ETHIOPIAN STAND-ALONE SOLAR STANDARDS: GUIDANCE FOR ADOPTION AND IMPLEMENTATION

June 2021

Africa Clean Energy
Catalysing Africa's Solar Markets

TETRA TECH
International Development

UKaid
from the British people

Foreign, Commonwealth and Development Office (FCDO)
Africa Clean Energy Technical Assistance Facility

June 2021
Tetra Tech International Development

Prosperity House, Westlands Road,
P.O. Box 4320, 00100, Nairobi, Kenya.
Tel: +254 (0)20 271 0485

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS

ACE TAF	Africa Clean Energy Technical Assistance Facility
COMESA	Common Market for Eastern and Southern Africa
ECAE	Ethiopian Conformity Assessment Enterprise
EEA	Ethiopian Energy Authority
ESA	Ethiopia Standards Agency
GoE	Government of Ethiopia
IGAD	Intergovernmental Authority on Development
M&E	Monitoring and Evaluation
MCM	Market Check Method
MoTI	Ministry of Trade and Industry
MoWIE	Ministry of Water, Irrigation and Energy
PVoC	Pre-shipment Verification of Conformity
QA	Quality Assurance
SAS	Stand-Alone Solar
TC	Technical Committee

EXECUTIVE SUMMARY

The Ethiopian market for SAS products is now at a level of maturity that warrants increased compliance measures to protect consumers, promote continued market growth and improve energy access for Ethiopians. The Ethiopian government, through the Ethiopia Standards Agency (ESA), Ethiopian Conformity Assessment Enterprise (ECAE), Ministry of Water, Irrigation and Energy (MoWIE), Ministry of Trade and Industry (MoTI) and others, has made commendable progress in developing and implementing policies to promote high-quality solar equipment and energy access.

This document provides recommendations to guide relevant stakeholders in the development and implementation of a quality assurance (QA) framework for stand-alone solar (SAS) products in Ethiopia. In the context of this document, products are photovoltaic (PV) powered, direct current (DC) energy systems with peak power of less than 350 watts, as defined by the IEC quality standards and laboratory test methods (IEC TS 62257-9-8:2020 and IEC TS 62257-9-5:2018), respectively.

The guidance presented in this document is organised according to the recommended sequencing and principal elements that form a comprehensive and best-practice approach to QA. This document is intended to be used by Ethiopia's institutional actors as a tool to guide their activities as they work together to build the QA framework for SAS products. Recommendations provided herein cover early-stage activities like developing a strategy and creating a detailed implementation plan, as well as successive steps such as establishing and operationalising systems for standards compliance, market surveillance, enforcement and monitoring and evaluation.

Carrying out the recommendations provided in this document will rely heavily on the policy structures that are in place and being built, as well as the continued commitment of public and private sector stakeholders. An effective compliance framework for SAS products in Ethiopia will also require allocation of funds and resources to put the framework in place and to allow sustainable operation. While there are some challenges to be encountered along the way, we believe that through cooperation, planning and dedication, Ethiopia is positioned to be a global leader in implementation of quality assurance for SAS products.

1 INTRODUCTION

Through goal setting, planning and taking coordinated action, Ethiopia's public and private sector stakeholders have worked together to lay the groundwork for a quality assurance (QA) framework for stand-alone solar (SAS) products. At the time of writing this document, the Government of Ethiopia (GoE) has finalised the adoption of national standards and is beginning to reinforce its local testing capacity, as well as establishing a robust structure for compliance. This section provides a brief overview of the current status of Ethiopia's QA framework for SAS products and the institutional actors.

1.1. International Standards for SAS

In June 2020, the IEC Technical Committee 82 published IEC TS 62257-9-8, which contains quality standards for pico-solar products and solar home system (SHS) kits with PV modules rated up to 350 watts. These quality standards are accompanied by IEC TS 62257-9-5:2018, which describes the test methods that are used to determine if products meet the quality standards.

1.2. Harmonisation of National Standards

The Ethiopia Standards Agency (ESA) constituted a technical committee (TC) to review the IEC quality standards and the current edition of the IEC test methods. The committee assessed the standards in the context of Ethiopia to determine if they should replace the existing Ethiopian quality standards for pico-solar products and SHS kits, as well as the corresponding test methods (CES 140:2015, ES 6087:2018). In late September 2020, the TC found that the IEC quality standards are applicable to the Ethiopian market and has moved to harmonise the Ethiopian standards with the IEC quality standards and test methods. In April 2021, the Ethiopian National Standards Council approved the following quality standards for SAS kits:

- ES IEC TS 62257-9-8:2021: Renewable energy and hybrid system for rural electrification. Part 9-8: Integrated system requirements for stand-alone renewable energy products with power rating less than or equal to 350W.
- ES IEC TS 62257-9-5:2021: Recommendation for renewable energy and hybrid system for rural electrification. Part 9-5: Integrated systems – Laboratory evaluation of stand-alone renewable energy products for rural electrification.

1.3. Conformity Assessment, Quality Mark and Market Surveillance

To leverage adoption of the IEC standards for SAS kits, GoE is strengthening the national QA framework by building a robust conformity assessment programme, which includes administering a quality label and carrying out market surveillance activities.

The Africa Clean Energy Technical Facility (ACE TAF) is supporting the Ministry of Trade and Industry (MoTI) in the development of a pre-shipment verification of conformity (PVoC) programme that will be used to check that imported SAS products meet Ethiopian standards before they leave their ports of origin.

In addition to its role in standardisation, ESA shall be responsible for the issuance of the **national quality mark for imported SAS kits** that comply with the national quality standards (ES IEC TS 62257-9-8:2021). VeraSol, with support from the World Bank and in collaboration with ACE TAF, offers expert technical assistance on good practice for the administration, issuance and enforcement of a quality mark or label for SAS kits.

With support from ACE TAF, the off-grid solar test lab at the Ethiopian Conformity Assessment Enterprise (ECAE) is receiving lab equipment and training that will enable it to test products according to the applicable IEC methods (ES IEC TS 62257-9-5:2021). Once equipped and trained, ECAE will be able to carry out market surveillance testing and potentially expand their services to further support the market for SAS systems.

