance between these two opposing principles. Despite these considerations, manufacturers continue to rightly cite the duration, expense, and sampling requirements of testing as barriers to successful market entry for new products. Future revisions of the test methods, the expansion of the test lab network, and upcoming changes to the QA framework are all measures currently in progress that are intended to address these concerns.

Drivers:

- **Testing takes too long**: Manufacturers bring products to the market at a fast pace, often with model life cycles of one or two years. The 3-6 month time period for testing can create a barrier for effective distribution of new products, since it can represent 25-50% of the product life cycle. Speeding the time from testing initiation to completion of an assessment, while maintaining the rigor of the program, will better serve both sellers and buyers who want to access the best quality products for their needs that are currently available.

- **Testing is too expensive:** Many companies working in the off-grid lighting market do not have access to substantial capital. Testing fees and associated shipping costs, which are commonly in excess of US$6,000, can be a significant barrier to bringing products to the market. Lowered testing costs enable emergent businesses to access program resources and may result in lower cost products for consumers. Note that the overall cost of testing has not changed significantly over the past few years, but the level of subsidy provided by IFC and World Bank – initially a large fraction of the cost of testing – has declined in recent years. As a result, manufacturers now pay the majority of the cost of testing.

- **Requiring 500 products to be available for sampling is burdensome:** To ensure a random sample of products for QTM testing, Lighting Global requires that the 18 products sent for testing be selected from a warehouse with at least 500 units of the same model. Smaller manufacturers or those with alternative manufacturing methods, such as "just-in-time" production, do not typically produce or store 500 units at a time, making this sampling requirement expensive and disruptive to meet. Moreover, even manufacturers with large volume production typically produce in batches, and they generally seek to move the product offsite as soon as possible in order to fulfill orders. If the timing of sample collection is not coordinated precisely, this can hold up orders or lead to delays in the timing of sample collection.

Next Steps:

- **Revisit and revise the test methods [ongoing task]:** The Lighting Global test methods as institutionalized in IEC/TS 62257-9-5 are dynamic and meant to be revised regularly based on stakeholder input and market needs. The Lighting Global QA team and other stakeholders are currently scrutinizing the test methods to determine ways to minimize testing time and cost while maintaining rigor and integrity.

- **Develop testing service capacity closer to manufacturers [ongoing]:** The laboratories that currently test products for the Lighting Global QA program according to the QTM method (i.e. the method used to determine if products meet the Minimum Quality Standards) are located in Germany and the USA, while the majority of products are produced in China. Because sampling for QTM testing is typically completed before products are distributed, most sampling occurs at warehouse and factory locations in China. Lighting Global QA is currently in the process of expanding the test lab network to include one or more labs located in China or East Asia, closer to these manufacturing centers, to facilitate lower cost testing and to minimize sample shipping costs for manufacturers. Lighting Global is also working to develop test lab capacity in India, as production for some manufacturers is located there.

- **Allow testing by outside labs [ongoing]:** Accepting test results from labs outside the Lighting Global network may reduce testing cost and time for manufacturers by allowing manufacturers to access a test lab of their choosing. The Lighting Global QA team has developed a new policy to allow manufacturers to procure testing according to the IEC/TS 62257-9-5 from outside test labs, provided that they meet specified criteria including ISO 17025 accreditation for relevant test methods and verified capabilities. The policy will be published on the Lighting Global website soon.

- **Move toward an accelerated verification option [planned]:** Lighting Global is currently exploring the possibility of creating an *accelerated verification* framework. In this framework, companies with an established track record for quality with the Lighting Global program could pursue early verification for products through a process that could reduce testing time and sampling requirements. This framework will likely require limited, rapid external laboratory testing to verify product performance (e.g. 4-6 weeks of testing with a small set of samples) in combination with rigorous market check testing.

- **Develop a stronger "watchdog" in the market [ongoing]:** Historically, the QA program acted as more of a "gatekeeper" to ensure that only quality products are supported by IFC programs; however, with market growth and the introduction of a wider range of test labs and, potentially, an early verification framework, "watchdog" activities, in which products already on the market are monitored for quality, are becoming increasingly important. Lighting Global has already created a Market Check Method testing framework and plans to increase the frequency of market check testing to ensure adequate monitoring of the market. Lighting Global is also exploring new avenues to develop a sustainable financing mechanism to ensure financial support for these watchdog efforts, such as a market check test fee that would accompany early verification testing.

