

Standards for Stand-Alone Solar: Guidance for Governments

MARCH 2020

Introduction

Off-grid solar solutions have accelerated electrification in sub-Saharan Africa (SSA) due to the ease with which they can be deployed. They have made it easier for governments to fast track universal electrification, especially in areas where grid extension is uneconomical. In fact, electrification in SSA is now outpacing population growth thanks to off-grid solar solutions¹. Off-grid solar solutions constitute

85% of all off-grid technologies. Consumers of these solar products are enjoying better lighting, improved health, longer working or study hours, higher incomes and new job opportunities². Moreover, consumers undertaking more than two income generating activities after adopting solar, are getting an average additional income of up to \$53 per month, as shown in Figure 1.

Average additional monthly income generated by type of economic activity



Figure 1: Average additional monthly income households generate after adopting stand-alone solar

Source: GOGLA (2019)

This brief provides guidance on:

For off-grid Solar solutions to continue delivering great benefits to consumers they need to be of high-quality. Off-grid solar consists of stand-alone solar and mini-grids. However, the focus of this brief is stand-alone solar. An effective way of improving the quality of stand-alone solar products in the market is the adoption and implementation of globally recognised quality standards. Once these standards have been adopted, they must be enforced, and surveillance done to ensure compliance.



The importance of quality standards for stand-alone solar products;



The standards adoption process and status of standards in sub-Saharan Africa;



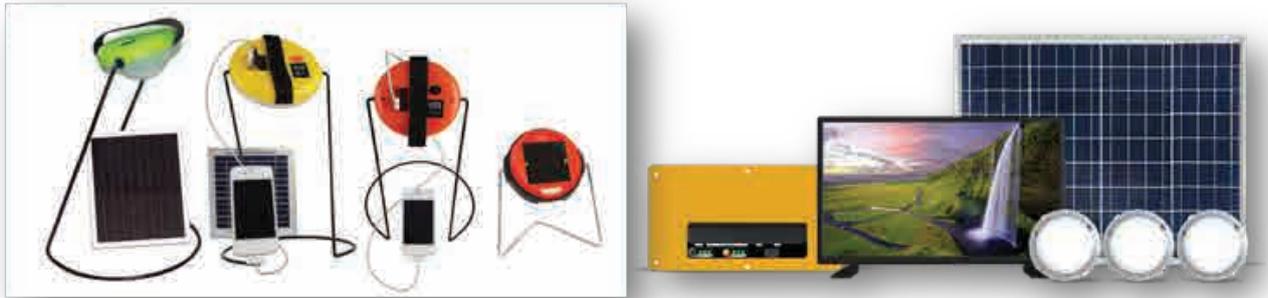
Common challenges encountered during adoption and implementation of standards;



Market surveillance; and



Recommendations for governments.



Stand-alone solar consists of pico solar (left) and solar home systems (right).
Photo credit: Lighting Global (left), Niwa Solar (right)

STAND ALONE SOLAR STANDARDS

Why Stand-Alone Solar Standards?

In the stand-alone solar industry, particularly in SSA, consumers are susceptible to an influx of low-quality products which are cheaper to purchase. Many of these products stop working within a few weeks or months of purchase. As a result, consumers stop trusting solar products, in effect eroding consumer confidence³. With time, market spoilage occurs affecting even companies that are selling genuine and high-quality solar products.

The problem of low-quality solar products eventually has a high cost on the poor and vulnerable population segments. These people have less disposable income (less than \$ 1 per day) and mostly make a significant sacrifice to purchase a stand-alone solar product. Due to cash constraints, the choice of product they purchase will mostly be influenced by price and what they can afford. The Government's role in checking on the quality of solar products entering the market becomes critical, so that the poor get value for their money. These low-quality solar products also have an environmental cost. They contribute to many batteries being disposed pre-maturely and inappropriately, in effect posing a health hazard.

Without guidance on what constitutes good quality solar, manufacturers design cheaper products with the aim of selling more units. As competition increases the products can become cheaper with little regard to functionality and durability. Eventually, this can result in a race to the bottom as traders cut corners to deliver the cheapest solar product. Deceived by the price, consumers buy the

A standard is a document established by consensus and approved by a regulatory authority that provides, for common and repeated use, rules, guidelines or characteristics for products and services and related processes or production methods, aimed at the achievement of the optimum degree of order in each context. It may also include or deal exclusively with terminology, symbols, packaging, marking or labelling requirements as they apply to a product, process or production method. Standards ensure that products and services are fit for their purpose and are comparable and compatible.