1.4. Institutional Actors

The key institutional actors in Ethiopia involved in the QA framework for SAS products are described below, and the general area of responsibility for each actor is presented in Table 1. As these stakeholders proceed in developing a standards implementation strategy, each actor's responsibilities will need to be clearly defined along with detailed processes and procedures.

- **Ministry of Water, Irrigation and Energy (MoWIE)** develops, manages and supplies energy resources equitably and sustainably. It is also charged with ensuring renewable energy supply.
- **Ministry of Trade and Industry (MoTI)** has various roles, but most relevant to QA for SAS are controlling the quality of exported and imported goods and prohibiting the importation and exportation of goods that do not comply with mandatory Ethiopian Standards. The ministry also carries out assessments and arranges agreements with third-party conformity assessment bodies abroad to conduct pre-shipment inspection.
- **Ethiopian Energy Authority (EEA)** is authorised to fully undertake the regulatory activities of the energy sector.
- **Ethiopia Conformity Assessment Enterprise (ECAE)** is the major conformity assessment organisation in the country, providing testing, inspection and certification services to the industry and the public.
- **Ethiopia Standards Agency (ESA)** develops national standards and administers the national standard quality mark.

Table 1: Areas of responsibility for institutions involved in Ethiopia's QA framework for SAS

Institutional actors	Responsibility area
MoWIE, MoTI, Technical Working Group (TWG)	Strategy and policy
ESA	Standards development and standards mark administration
MoTI, MoWIE, EEA	Regulations
ESA	Standards programme administrator
MoWIE, ESA, MoTI, ECAE	Standards programme communication
ESA, ECAE	Compliance
International test labs, ECAE	Testing and research centre
MoTI	Import checks

2. SUMMARY OF KEY RECOMMENDATIONS

While Ethiopia has several elements of a national SAS QA framework in place and under development, there are some additional steps to be taken for the framework to be fully operational and effective. Table 2 presents recommended actions for developing and implementing a comprehensive national quality assurance framework for SAS products. It also suggests timing for each action and, in most cases, proposes which organisation(s) may be responsible. **The timing, sequencing and parties responsible for each workstream and action should be discussed and validated through stakeholder consultation.** Elements of the proposed QA framework and recommendations for implementing a comprehensive QA strategy are elaborated upon in the subsequent sections.

Table 2: Recommended actions for development and implementation of Ethiopian QA framework for SAS products

Recommended actions	Expected timing[1]				
	Immediate	short term	medium term	Long term	Responsible
Goal setting and planning for QA framework					**MoWIE**
Convene key stakeholders in the "Quality and Standards" sub-working group of the Off-Grid Task Force to set milestones and a timeline for roll-out of QA activities	x				**MoWIE**
Workshop to present a draft implementation plan to private and public sector actors	x				**MoWIE, ESA**
Address stakeholder input, finalise the implementation plan and begin conducting activities described therein (including communicating the final strategy to stakeholders)		x			**ESA, MoTI, MoWIE, ECAE, EEA**
Standards adoption and transition period					**ESA**
Draft strategy for transitioning to new standards; i.e. SAS products that meet either the previous Ethiopian standards or the IEC quality standards are, for a set period of time, allowed to be imported, assembled or manufactured in Ethiopia	x				**ESA/ MOTI/EEA**
Present proposed transition strategy and receive feedback as part of the recommended stakeholder workshop	x				**ESA**
Address stakeholder input, finalise the transition strategy	x				**ESA**
Stakeholder outreach for public and private sectors, civil society and consumers	x	x			**ESA**

Immediate: less than 3 months | Short term: 3-6 months | Medium term: 6 months–2 years | Long term: more than 2 years

Conformity assessment and quality mark for SAS products					MoTI / ECAE
Finalise and distribute the PVoC brief to stakeholders	x				MoTI / ECAE
Undertake the activities laid out in the PVoC implementation plan	x				MoTI / ECAE
Engage with approved PVoC companies to familiarise them with SAS products and the relevant IEC standards, and to facilitate document assessment and physical inspection			x		MoTI / ECAE
Seek technical assistance to carry out the PVoC implementation plan and support PVoC companies as needed			x		MoTI / ECAE
Develop and pilot a quality marking scheme for standards-compliant SAS kits, including an online platform for recording and accessing data			x	x	ESA, MoTI/ ECAE
Market surveillance for SAS products					**ECAE / MoTI**
Develop market surveillance strategy and implementation plan with input from key partners and industry players		x			ECAE
Conduct needs assessment: Determine resources and capacities needed to establish and run the programme		x			ECAE
Establish a procedure and forms for visual inspection and assessment of quality mark and consumer-facing information			x		ECAE
Establish protocol, reporting requirements and forms for product sampling			x		ECAE
Establish and employ a system for recording and reporting key information about market surveillance activities			x		ECAE
Train ECAE and MoTI staff as well as other personnel involved in conducting market surveillance activities			x		ECAE
ECAE becomes a member of VeraSol's Test Lab Network			x		ECAE
ECAE receive ISO 17025 accreditation for IEC TS 62257-9-5				x	ECAE

SAS standards enforcement					MoTI
Engage with key public and private sector actors in developing appropriate sanctions for non-compliance. This may be part of the aforementioned workshop	x				MoTI
Formalise the protocol for enforcement actions that are taken for different types of infractions		x			MoTI
Provide enforcement agents who will handle SAS products with the specific training and tools needed to carry out their roles			x		ECAE / MoTI
Establish mechanism(s) for informing companies, consumers and relevant government agencies of SAS standards enforcement interventions			x		MoTI/ECAE
Monitoring & evaluation of QA framework for SAS					**MoTI/ECAE**
Develop an M&E plan and tools for SAS in line with best practice			x		MoTI/ECAE
Train staff responsible for conducting M&E			x		MoTI/ECAE
Issue M&E reports describing compliance activities and key indicators to implementing agencies on a regular basis			x	x	MoTI/ECAE
Key decision-makers convene at least annually to discuss M&E findings and to determine what adjustments should be made, if any			x	x	MoTI/ECAE
Communicating QA framework and activities					
Inform public and private sector actors of the standards and their impact on stakeholders via validation workshop	x				ESA
Maintain close communication with private sector stakeholders through distribution of guidance documents on compliance and dialogue via existing coordination platforms	x	x	x	x	MoWIE
Develop and carry out consumer awareness campaign to inform and educate public about the importance of SAS product quality, the national standards and how to find out if a product meets the standards		x	x		ESA/MoWIE
Inform private sector of market surveillance activities and enforcement actions that have been taken, thereby deterring future acts of non-compliance			x	x	ECAE/MOTI