Challenge 2: Increase the scope of the Quality Assurance framework to measure system types and features that are prioritized by the market.

The initial focus for Lighting Africa and Lighting Asia activities in the off-grid lighting market was lighting. This was reflected in how the program described products ("modern off-grid lighting products") and programs ("Lighting" Africa, etc.). As the market has matured (and LED technology along with other superefficient appliances continue to improve), pico-power energy systems now do much more than just provide light. Mobile phone charging, low-power televisions, fans, radios, and other appliances can now be powered by pico-power kits, with the available service depending on the system size. Moreover, small solar home system kits that are somewhat larger than those typically considered to be 'pico-power' systems have become increasingly affordable. In anticipation of and response to these continued trends, the QA framework is being expanded to cover new energy technology areas.

Drivers for change:

- **Larger kit-based systems with solar module wattages greater than 10 watts are becoming more common and affordable:** Historically the scope of the QA program has covered products with solar modules ranging from 0 to 10 watts. The decreasing cost of solar PV modules, rechargeable batteries, and LEDs have facilitated the development of larger "plug-and-play" solar home system kits at a price affordable to many in the off-grid lighting market. These have solar modules between 10 to 100 watts and offer a wide range of services. The current test methods do not effectively address many of these larger kits.

- **Products of all sizes offer auxiliary services:** Based on consumer demand and because more and more energy is available (since LEDs require less and less power), many products provide power for auxiliary loads, the most common of which is mobile phone charging. Current product tests do not thoroughly assess these auxiliary uses, and measurements of full-battery and solar run times do not account for the impact of also using the product to charge a mobile phone or power other devices. Beyond additional energy services, some products now include onboard metering and billing technology ("pay-as-you-go" systems). The accuracy of metering and quality of these systems is an important element of the end-user experience.

Next Steps:

- **Extend scope of product testing to cover larger DC solar home system kits [ongoing]:** Lighting Global is engaged with the IEC to update IEC TS 62257-9-6 in the spirit of the successful work we completed on IEC TS 62257-9-5, Edition 2.0 (the Technical Specification for off-grid lighting), which will result in a unified framework for preconfigured solar products and kits ranging from 0 – 100 W. The scope of this work includes developing a modified version of the QA framework for larger kits, pilot testing the extended framework, and formally submitting it for approval through the IEC. Lighting Global plans to employ the same set of QA principles that we have used for pico-power products to develop standards for the solar home system market, while continuing to use stakeholder consultations and feedback from the field to inform the process. Note that the Lighting Global, Lighting Africa and Lighting Asia programs are in the process of determining the range of system sizes that will be covered by the program; it is possible that the largest system size covered under the program will be set at a threshold that is lower than 100 watts (e.g. the upper bound could be 50 watts or some other level). The

respective programs will consider market needs, program resources, and stakeholder input when making this decision.

- **Build test lab capacity for testing larger solar home system kits [planned]:** In parallel with developing new test standards, the test labs that will measure system quality and performance need to be identified and prepared. We plan to both expand the network of test labs to include labs that already have capabilities in this area and build the capacity of labs that thus far have focused on pico-power lighting systems.

- **Measure and report auxiliary power capabilities for pico-power products [planned]:** The work we complete in support of solar home system (SHS) testing will result in better methods for estimating the level of service available to users who plug their own appliances (like mobile phones) into the full range of pico-power systems. One focus of this effort will be incorporating measurements of auxiliary power capabilities in all products (not just SHS). A key challenge to this effort is establishing an effective and clear way of communicating the capabilities in light of the wide diversity of power consumption for mobile devices and the impact of user behavior on performance.

Challenge 3: Long-term sustainability of QA program

Funding for the Lighting Global program, including the quality assurance component, is expected to last for approximately three more years. The need for quality assurance in the off-grid lighting and energy systems market will continue into the future, and it is therefore important to establish a financially viable, long-term framework that will allow for continuation of the quality assurance effort. In addition, it is important to develop additional quality assurance functions, such as an "on-the-package" quality seal that can effectively communicate quality to buyers across the supply chain.