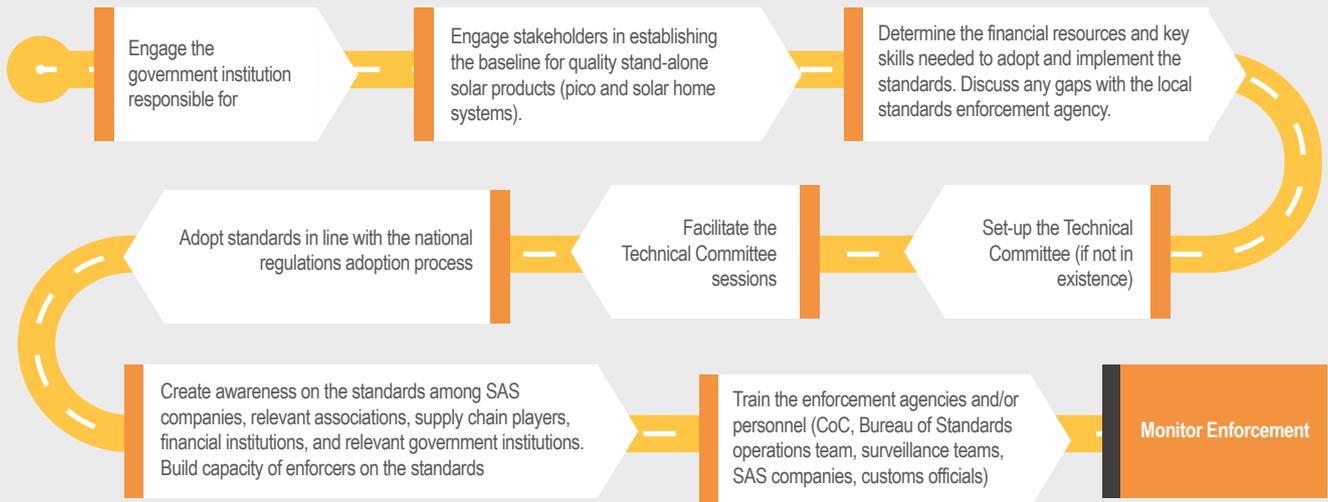
cheaper products. This creates another problem as solar e-waste begins to build up.

Governments have a responsibility to protect their citizens from sub-standard solar products and e-waste that will affect the environment, health and well-being of the people. In addition, governments should intervene to protect importers, distributors and retailers who inadvertently invest in low-quality products because they are not familiar with the standards and the importance of quality assurance. One of the most important ways to address these issues is through quality standards, which set a baseline level of quality, durability and truth in advertising to protect

The Standards Adoption Process

In 2013 the International Electrotechnical Commission (IEC)* adopted test methods (IEC (IEC/TS 62257-9-5) developed by the Lighting Global Programme under the International Finance Corporation (IFC). Recently, the Lighting Global Quality Standards (IEC/TS 62257-9-8) have been approved to be adopted by IEC and will be published in June 2020. There are two sets of Standards, one set for pico solar systems, and another for solar home system (SHS) kits. To protect consumers, governments

need to adopt both standards as these are the main products used for lighting by the vulnerable and off-grid population. To show compliance with the standards, products must be tested according to the IEC test methods at an ISO accredited laboratory. It is the test results that determine whether a product meets the standards or not. The typical process of standards adoption involves a series of steps as shown in Figure 1.



Stakeholders: stand-alone solar companies, relevant associations, certificate of conformity companies, supply chain players, anti-counterfeit agency and academia.

Figure 1: The SAS standards adoption process

The nature of enforcement also differs from country to country and to a large extent depends on the organization and resources of enforcement agencies in a specific country.

Adoption of standards is beneficial to manufacturers and the stand-alone solar industry in the country and regionally. Once adopted especially at regional level, countries work with harmonized regulations and barriers to trade are reduced⁵. Adoption of global standards also enables mass production of high-quality products which results in reduced prices. On the other hand, standards that are not aligned to those that are globally recognised affect production and in turn affordability as the prices of products tend to go up.