Regional collaboration on QA for SAS					ESA
Explore collaboration with other standards bodies and national SAS compliance programmes in the region.			x		ESA
Advocate within IGAD and/or COMESA for harmonisation with the IEC quality standards and test methods for SAS products			x		ESA
Once the ECAE test lab for SAS products is ISO 17025 accredited, promote utilisation of ECAE and other accredited labs for QA activities in the region				x	ESA

3. KEY STEPS FOR DESIGNING AND IMPLEMENTING QA FRAMEWORK FOR SAS

The significant progress made by GoE, as well as the recommendations described in this document, are guided by the best-practice approach for developing and realising a QA framework for SAS. Figure 1 summarises the main elements of a QA framework and gives an indication of the sequencing of activities. The process begins with goal setting, followed by a planning stage. Subsequent phases, such as adopting standards and developing a compliance framework, often run in parallel to each other and to communications and capacity-building efforts. The key steps described in the following pages are presented in an order similar to Figure 1, although in practice, some activities are and will be implemented concurrently.

Figure 1: Conceptual schematic of best-practice approach for standards and implementation

3.1 Goal Setting and Planning

An appropriate and effective QA framework is developed by convening stakeholders to establish a common vision and working together to shape a plan to achieve agreed-upon goals and objectives.

GoE and other key actors in the solar sector have adopted a compulsory national standard for SAS products, which is currently underway. Work is also in progress to put in place conformity assessment and market surveillance programmes for SAS products. MoTI is finalising a PVoC programme that will be used to assess conformity of imported SAS products. ECAE will receive additional laboratory equipment and training, which will enable it to carry out market surveillance testing on SAS products.

The government has made significant (and commendable) progress towards developing and implementing a comprehensive national QA framework for SAS products. With key elements of the framework being put into place, additional coordination among stakeholders is now needed for final planning and roll-out.

Framework implementers should convene to set a timeline and milestones for QA framework activities, which include transitioning to the new standards, running the PVoC programme, carrying out market surveillance activities and communicating to stakeholders. Roles and responsibilities should be clearly defined, and each actor should identify the capacities and resources that will be needed to carry out their duties.

Recommendations for goal setting and planning

- Convene key stakeholders in the Quality and Standards sub-working group of the Off-Grid Task Force to set milestones and a timeline for roll-out of QA activities.
- Facilitate stakeholder feedback and buy-in by holding a workshop to present a draft implementation plan to private and public sector actors.
- Address stakeholder input, finalise the implementation plan, and begin conducting activities described therein (including communicating the final strategy to stakeholders).

3.2 Standards Adoption

The adoption phase of the process is characterised by work led by the relevant technical committee, which is housed under ESA. The main steps in adopting standards are summarised in Figure 2.

Figure 2: Summary of standards adoption process

At the time of writing, ESA and its partners were advancing through the final steps of the standards adoption process. The IEC quality standards and test methods for SAS products have been adopted, and are now awaiting approval by the relevant ministerial council. Upon approval, an announcement should be made to all stakeholders involved in and impacted by the new standards.

Recommendations for standards adoption

Upon final approval of the standards, inform stakeholders and the general public of the adoption. This outreach should also summarise when and how the standards will be operational and how stakeholders can participate and obtain additional information.

3.3 Transition Period to IEC Standards

Before the IEC quality standards become operational in Ethiopia, it is imperative to determine how to shift from the existing national standards in a way that is least disruptive to good quality products entering the market. We recommend a transition period, during which time SAS products that meet either the previous Ethiopian standards or the IEC quality standards are allowed to be imported, assembled or manufactured in Ethiopia. By establishing a transition period, the market can continue to be protected from low-quality products.

Effective January 2021, VeraSol has required that all SAS products seeking VeraSol certification be tested according to the most recent version of the IEC test methods (IEC TS 62257-9-5: 2018) and evaluated to the IEC quality standards (IEC TS 62257-9-8). Since test results are valid for a period of two years, we anticipate that many products that meet the Lighting Global Quality Standards will continue to be manufactured and imported into key markets (like Ethiopia) until late 2022. If Ethiopia requires that products meet the IEC standards with little or no time for the private sector to re-test and recertify products, it could create a void in the market that may likely be filled by substandard products. This scenario could have a profoundly negative impact on Ethiopia's solar market growth and energy access goals.

When determining an approach to address challenges linked to the two sets of standards, the government should encourage input from stakeholders in the solar industry. By taking into account their perspectives, GoE is more likely to address the private sector's concerns and receive their buy-in, which is critical for the success of the QA framework.

Expert technical assistance from VeraSol is available to guide this conversation by sharing best-practice approaches and case studies from other countries, and by facilitating assessment of potential mechanisms for transitioning to the new standards.

Recommendations for transitioning to IEC standards

- Present a proposed transition strategy and receive feedback as part of the recommended stakeholder workshop.
- Address stakeholder input, finalise the transition strategy and take actions described therein (including communicating the final approach to stakeholders).
- Put in place a transition period, during which time SAS products that meet either the previous Ethiopian standards or the IEC standards are allowed to be imported, assembled or manufactured in Ethiopia. Accepting products conforming with either standard through 2022 is advisable

3.4 Conformity Assessment and Quality Mark for SAS Products

At the time of writing, Ethiopia is putting in place a PVoC programme for SAS products. This programme is intended to ensure that SAS products imported into the country adhere to the newly adopted standards before they arrive at Ethiopian ports of entry. With support from ACE TAF, MoTI is developing a PVoC implementation plan and a PVoC brief.

The implementation plan is intended to be used by programme implementors to assist them in getting all the necessary elements in place. The document includes a set of clear recommendations and a workplan for the programme implementors. The PVoC brief is intended for the broad set of public and private sector stakeholders linked to conformity assessment of SAS products. The document provides an overview of Ethiopia's PVoC programme, including information about "certification routes", fees and contact information for additional information.

With some of the main elements of the PVoC programme now being put into place, there is further work to complete before it can be fully operational. Stakeholders should undertake the activities laid out in the PVoC implementation plan. In addition, the appointed PVoC companies should be given guidance on the new Ethiopian SAS standard and how to assess conformity. Expert technical assistance from VeraSol is available to equip PVoC companies to correctly, consistently and effectively determine if products meet the IEC quality standards.