Drivers:

- **Program lacks "on-the-package" quality seal:** While many manufacturers, distributors and standards/customs agencies understand the value of the Lighting Global Standardized Specifications Sheet and Verification letter, the program currently lacks an "on-the-package" mechanism to effectively communicate verified product quality and/or performance to buyers across the supply chain. While the Lighting Africa and Lighting Asia programs are using consumer awareness campaigns to communicate quality in some countries and regions, this approach is limited geographically and is unlikely to continue after current program funding expires. A quality seal or label, if deployed effectively and with sufficient resources, could help buyers across the supply chain and manufacturers of high quality products alike by clearly signaling product quality to the market. An effective quality seal could also help generate demand for a long-term quality assurance program, provided that it delivers value to manufacturers of good quality products at a reasonable cost.

- **Long-term Sustainability of the QA program:** The QA program has been supported by the IFC and World Bank through the Lighting Africa and Lighting Asia programs, and it will continue to be supported by the IFC and World Bank in the context of the Lighting Global program for the next three years. Other organizations such as the U.S. Department of Energy and GIZ have also provided funding for specific quality assurance related activities. However, the market need for trusted and reliable information about product quality will continue well beyond current commitments from these

institutions. During the next three years, Lighting Global must therefore determine a strategy and business model that will help ensure that effective quality assurance services are maintained on a sustainable basis beyond the end of the program.

Next Steps:

- **Analysis related to the development of an "on-the-package" quality seal [analysis ongoing]:** Lighting Global, Lighting Africa, and the U.S. Department of Energy have conducted a preliminary analysis of communication strategies to effectively deliver information about quality to buyers across the supply chain. The analysis was led by Navigant Consulting in close collaboration with the Lighting Global quality assurance team. This analysis indicated that a basic "business to business" (B2B) quality seal could be an effective tool for delivering information about quality at a reasonable cost. A consumer-facing quality label might also be considered, but the marketing costs required to effectively raise awareness about the label are substantial. Moreover, prior experience with quality labels indicates that they are most effective when the branding and communication materials are tailored to a particular country or region (i.e. a uniform, global quality label may not be a viable and effective strategy). Lighting Global is committed to improving its ability to communicate quality across the supply chain. Analysis of this topic is ongoing, and a decision about next steps has not yet been finalized.

- **Development of "on-the-package" reporting requirements for quality assured off-grid lighting products [planned]:** Based on feedback from industry stakeholders in the context of the most recent revision of the Lighting Global Minimum Quality Standards and input from consumer focus groups in Africa and Asia, Lighting Global is taking steps to establish common consumer-facing "on-the-package" reporting requirements for key performance metrics such as light output and daily run time. The program anticipates developing the requirements over the coming six months and will solicit feedback from industry stakeholders and end-consumers alike. More information about the reporting requirements and the upcoming stakeholder process will be available on the Stakeholder Engagement page on the Lighting Global website.

- **Development of a long term quality assurance strategy [ongoing]:** Lighting Global has been working to develop a long term strategy to institutionalize the quality assurance effort so that it can be sustained after current program support from IFC and World Bank ends in about three years. This effort has involved support and collaboration with partners such as the U.S. Department of Energy, Lawrence Berkeley National Laboratory, Navigant Consulting, and the International Electrotechnical Commission. It has also involved engagement with key industry stakeholders such as the Global Off-Grid Lighting Association (GOGLA).

    - Analysis to date indicates a need to establish a trusted, reliable, and independent certification body that builds on the experience of the existing Lighting Global program. While work is ongoing, Lighting Global anticipates that a proposed preliminary framework and terms of reference for such an organization or consortium of organizations will be released in the coming year.

    - Key steps that represent progress toward laying the foundation for a long term quality assurance framework have already been taken. These include:

  - Institutionalization of the quality assurance framework through the International Electrotechnical Commission in the form of IEC TS 62257-9-5, Edition 2.0.
  - Initial steps toward expanding and commercializing the testing framework, thereby increasing the options for manufacturers that seek testing services for their products.
  - Working to establish a strong working relationship with the Global Off-Grid Lighting Association (GOGLA) in order to enable GOGLA to serve as a key conduit for industry input on matters related to quality assurance.
- Additional important steps will be taken over the coming years.

Conclusion

Lighting Global is committed to the continued development of a practical, dependable, and sustainable quality assurance system for off-grid lighting and energy systems. This document briefly describes the existing quality assurance program and identifies areas for future change as the program works to adapt to evolving market conditions. In some cases the measures described in this document will take time to develop and implement, but with patience and persistence we are confident that we can succeed. We value input from key stakeholders ranging from product manufacturers to end-users, and we look forward to continued engagement as we work to fulfill our mission of quality assured clean energy systems for off-grid applications.