Mandatory and voluntary standards

Standards can either be mandatory or voluntary. Voluntary standards are developed by the private sector in conjunction with standards development organizations. Mandatory standards are standards that have been incorporated into law and require compliance by law, regulation, government statute policy or contractual agreement. Sometimes regulators use their statutory authority to enforce voluntary standards, the same way they enforce mandatory standards, even if they are not incorporated by law. Voluntary standards are good for a nascent solar market that is still developing, and where systems are not well developed. In new markets where the risk of counterfeits is minimal, governments can give tax incentives for good quality products.

Mandatory standards on the other hand, are good for monitoring the solar market and enforcement. Where the risk of counterfeit products is high, regulators can begin with mandatory standards to protect the market.

*The International Electrotechnical Commission (IEC) is an international organisation that develops global standards for devices that contain electronics and use or produce electricity. The advantage of adopting IEC standards is that they are developed by committees that bring together experts working in related areas across the world. Experts from industry, commerce, government, test and research laboratories, academia and consumer groups are involved in the standards development process

Status of Standards Adoption in Sub-Sahara Africa

East Africa is ahead of the other regions in adopting standards for stand-alone solar. This is driven by the fact that the market for stand-alone solar is well advanced in this region compared to West and Southern Africa. Ethiopia, Kenya, Rwanda and Tanzania have already adopted standards for smaller stand-alone solar systems (pico solar). Ethiopia has voluntary standards for SHS. Rwanda has adopted guidelines for SHS that are aligned to the IEC standards but with additional requirements, while the other two countries adopted standards developed by the IEC.

In West Africa, though governments are yet to fully adopt

the IEC standards, they are working through the Economic Community of West African States (ECOWAS) in collaboration with the ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE) and the World Bank Group (World Bank & the International Finance Corporation, IFC) on a regional approach towards adopting the stand-alone solar standards.

In Southern Africa, Zambia is initiating steps towards the standards adoption process. Most of the other countries in the region are yet to adopt. The status of standards adoption in sub-Sahara Africa is summarised in Table 1.

Challenges

The main challenges that have been identified in the standards adoption process are:

Buy-in



The standard regulatory body needs to be convinced why standards for stand-alone solar are necessary because they also have many other products to regulate. It is advisable to approach the standards body when there is some traction in terms of units sold in the specific country.

Financing



In many cases, governments do not have enough budgetary allocations for adoption and enforcement of regulations. Financial resources are required for the standards adoption process, capacity building of the enforcement officers, awareness creation among stakeholders and resources for market surveillance

Duration



The process of adopting and implementing standards is generally the same for all countries but the time taken to go through the process differs. The duration is affected by the process each country goes through when enacting regulations. Usually, the technical committee holds at least two meetings, each lasting five days. However, the period becomes longer when funding for the technical committee meetings is insufficient or not available. The duration can also be affected by the unavailability of technical experts that are well versed with the technology. In addition, the time required to create awareness among stakeholders once the standards have been adopted, should be considered.

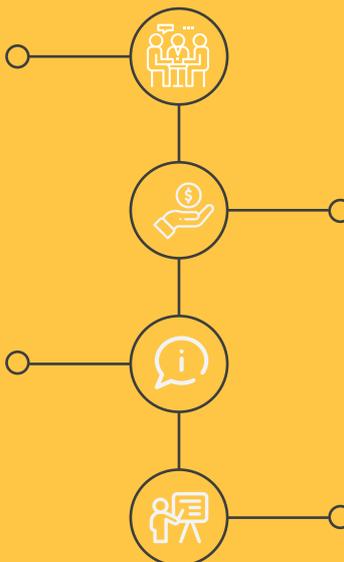
Table 1: Status of Stand-alone Solar Standards Adoption in ACE-TAF Countries