The PVoC implementation plan proposes use of an import standardisation mark (ISM) for imported SAS products that comply with the applicable national standards (ES IEC TS 62257-9-8:2021). As administrator of the national quality mark, ESA should be responsible for developing and executing the marking scheme. According to the PVoC implementation plan, ESA shall issue ISM stickers to be placed on SAS products that have been imported via PVoC, and which have a valid certificate of conformity (CoC) indicating that they comply with the aforementioned quality standard.

It is recommended that ESA use an online platform to record information about SAS product registration and the issuance of ISM stickers for standards-compliant products. This database should be accessible to market surveillance agents, allowing them to carry out real-time validation and verification of goods carrying the quality mark. Information from the database should also be made easily accessible to consumers to directly authenticate the goods before purchase. With support from the World Bank and collaboration with ACE TAF, VeraSol is offering expert technical assistance to ESA and partner institutions in the development of a quality marking framework for SAS kits.

Recommendations for conformity assessment and quality mark for SAS

- Undertake the activities laid out in the PVoC implementation plan.
- Finalise and distribute the PVoC brief to stakeholders.
- Engage with approved PVoC companies to familiarise them with SAS products and the relevant IEC standards, and facilitate document assessment and physical inspection.
- Develop and pilot a quality marking scheme for standards-compliant SAS kits, including an online platform for recording and accessing data.
- Seek technical assistance in carrying out the PVoC implementation plan and support PVoC companies, as needed.

3.5 Market Surveillance for SAS Products

Market surveillance is a coordinated operation typically carried out by government agencies with the objective of identifying suspicious products in the market and assessing them to determine if they comply with applicable standards. Actions are taken to correct cases of non-compliance and to deter future infractions, thereby helping to maintain a high level of product quality in the market.

Market surveillance activities can include inspection (e.g. certification documents, consumer-facing and online information, and physical samples) as well as laboratory testing. Activities should be targeted such that resources are most effectively used to ensure that products in the market meet the national standards.

To begin building a national market surveillance programme, the implementing agencies should define the overall strategy and the methodologies to be used. An assessment of the required capacities and resources should be carried out to identify any gaps. Actions can then be taken to build capacities and secure the necessary resources to establish and operate the programme. To monitor, evaluate and improve the effectiveness of market surveillance activities, it is important to establish a protocol and system for recording and organising programme data. This section recommends steps to take in the development and implementation of a market surveillance programme for SAS products. The process is discussed according to the following principal actions:

1. Prepare market surveillance strategy and implementation plan.
2. Determine market surveillance approach.
3. Assess resource and capacity needs.
4. Set procedure for screening and full analysis of samples.
5. Conduct initial laboratory testing, reporting and evaluation of results.
6. Determine market surveillance follow-up actions.
7. Record and report market surveillance activities.
8. Train market surveillance and compliance personnel.
9. Laboratory capacity building at ECAE.

3.5.1. Prepare market surveillance strategy and implementation plan

ESA has contracted ECAE to conduct market surveillance for imported as well as locally manufactured or assembled products. MoTI is also involved in regulating goods in Ethiopia at the regional and federal levels. This suggests the need of a multi-agency approach to market surveillance. At the regional level, activities could be carried out by a combination of ECAE and MoTI. At the federal level, specifically at the ports of entry, MoTI appears best positioned to handle market surveillance.

We recommend, therefore, that a market surveillance strategy and implementation plan be developed by ECAE and MoTI, with input from key partners and industry players. The strategy should identify the goals and objectives of the market surveillance programme, which should be both achievable and measurable. The strategy should describe the types of activities to be undertaken, how the programme is to be operated, and clearly define roles and responsibilities. The strategy should be accompanied by an implementation plan that sets milestones and a timeline for developing and executing the market surveillance programme.

3.5.2. Determine market surveillance approach

In creating a national strategy for market surveillance, the government must **determine if proactive and/or reactive approaches will be used.** Proactive market surveillance is carried out according to an established routine or a set number of interventions. In a reactive approach, on the other hand, interventions are initiated by reports of incidents, user complaints, safety concerns and competitor reports, among others. Determining which approach is most appropriate should be based on discussion between ECAE and MoTI as part of the market surveillance strategy development.

Regardless of whether a proactive and/or reactive approach is adopted, designers of the market surveillance programme will need to specify the means by which products are identified for inspection/testing. **We recommend that products in the Ethiopian market be targeted through risk-based assessment, which is typically the most cost-effective approach.** Risk-based selection relies on market monitoring and intelligence to target products for inspection and testing. Products, brands or models are prioritised for evaluation and/or testing based on a set of factors that increase the likelihood of non-conformity. Common factors include market vulnerability, history of non-compliance, high market share, low price compared to similar products, intelligence or complaints from individuals, groups, or organisations. Table 3 provides some key criteria that can help identify high-risk products in the market.

For this risk-based method to be successful in Ethiopia, there should be mechanisms in place for recording and accessing key information (e.g. scale of importation, Free on Board (FOB) price comparison, online sources and reports from civil society). As described in Section 3.4, a database of standards-compliant SAS products that are registered to affix the ISM sticker would be an extremely valuable resource for market surveillance. Up to date and easily accessible information will greatly facilitate identification of high-risk products through document review and market observation. **Successful market monitoring in Ethiopia will rely on coordination among ECAE, MoTI, ESA and other public, private and civil-society actors.**

Table 3: Specific criteria for determining high-risk factor of products

Specific criteria that can help identify a high-risk factor
Newer models
Products covered by new legislation
Products with high market share
Brands with history of non-compliance with other regulations
Suppliers with a demonstrated record of verification testing non-compliance
Models about which complaints have been received from third parties
International and local complaints or market intelligence
Ambiguities in the supplied technical documentation that is provided with the entry conditions, or certification and registration

While we do strongly recommend a risk-based approach for targeting market surveillance activities, it is useful to understand a "random" approach. In this approach, products or retail outlets are selected at random for testing and market inspections. Evaluating products selected at random can be relatively costly and may not find or correct many non-compliant cases, as compared to the risk-based approach. Random selection of products for market surveillance, however, can act as a deterrent to non-compliance. This strategy tends to be used when there is no data available or the authority has no previous experience with the specific product, sector or regulation.

