

FINAL GUIDELINE REPORT ON MINIMUM ENERGY PERFORMANCE STANDARDS AND LABELING

Consultancy Services to Implement Harmonised Regulatory/Technical Frameworks and Synthesised Renewable and Energy Efficiency Strategies in the EA-SA-IO Region

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Consultancy services to implement harmonised regulatory/technical frameworks and synthesised renewable and energy efficiency strategies in the EA-SA-IO region

This assignment will support the Common Market for Eastern and Southern Africa (COMESA), East African Community (EAC), Intergovernmental Authority on Development (IGAD), Indian Ocean Commission (IOC), and Southern African Development Community (SADC), in their collective efforts to promote the development of a sustainable regional energy market in the Eastern Africa, Southern Africa, and Indian Ocean (EA-SA-IO) region.

Final Report

This report presents an integrated policy approach to transforming the market with energy efficient standards and labelling (S&L), identify the current state of S&L policies in the EA-SA-IO regions, and formulate guidelines for accelerating the adoption of minimum energy performance standard (MEPS) policies for select electrical appliances.

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Opinions and Limitations

Unless otherwise indicated, the opinions herein are those of the authors and do not necessarily reflect the views of ESREM, COMESA, EAC, IGAD, IOC, or SADC.

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Acronyms / Abbreviations

Acronym	Definition
AfDB	African Development Bank
CIE	International Commission on Illumination
CFL	Compact fluorescent lamp
CTCN	Climate Technology Centre and Network
DSM	Demand-side management
EA-SA-IO	Eastern Africa-South Africa-Indian Ocean
EAC	East African Community
EACREEE	East African Centre of Excellence for Renewable Energy and Efficiency
EBRD	European Bank for Reconstruction and Development
ECOWAS	Economic Community of West African States
EE	Energy efficiency
EELA	Energy Efficiency Lighting and Appliances (project)
EU	European Union
HEPS	High energy performance standard
IEC	International Electrotechnical Commission
LED	Light-emitting diode
MEPS	Minimum energy performance standard
MRA	Mutual recognition agreement
MVE	Monitoring, verification, and enforcement
RAERESA	Regional Association of Energy Regulators for Eastern and Southern Africa
RE	Renewable energy
SADC	South African Development Community
SE4ALL	Sustainable Energy for All
S&L	Standards and labelling
UNEP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Organisation
WB	World Bank

1 Introduction

1.1 Authority of the Guidelines

These Guidelines are prepared under the authority of the contract signed on 11 May 2020 between the Regional Association of Energy Regulators for Eastern and Southern Africa (RAERESA), an agency of the Common Market for Eastern and Southern Africa (COMESA), and CPCS Transcom International Limited (CPCS) to provide consultancy services "to implement harmonised regulatory/technical frameworks and synthesised renewable and energy efficiency strategies in the EA-SA-IO regions."

1.2 Purpose of These Guidelines

The main purposes of these Guidelines are to present the integrated policy approach to transforming the market with energy efficient standards and labelling (S&L), identify the current state of S&L policies in the EA-SA-IO regions, and formulate guidelines for accelerating the adoption of minimum energy performance standard (MEPS) policies for select electrical appliances. Typically, S&L and MEPS concepts include other energy efficiency-related (EE) areas (such as demand-side management, or DSM, EE credit facilities, etc.) that are presented in other guidelines developed under this mandate.

The main policy utilised by S&L programmes is the establishment of minimum energy efficiency levels or performance standards for products or an appliance category to be sold in the market. This approach results in stopping or inhibiting the least efficient products from entering the market and provides an opening for more efficient products, which ultimately helps initiate market transformation. Well designed and implemented S&L and supporting policies can help address barriers to adoption, reduce overall appliance energy demand, per-unit appliance energy consumption, and related environmental impacts.

The objectives of these Guidelines are to provide policy makers with:

- A broad understanding of how energy efficient standards and labelling policies can help address existing barriers to the adoption of energy efficient lighting and appliances and help transform markets in the EA-SA-IO regions;
- Guidance on the development of S&L and supporting policies, including model legislation;
- Proposed MEPS (electric fans, grid-connected television sets) for regional consideration.

A recent regional market assessment prepared by CLASP found that the EA-SA-IO regions are receptive to DSM interventions including S&L and supporting policy actions. The report also states that a number of countries had energy policies in place and several were developing or had recently adopted energy policies that emphasised RE and EE.[1] However, the report also states that many challenges remain because countries lack capacity or are only focused on certain aspects rather than integrated policy actions.

[1] Boosting African regional markets of highly efficient appliances through effective energy efficiency and trade policy, A. Careno et al. CLASP 2019.

Well designed and integrated S&L policies as covered by this report (and many others) can help address these identified barriers and challenges, leading to the increased adoption of energy efficient products.

1.3 Structure of These Guidelines

The remainder of the Guidelines is structured as follows:

- Chapter 2 presents an overview of the integrated policy approach to promote appliance EE and transform the market for EE products.
- Chapter 3 provides current S&L activities in the regions and identifies key programmes or activities and coverage (in terms of appliances or equipment MEPS) in each.
- Chapter 4 summarises the analyses and recommendations of minimum performance standards for consumer electric fans and grid-connected television sets for consideration.
- Chapter 5 presents general recommendations for S&L and market transformation programs.