ACE Country	Pico-solar Standards			SHS Kit Standards		
	Standard Type	Implementation	Harmonization	Type of standard	Implementation	Harmonization
Ethiopia	Compulsory	Enforced for importation via Pre-shipment Verification of Conformity (PVoC)	Aligned w/ Lighting Global Quality Standards; Expected future normative reference: IEC/TS 62257-13-1	Voluntary	none	Aligned w/ Lighting Global Quality Standards; Expected future normative reference: IEC/TS 62257-13-1
Ghana	ECOWAS regional harmonization process underway; National standard type unknown.	n/a	ECOWAS regional harmonization process underway; Normative reference: IEC/TS 62257-13-1	ECOWAS regional harmonization process underway; National standard type unknown	n/a	ECOWAS regional harmonization process underway; Normative reference: IEC/TS 62257-13-1 (once it is published)
Kenya	Compulsory	Enforced for importation via Pre-shipment Verification of Conformity (PVoC)	Aligned w/ Lighting Global Quality Standards; Expected future normative reference: IEC/TS 62257-13-1	Bureau of standards interested in adoption of compulsory standard	Expected to be enforced at importation via Pre-shipment Verification of Conformity (PVoC)	Expected to be aligned with IEC/TS 62257-13-1
Malawi	none	n/a	n/a	none	n/a	n/a
Mozambique	none	n/a	n/a	none	n/a	n/a
Nigeria	National adoption process underway; ECOWAS regional harmonization process underway; Compulsory expected.	Stakeholders exploring process for enforcement at importation and market surveillance	ECOWAS regional harmonization process underway; Normative reference: IEC/TS 62257-13-1 (once it is published)	Adoption process underway; Compulsory expected	Stakeholders exploring process for enforcement at importation and market surveillance	ECOWAS regional harmonization process underway; Normative reference: IEC/TS 62257-13-1 (once it is published)
Rwanda	Compulsory	Enforced by Rwanda Bureau of Standards	Aligned w/ Lighting Global Quality Standards; Expected future normative reference: IEC/TS 62257-13-1	MININFRA Guidelines	Rwanda Government is discussing enforcement approach.	Aligned w/ Lighting Global Quality Standards; Additional service level and warranty requirements
Senegal	ECOWAS regional harmonization process underway; National standard type unknown.	n/a	ECOWAS regional harmonization process underway; Normative reference: IEC/TS 62257-13-1 (once it is published)	ECOWAS regional harmonization process underway; National standard type unknown	n/a	ECOWAS regional harmonization process underway; Normative reference: IEC/TS 62257-13-1 (once it is published)
Sierra Leone	ECOWAS regional harmonization process underway; National standard type unknown.	n/a	ECOWAS regional harmonization process underway; Normative reference: IEC/TS 62257-13-1 (once it is published)	ECOWAS regional harmonization process underway; National standard type unknown	n/a	ECOWAS regional harmonization process underway; Normative reference: IEC/TS 62257-13-1 (once it is published)
Somalia	none	n/a	n/a	none	n/a	n/a
Tanzania	Compulsory	Enforced for importation via Pre-shipment Verification of Conformity (PVoC)	Aligned w/ Lighting Global Quality Standards; Expected future normative reference: IEC/TS 62257-13-1	Bureau of standards interested in adoption of compulsory standard	Expected to be enforced at importation via Pre-shipment Verification of Conformity (PVoC)	Expected to be aligned with IEC/TS 62257-13-1

Source: IFC Lighting Global Programme

Recommendations

Using an inclusive process where stakeholders are involved in developing the roadmap towards standards adoption and implementation increases the likelihood of timeliness and success. It is also a safe way of getting buy-in.



To reduce the amount of time spent on the adoption process, regulatory bodies should consider having the recommended two technical committee meetings in a secluded location, away from the office and busy towns. This ensures better focus and faster decision making. Working on an adoption timeline with commitment from the stakeholders could also reduce the duration. However, the total number of technical meetings may differ from country to country depending on the policy/regulation adoption process.

Governments should allocate enough financial resources to cover the standards adoption process, capacity building of enforcement agencies, awareness creation and market surveillance. Government may work with development partners to cover some of the costs.

Once gazetted, stakeholders at national and sub-national level need to be made aware of the existence of the standards and their implications.

Quality Standards and Testing

Certain tests are done to assess the performance of individual components of solar products⁶. The components that are tested include LED bulbs, the battery and the solar PV module. The system level aspects that are tested include: run time, water protection and durability. The tests that are done include:



The Quality Test

The test is conducted to verify whether a product meets the quality standards (to be published as IEC TS 62257-9-8). Test results are used to verify the manufacturer's claims and provide information for a standardized specification sheet that is available for download on the Lighting Global website. Each test is done on six randomly selected product samples. Full product testing takes approximately four months to complete.



The Initial Screening Test

It is a test like the quality test but costs less and takes a shorter time. It provides rapid feedback on emerging products for manufacturers, distributors, government agents and non-governmental organisations. It shows the likelihood of a product passing the quality test. The product samples are provided by the company for screening. Only three samples are needed, and it takes about six weeks for the test to be completed. Because of the small sample size and lack of random sampling, the results from these tests cannot be used to demonstrate conformity with the quality standards.