3.5.3. Assess resource and capacity needs

Throughout the process of developing Ethiopia's market surveillance strategy and implementation plan, it is of utmost importance to consider the resources and capacities needed to set up and run the programme. A theoretically robust quality assurance framework is unlikely to achieve tangible results if any of the key elements are lacking what they need to operate. With this in mind, market surveillance programmes should be as resource efficient as possible and should have resource and capacity demands that fit within local constraints. Key elements to consider when assessing the required resource, capacities and potential gaps include, but are not limited to:

- Staff
- Funding (initial and ongoing)
- Institutional capacities
- Administrative capabilities
- Laboratory/infrastructure
- Data management tools
- Field equipment

3.5.4. Set procedure for screening and full analysis of samples

Ethiopia's market surveillance procedure for SAS products should specify where and how product samples are to be visually inspected and procured for testing. Product samples are typically inspected and procured for testing at ports of entry, warehouses, procurement centres, other bulk storage locations, retail outlets in the market, or informal selling outlets.

We recommend that visual inspection and screening of products' consumer-facing information play a key role in Ethiopia's market surveillance strategy. Thorough and systematic visual inspection can be an effective and resource-efficient way to identify instances of non-compliance and to target products for additional actions, including laboratory testing. To put in place the screening element of the market surveillance programme, **ECAE and MoTI should establish a procedure for visual inspection, validation of the quality mark and assessment of consumer-facing information, including a checklist and reporting form.**

Results from this analytical screening are used in two primary ways:

1. Identifying non-conformity due to lack of required consumer-facing information and quality mark (as set by the Ethiopian SAS quality standard) and/or other national requirements (e.g. label or quality mark).
2. Determining if the product is a candidate for laboratory testing (i.e. input for the risk-based assessment, as described above).

When a decision has been made that a product is to be subjected to laboratory testing, samples of the product need to be procured and sent to the laboratory. Collection, shipment and receipt of the product samples must be conducted according to a determined procedure, which should be aligned with the sampling requirements specified in the IEC test methods for SAS products (IEC TS 62257-9-5: 2018). **Establishing protocol, reporting requirements and forms for product sampling is necessary for successful market surveillance testing.**

3.5.5. Conduct initial laboratory testing, reporting and evaluation of results

Product samples procured from the Ethiopian market should be laboratory tested according to the Market Check Method (MCM), as described in IEC TS 62257-9-5: 2018. The MCM is a suite of tests specifically intended to be used as part of a market surveillance programme. Depending on the number and type of product samples being tested, laboratories can typically complete MCM testing in approximately four weeks. Initial MCM testing for market surveillance is usually done with a sample size of two for each test (a total of at least six samples is required).

Upon completion of MCM testing, the laboratory issues a detailed test report, which should also meet reporting requirements set by the IEC test methods and the national market surveillance programme. Results from the test report must then be compared to the Ethiopian SAS quality standards (harmonised with IEC TS 62257-9-8: 2020) to determine if the tested samples are in compliance. Findings from this evaluation should be detailed in a market surveillance testing conformity assessment report, where any non-conformities are clearly identified.

3.5.6. Determine market surveillance follow-up actions

After initial market surveillance testing and conformity assessment are completed, there should be a protocol for determining which follow-up actions to take for cases of non-compliance. When test results show that product samples fail to meet the standards, additional targeted testing on a larger set of samples may be needed. Due to this relatively small sample size for MCM testing (typically 2 samples), there is a possibility that the tested samples are not representative of the quality of the products in the market.

For example, if one sample out of the two units tested is defective, the test report would show that the product is clearly sub-standard. If a larger sample size is used, however, there's a higher likelihood that the test results correctly represent the quality of products in the market. For this reason, we recommend that a secondary check test is done on a larger sample size, and only targeting the specific tests that were failed in the first round of testing. **We suggest that Ethiopia uses a process of primary and secondary market check testing,** similar to what VeraSol follows for its programmatic market surveillance, described in Figure 3.

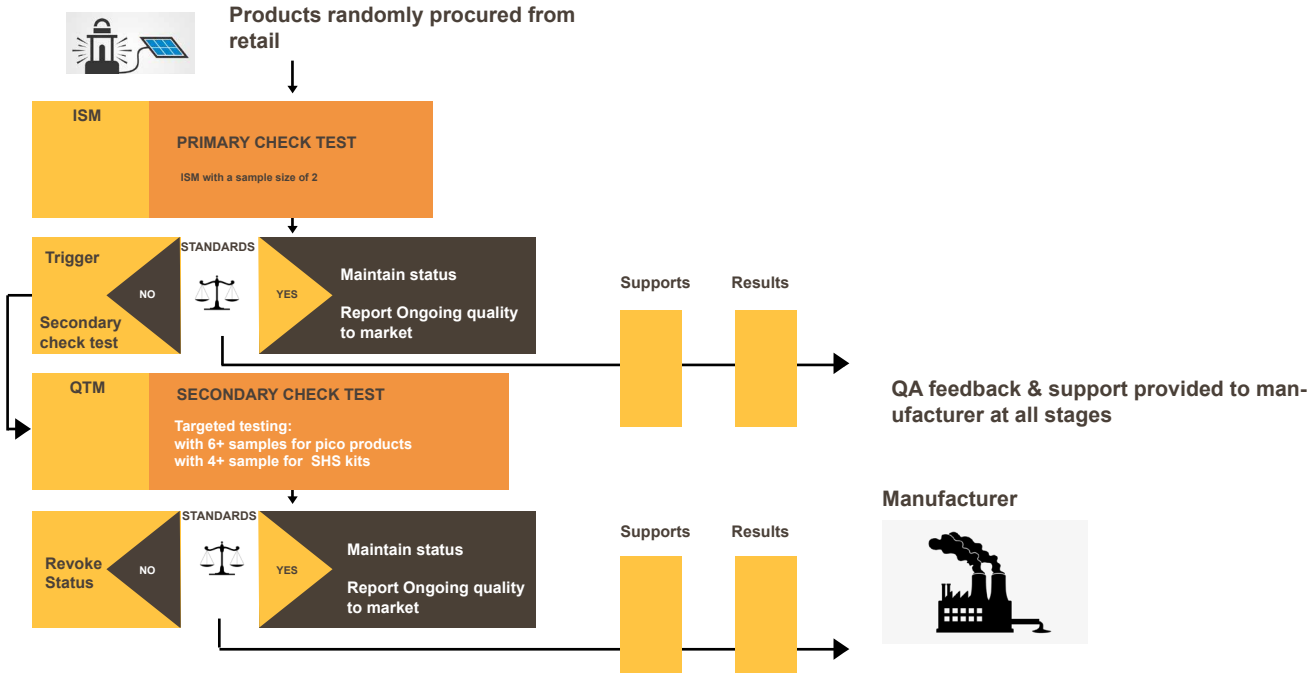

Figure 3: VeraSol programmatic market surveillance process

When a final determination of standards compliance or non-compliance is made for a product assessed under the market surveillance programme, the findings should be communicated to the appropriate parties. Corrective actions should be taken, which should be proportional to the type and severity of infraction(s). Enforcement of the standards is further addressed in Section 3.6.

3.5.7. Record and report market surveillance activities

To facilitate programme efficiency and monitoring, **key information about market surveillance activities should be recorded.** Data and documentation should be saved electronically and organised in a way that eases analysis both of product conformity and of the market surveillance programme itself.

In addition, **a comprehensive report of activities carried out under the market surveillance programme should be issued on a regular basis** (e.g. quarterly or semi-annually). The report should be shared among relevant departments in the implementing agencies and others as deemed appropriate/useful (e.g. MoWIE, ESA, EEA). Communication of market surveillance activities should also be made available to market actors and the general public, which is further addressed in Section 3.8.

3.5.8. Train market surveillance and compliance personnel

According to the proposed framework, staff from ECAE shall be responsible for conducting market surveillance activities across Ethiopia. Staff from MoTI shall also carry out surveillance activities at the federal level and at ports of entry. As Ethiopia's regulatory body responsible for authenticating third-party quality certificates and regulating imported goods at the port of entry, MoTI employees also play the role of compliance officers. This suggests the need for training across a relatively wide set of themes for ECAE and MoTI to be fully prepared for implementation.

Overarching and targeted training should be provided to ECAE and MoTI staff, as well as any other personnel who will be involved in conducting market surveillance activities. All implementers of the programme should receive basic training covering the products and technologies, standards, how the market surveillance programme works and Ethiopia's compliance framework for SAS products as a whole. Personnel who will be responsible for market monitoring, evaluation of documentation, visual inspection and product sampling should receive additional deep-dive training on how to carry out these specific activities. Staff from MoTI who are involved in standards compliance for SAS products should receive additional training that focuses on applicable regulations and procedures. All training materials should be made available to ECAE and MoTI staff for reference and for training of new personnel.

3.5.9. Laboratory capacity building at ECAE

ECAE is expected to carry out laboratory testing, reporting and evaluation of results for the national market surveillance programme. As mentioned previously, ECAE is receiving additional equipment and training that will allow them to test SAS products according to the applicable IEC test methods.

Before initiating market surveillance testing, ECAE should complete the training to be delivered by ACE TAF and show a high level of competence testing SAS products. **We recommend that becoming a member of VeraSol's Test Lab Network be a prerequisite for ECAE to begin conducting market surveillance testing.** This will assure that the SAS laboratory at ECAE is fully capable of producing timely and accurate reports, as well as allowing the lab to participate in inter-laboratory comparison testing, which is a requirement for ISO 17025 accreditation.

Recommendations for market surveillance

- A market surveillance strategy and implementation plan should be developed by ECAE and MoTI, with input from key partners and industry players.
- Determine if proactive and/or reactive approaches will be used.
- Use risk-based assessment to target products for market surveillance, which should be based on input from market monitoring.
- Use product registration database to verify validity of ISM stickers on standards-compliant SAS products.
- Determine what resources and capacities are needed to set up and run the programme, and carry out a needs assessment.
- Establish a procedure and forms for visual inspection and assessment of consumer-facing information.
- Establish protocol, reporting requirements and forms for product sampling.
- Laboratory testing for market surveillance should be done according to MCM, as described in IEC TS 62257-9-5: 2018.
- Use primary and secondary market check testing as appropriate.
- Establish and employ a system for recording and reporting key information about market surveillance activities.
- Training should be provided to ECAE and MoTI staff, as well as any other personnel who will be involved in conducting market surveillance activities.
- ECAE should be become a member of VeraSol's Test Lab Network as a prerequisite to begin conducting market surveillance testing.

3.6. SAS Product Standards Enforcement

Once non-compliance has been identified through the market surveillance process, consequences of the offence must be considered to determine a suitable enforcement approach. A successful enforcement regime enables authorities to respond in a timely manner and to minimise the impact of the offence on consumers and other market participants. It is extremely important to acknowledge that some types of non-compliance are more grievous than others. Relatively minor issues (e.g. failing to meet a consumer-facing information requirement) shouldn't be treated in the same way as more serious issues (e.g. non-functionality, failure of main system components or failing to meet safety requirements). In an ideal situation, responses to non-compliance should start with the least severe action and escalate to the more severe, depending on the type of non-compliance and the responsiveness of the transgressor.

Prior to initiating market surveillance activities for SAS products, there should be a formalised protocol for the enforcement actions that are taken for different types of infractions. As a starting point, the enforcing agency should reference any existing standards enforcement protocol for related product types, e.g. consumer electronics, energy generating devices, appliances, etc. The enforcement agency should also make sure that their approach is aligned with any federal, state or other regulations that dictate what enforcement measures are prescribed or allowed.

When establishing a set of enforcement actions, it is useful to categorise types of infractions and place them in order of severity. Infractions to consider should include product non-conformity (i.e. if/how the product fails to meet the quality standard) as well as regulatory non-compliance (i.e. if/how the private party responsible for importing, distributing or selling fails to comply with Ethiopian regulations). When the full range of potential infractions is in order, proportional enforcement actions should be assigned accordingly. The consequences for non-compliance should be clearly defined, easily actionable and verifiable. **We recommend that MoTI engage with key public and private sector actors such as the renewable energy industry association in developing appropriate sanctions for defaulters,** with consideration given to the nature of the SAS sector and consumer protection.