Market Check Test

one to six samples are randomly selected from the retail market and tested to confirm whether they meet the quality standards.

The license for products that pass the quality tests are valid for two years. However, if a market test check is done and the results show that the product no longer meets the IEC standards, the IEC/ Lighting Global Certificate is revoked. The market test check is covered in more details below.

Market Check Test

Once the stand-alone solar standards have been adopted, enforcement is the next step. The market check test⁷ is part of the enforcement process and is done in approved laboratories that have the necessary equipment and trained staff. If a country chooses to carry out market check testing as part of their market surveillance strategy, regulatory authorities will need access to laboratories where products in the market can be tested randomly. The

Lighting Global Programme supports and collaborates with testing laboratories in Ethiopia, Kenya, Nigeria and Tanzania. The laboratories can provide testing services for national market surveillance efforts and for those of neighbouring countries.

The testing laboratories and random market check tests are an important part of a standards implementation strategy because they contribute to:



Enforcement of standards: The ability to do random tests on products available in the market strengthens the government's ability to enforce standards.



Verification: verification of products based on the documentation presented at the port of entry is usually not enough. Random market tests help to confirm that the products entering the market meet the required specifications.



Act as a deterrent: The random market checks also act as a deterrent to businesspeople who may want to circumvent the system.



Protects consumers from exploitation: There are instances where companies import a batch of products that meet the required standards and later import products that are of slightly lower quality. The only way to identify such malpractices is by random market tests. This goes a long way in protecting consumers who in many cases are not aware of the standards.

Sustainable Laboratories

All the solar testing laboratories are required to have calibrated equipment and skilled staff. Obtaining a functional laboratory complete with the necessary equipment and skilled staff, takes about one year. Once this is achieved, the laboratories go through the accreditation process. Accreditation takes time and requires resources and expertise as guided by the International Standards Organisation certification guidelines⁸. Once accredited with ISO 17025 for IEC test

methods, the laboratories can then charge for the tests they conduct, offer training at a cost and participate in inter-laboratory testing. With the money they charge for their services, combined with some operations and maintenance support from government, the laboratories can be sustainable. Currently, the only accredited laboratory in sub-Saharan Africa is at the University of Nairobi, Kenya.

Market Surveillance

Market surveillance consists of activities and measures taken by designated authorities to ensure that products comply with the requirements set out in the relevant legislation and do not endanger health, safety or any other aspect of public interest⁹. Surveillance models include:



Statutory Surveillance

the bureau of standards conducts mandatory checks on the solar products in the market. These are carried out regularly (like annually) and are useful in identifying poor-quality and counterfeit products in the market.



Risk Surveillance

areas that are potentially risky due to their proximity to boarder points or other vulnerabilities are identified. Enforcement officers then conduct spot checks on the solar products being sold in retail stores. This can also be done in areas where poor quality products are likely to have high impact on the consumers or the environment.



Random Surveillance

samples of solar products are randomly picked from retail stores to confirm whether the products meet the quality standards.

The Quality Assurance department under Lighting Global (now VeraSol) has been conducting surveillance in countries that have advanced solar markets to avoid market spoilage and erosion of consumer confidence.