3.6.1 Carrying out enforcement activities

After the standards enforcement protocol is developed and approved, the compliance authority is then responsible for carrying out enforcement measures. **Enforcement agents who will handle SAS products should be provided with the specific training and tools needed to carry out their role.** These agents should be capable of assessing the severity and impact of instances of non-compliance, determining the actions to be taken (in consideration of both formal and informal actions), collecting and evaluating any necessary evidence, taking action and coordinating with other bodies as needed. An approved format for reporting enforcement actions should be used for monitoring and evaluation (M&E) and for communicating with other public sector actors.

3.6.2 Informing stakeholders of enforcement actions

Enforcing standards corrects non-compliance and can also deter future offences by communicating enforcement activities to sector stakeholders. Standards enforcement can be best leveraged to discourage non-compliance by setting and using a communication plan. **We recommend that the compliance authority establishes a simple yet effective approach to inform companies, consumers and relevant government agencies of SAS standards enforcement interventions.** The plan should identify the target audience, key messaging and approximate frequency, and make use of media and existing channels of communication most likely to be seen by key stakeholders.

Recommendations for standards enforcement

- Formalise the protocol for enforcement actions that are taken for different types of infractions.
- MoTI should engage with key public and private sector actors such as the renewable energy industry association in developing appropriate sanctions for non-compliance.
- Provide enforcement agents who will handle SAS products with the specific training and tools needed to perform their role.
- The compliance authority should establish a simple yet effective approach to inform companies, consumers and relevant government agencies of SAS standards enforcement interventions.

3.7. Monitoring and Evaluation (M&E)

Regularly monitoring and evaluating of Ethiopia's SAS compliance programme is necessary to improve effectiveness and justify investment in the programme. Well-structured M&E provides a clear picture of the inputs, outputs and results, which allows implementers to make informed decisions about the overall strategy and specific activities carried out under the programme.

Monitoring is the systematic and routine collection of information from standards enforcement operations in order to:

- Provide a consolidated source of information to show enforcement progress.
- Allow ECAE, MoTI and other relevant stakeholders and market actors to learn from each other's experiences on SAS standards enforcement.
- Generate reports that contribute to transparency and accountability, and allow for lessons to be shared more easily.
- Reveal mistakes on product compliance and offer paths for learning and improvement.
- Provide the basis for questioning and testing assumptions.
- Provide a means for programmes and interventions to learn from their M&E report and to incorporate them into policy and practice.
- Present a more robust basis for raising funds and influencing policy.

Data acquired through monitoring must then be evaluated in a systematic and objective way to assess the impact and other key indicators of SAS standards enforcement activities. Evaluations appraise data and information that informs strategic decisions, thus improving the process of standards implementation.

Standards enforcement evaluations should help to draw conclusions on five main aspects.

1. **Relevance**: Relevance of enforcement to the target group, which determines data output.
2. **Effectiveness**: Measure of level of compliance attained.
3. **Efficiency**: Both qualitative and quantitative output of the enforcement programme to the resource input for implementation.
4. **Impact**: Both positive and negative impact produced by the enforcement programme and variables driving the impact.
5. **Sustainability**: A measure of potential to confirm if the standards implementation benefits and aim will continue to be achieved.

M&E planning specific to SAS in Ethiopia should be in line with the five main aspects described above, evaluated for adequacy, and should start early before commencement of standards enforcement. This plan should include indicators for measuring impact, data collection and timeline, capacity and resource needs, frequency of assessment, coordination and reporting.

Like other elements of the SAS compliance framework, some level of capacity building will likely be required to successfully carry out M&E. The individual(s) responsible for M&E should be familiar with SAS products and should have a thorough understanding of how the compliance framework functions. In addition, they should receive training on the principals of M&E and how it is to be put in practice for SAS products in Ethiopia.

Evaluation of SAS compliance activities and key indicators should be compiled in a report that is issued on a regular basis (e.g. semi-annually or annually). The report should be shared among relevant departments in the implementing agencies and others as deemed appropriate/useful (e.g. MoWIE, ESA, EEA). Decision-makers should convene to discuss the findings and determine what adjustments should be made, if needed.

Recommendations for monitoring and evaluation

- An M&E plan for SAS in Ethiopia should be developed in line with best practice and should start early before commencement of standards enforcement.
- Staff responsible for conducting M&E should receive training on the SAS compliance framework, M&E principles and best practice, and practical training on how to carry out M&E for SAS products in Ethiopia.
- M&E reports describing compliance activities and key indicators should be issued to implementing agencies on a regular basis.
- Key decision-makers should convene at least annually to discuss M&E findings and to determine what adjustments should be made, if any.

3.8. Communication

Communication and coordination with relevant stakeholders are of critical importance throughout the process of designing and implementing a QA framework. Compliance programme implementers should identify and/or establish mechanisms used to convey information and to receive feedback from the public and private sectors and civil society.

3.8.1 Communicating with the private sector

Now that Ethiopia is in the process of adopting and implementing new SAS standards, **it is imperative that the industry players are involved in the discussion and made aware of what the new standards actually mean to them and their businesses.** To do this, we recommend the following:

- Many key stakeholders were made aware of the new SAS standard when they were invited to comment on the standard. This was the first step in creating awareness. Further stakeholder outreach after the validation workshop should be held to continue to pass information on the new standards. Industry players like manufacturers, importers and distributors should have access to information such as:
    1. How the IEC standards differ from the prior national standards.
    2. The grace period before the implementation of the new standard.
    3. Market surveillance activities that will be carried out by the authorities.
    4. The penalties for non-compliance.
- Develop standards briefs and knowledge materials for private sector stakeholders, including practical information about key topics such as PVoC, issuance of ISM stickers and standards enforcement.
- Facilitate engagement with the private sector by leveraging existing stakeholder coordination platforms, or establish a new one if need be.
- Inform the private sector of market surveillance activities and enforcement actions that have been taken. Communicating this work to the private sector serves as a deterrent to future acts of non-compliance.

3.8.2 Communicating with the public sector

Public sector actors that are involved in and/or impacted by the national QA framework for SAS products should be kept abreast of key milestones in the development of the framework. Strong communication among government actors fosters participation and buy-in, which is needed to develop an appropriate, functional and effective compliance scheme. Throughout the process of goal setting, planning, standards adoption, implementation and continuous M&E, implementing agencies and other relevant bodies should maintain close coordination.

To promote efficient and effective collaboration, **we recommend that the Quality and Standards sub-working group of the Off-Grid Task Force be leveraged** for this purpose. In addition, there will likely be a need **to hold a series of workshops to ensure a high level of public sector participation, awareness and capacity building**. Activities should be regularly reported to decision-makers and key implementers of the SAS compliance framework, who should convene at least on an annual basis to assess the programme.

3.8.3 Consumer awareness

Consumer awareness creation for the Ethiopian SAS standards is a critical activity that should be carried out prior to standards enforcement. The objective is to inform buyers (and potential buyers) that national SAS standards exist, and to emphasise the importance and value of purchasing quality solar products.

We recommend that GoE invest in a media campaign to inform and educate the public on the new standards being implemented. Best results are likely to be achieved by hiring a qualified and experienced locally based communications firm to develop, pilot and run the campaign. The key messages and the means by which they are delivered should be tailored to suit the Ethiopian context. Key information to be disseminated may likely include:

- What the standards mean to the consumer.
- Benefits of standards-compliant products.
- How to ensure that one is buying products that meet the standards (which may include promotion of a mobile application used to check product conformity).
- Where and how to report sub-standard and counterfeit products.
- Based on our experience supporting consumer awareness activities for SAS in Eastern Africa and more broadly in sub-Saharan Africa, we have seen the following common means of connecting with target audiences:
  - Digital media such as TV, radio, digital billboards, short videos developed for consumers, etc.
  - Print media such as newspapers, posters, billboards, leaflets, and other material developed for consumers.
  - Existing consumer engagement channels used by public and private sector stakeholders.
  - Market roadshows.

The general public should also be made aware of market surveillance and enforcement activities for SAS products in Ethiopia. This is commonly accomplished through printed and televised news media. By informing the public about instances of non-compliance and enforcement actions taken, the government reinforces the importance of quality SAS products and keeps the topic of quality in the public's mind.

Recommendations for communication

- Maintain close communication with private sector stakeholders through a standards validation workshop, distribution of guidance documents on compliance and dialogue via existing coordination platforms.
- Use the Off-Grid Task Force as a medium for communicating with key public sector actors.
- Hold a series of workshops to ensure a high level of public sector participation, awareness and capacity building.
- Design and run a media campaign to inform and educate the public on the new standards being implemented.
- Create a free web application (or other more appropriate service) that allows consumers to validate SAS product quality on mobile devices. This would leverage the ESA product registration database described in Section 3.4.

4. REGIONAL COLLABORATION

After Ethiopia's national QA framework for SAS products has been operationalised and run for a sufficient duration (to be determined through M&E and stakeholder input), **we advise GoE to explore collaboration with other standards bodies and national SAS compliance programmes in the region.** At a minimum, dialogue between QA framework implementers in the region (e.g. members of IGAD and COMESA) can facilitate sharing experiences and lessons learned, which can be used to improve national QA frameworks for SAS products.

Multiple countries in the Eastern Africa region – including Kenya, Tanzania and Uganda – are adopting the IEC standards for SAS products on a compulsory basis. This move towards regional harmonisation of standards sets the stage for further cooperation among national QA programmes, including market surveillance, laboratory testing and mutual recognition agreements (MRAs).

Acknowledging that many national compliance regimes are resource constrained, regional collaboration can be leveraged to help fill resource and capacity gaps. By taking steps such as sharing market intelligence, aligning product test procedures and reporting, and establishing/using a regional product registration database, national governments can both strengthen compliance programmes and reduce resource costs. If/when Ethiopia decides to pursue a regional approach for any components of the SAS compliance framework, **we encourage the government to advocate harmonisation with the applicable IEC standards and to promote utilisation of accredited test labs in the region (including ECAE, once ISO 17025 accredited).**

Aligning policies and test procedures to support compliance at a regional level has many benefits, including:

- Comparable test results between various states.
- Reduced policy development costs.
- Increased availability of accredited testing services.
- Simplified customs procedures among countries.
- Reduced costs and compliance burden for manufacturers.
- Encourages learning from other country programmes.
- May help reduce technical barriers to trade.

Recommendations for regional collaboration

- Explore collaboration with other standards bodies and national SAS compliance programmes in the region.
- Advocate within IGAD and/or COMESA for harmonisation of the IEC quality standards and test methods for SAS products.
- Once the ECAE test lab for SAS products is ISO 17025 accredited, promote utilisation of ECAE and other accredited labs for QA activities in the region.

5. CONCLUSION

Ethiopia is well-positioned to establish a comprehensive QA framework that effectively protects consumers from low-quality SAS products. Several key elements are already in place. Ethiopia's market for SAS products is relatively large, vibrant and mature. The government has shown a high level of political will to increase energy access by improving the quality of SAS products in the national market. Steps have already been taken to build a robust QA framework through standards adoption, conformity assessment and market surveillance. This progress has been underpinned by a broad set of stakeholders that has participated throughout the journey.

By adopting the IEC quality standards for SAS products, Ethiopia has laid the foundation upon which a QA framework can be built. Much has already been accomplished, yet a great deal of work lies ahead. In continued collaboration with key stakeholders, GoE seeks to plan, develop and build its capacity to operate QA activities for SAS.

Building up a comprehensive QA framework for SAS can be a challenging undertaking. This is especially true for people and institutions unfamiliar with solar products, technologies, standards and markets. To help address these and other challenges, we are providing this guidance document to GoE. This should be considered a living document, which is intended to be used – and revised as needed – to help steer and coordinate QA activities for SAS products in Ethiopia. We feel confident that by engaging stakeholders and following the recommendations herein, GoE will improve the quality of SAS products in the market and improve access to affordable, reliable and clean energy.

Africa Clean Energy
Catalysing Africa's Solar Markets

TETRA TECH
International Development

UKaid
from the British people

ACE TAF PARTNERS INCLUDE:

WORLD RESOURCES INSTITUTE

GOGLA

Open Capital

teri

SOLAR SISTER

STRATEGIC PARTNER:

LIGHTING GLOBAL

AN INNOVATION OF WORLD BANK GROUP
THE WORLD BANK IFC

Tetra Tech International Development

Fourth Floor, Prosperity House, Westlands Road |
PO Box 19084 – 00100 | Nairobi, Kenya.