Pre-export Verification of Conformity

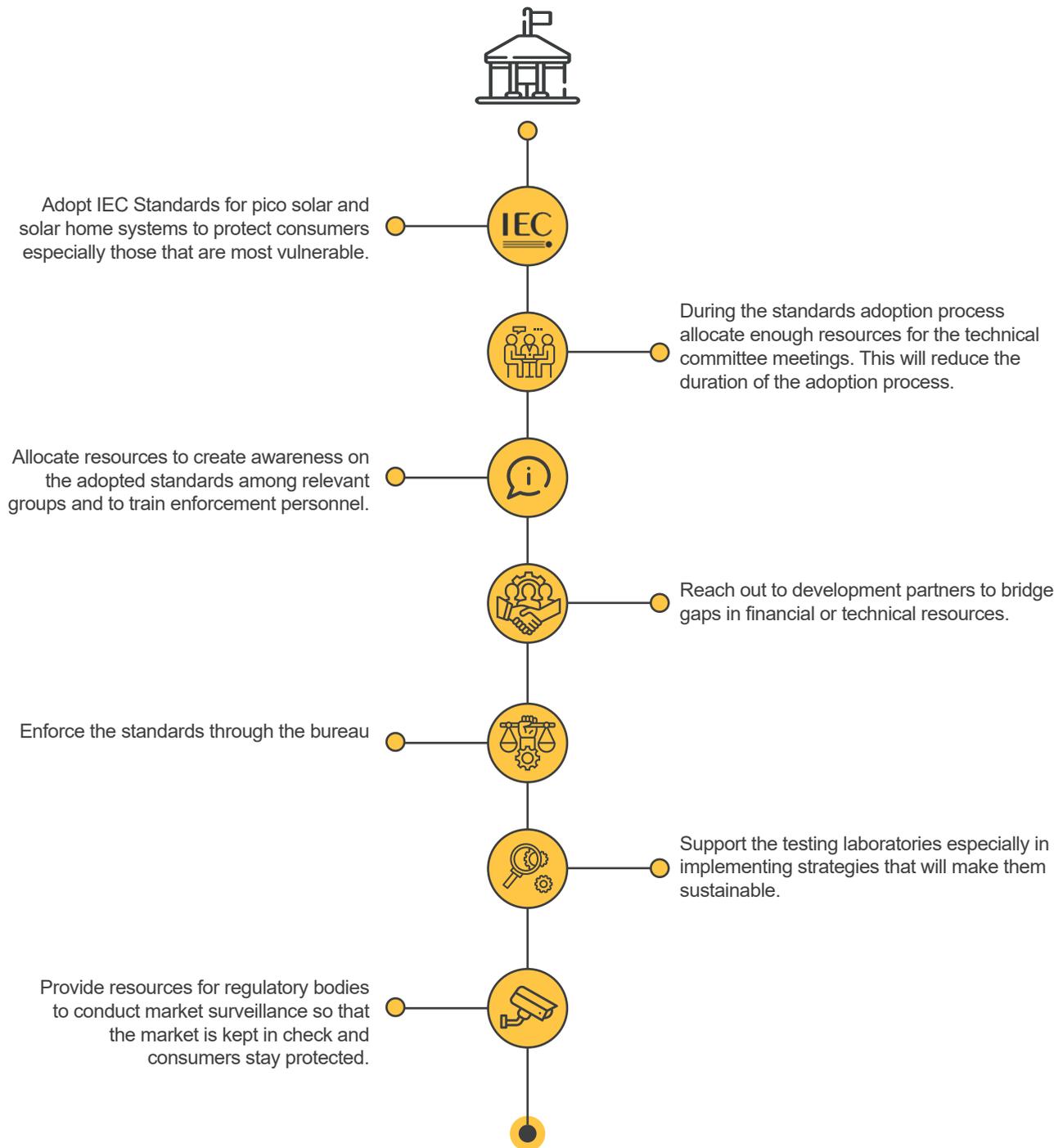
Pre-export verification of conformity (PVoC) is an assessment procedure applied at the country of supply/origin to ensure compliance of imported products with applicable standards, approved specifications or applicable regulations¹⁰. It is part of the enforcement process and supplements market surveillance efforts. Before the products leave the country of origin, a Certificate of Conformity is issued by an authorised PVoC Agent to show that the consignment of products, meets the required standards. Kenya has been using PVoC to enforce standards for pico solar.

What Not to Do

Where PVoC is not in place, it is critical that regulatory bodies do not conduct mandatory pre-testing of products after they have arrived at the port. This is because the quality test takes about four months and can affect the availability of good-quality products in the market. In one country where the regulator insisted on doing the test while

the good quality products were held at the port for four months, poor quality products flooded the market. The recommendation is to process the products and then conduct a market check test

Conclusion: Action for Governments



References

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- ³Rotich, K. (2019) Solar dealers decry increase in fakes, Business Daily
- ⁴Lighting Global Quality Assurance Programme
- ⁵International Electrotechnical Commission
- ⁷Lighting Global Quality Assurance Framework
- ⁸Certification and conformity, ISO
- ⁹Market Surveillance Programme – European Commission
- ¹⁰Kenya Bureau of Standards: Pre-export verification of conformity.

This brief is authored by the IFC Lighting Global Team
and the Africa Clean Energy Technical Assistance Facility



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