2 Transforming the Market for Energy Efficiency

2.1 The Integrated Policy Approach

International experiences have demonstrated that the best results for transforming markets to energy efficient products are achieved when implemented with an approach consisting of integrated policy actions (i.e. complementary policy measures implemented by one or more stakeholders). Such approaches have led to the wide consumer adoption of efficient, quality appliances and lighting products. The main building blocks of such approaches are summarised below.

2.1.1 Establishing Minimum Energy Performance Standards (MEPS)

Minimum energy performance standards (MEPS) are the key measures of an integrated policy approach and serve as the foundation upon which policy makers can build a successful market transition strategy. It is recommended that, when developing MEPS for lighting and other appliances, performance criteria for sustainability, quality, and safety be areas to be considered in addition to energy performance. By considering areas other than just energy performance for inclusion in MEPS, consumers are protected because well-made, reasonably priced, and energy efficient products are admitted to the market in a controlled manner through effective policies as well as with appropriate enforcement actions by the implementing agency.

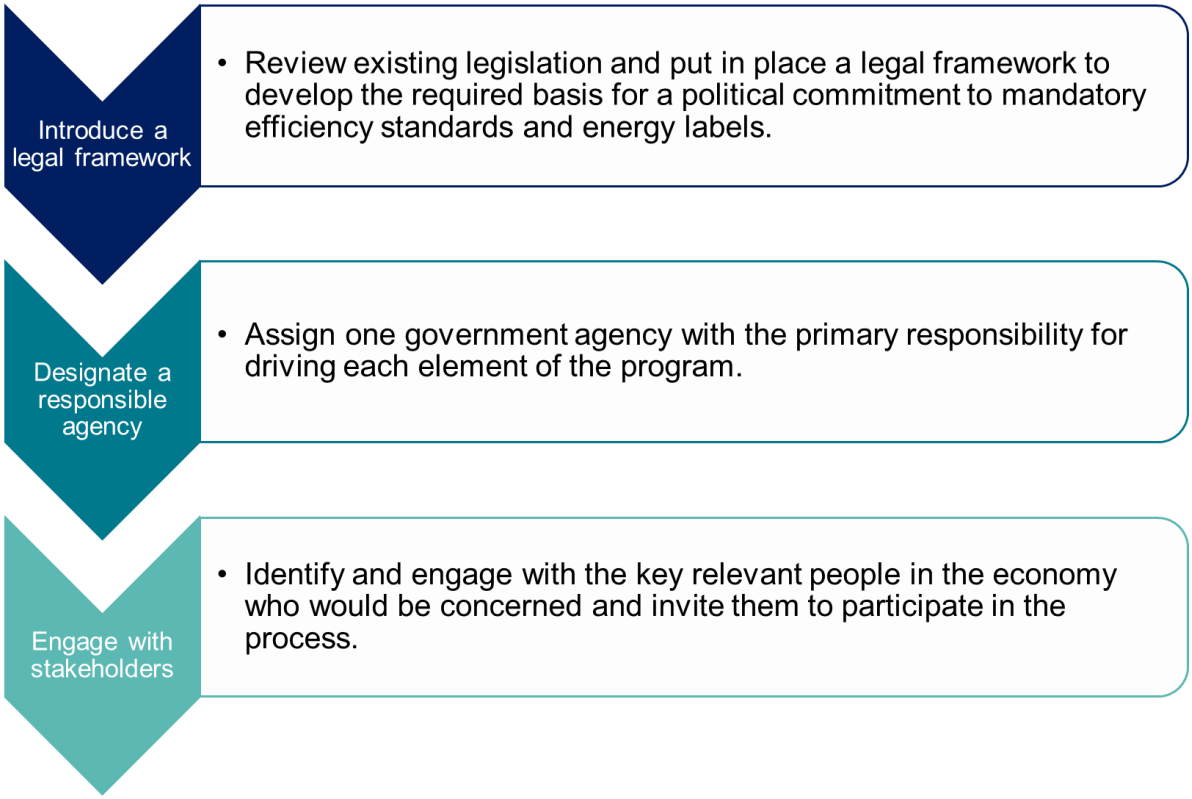
The example presented below outlines the steps needed to be taken to design MEPS for lighting products developed, based on the United Nations Environment Programme (UNEP). However, the process is applicable to developing MEPS for other appliances and product categories.[2] This process is also repeatable, especially the review and update steps, and should not be overlooked. They need to be budgeted for once a set of MEPS is implemented. This is because the marketplace can be dynamic and the pace of technological change rapid. Hence, it is important for performance requirements to keep up with technological changes and reflect market trends and conditions to maximise the energy savings potential and sustain programme effectiveness.[3]

[2] The full MEPS development process is referenced by a number of publications, including the UNEP Policymakers' Guidance Notes and its Tool Kit for Phasing Out Inefficient Lighting.

[3] According to the "Methodological tool" of the UN's Framework Convention on Climate Change, Appendix 2:

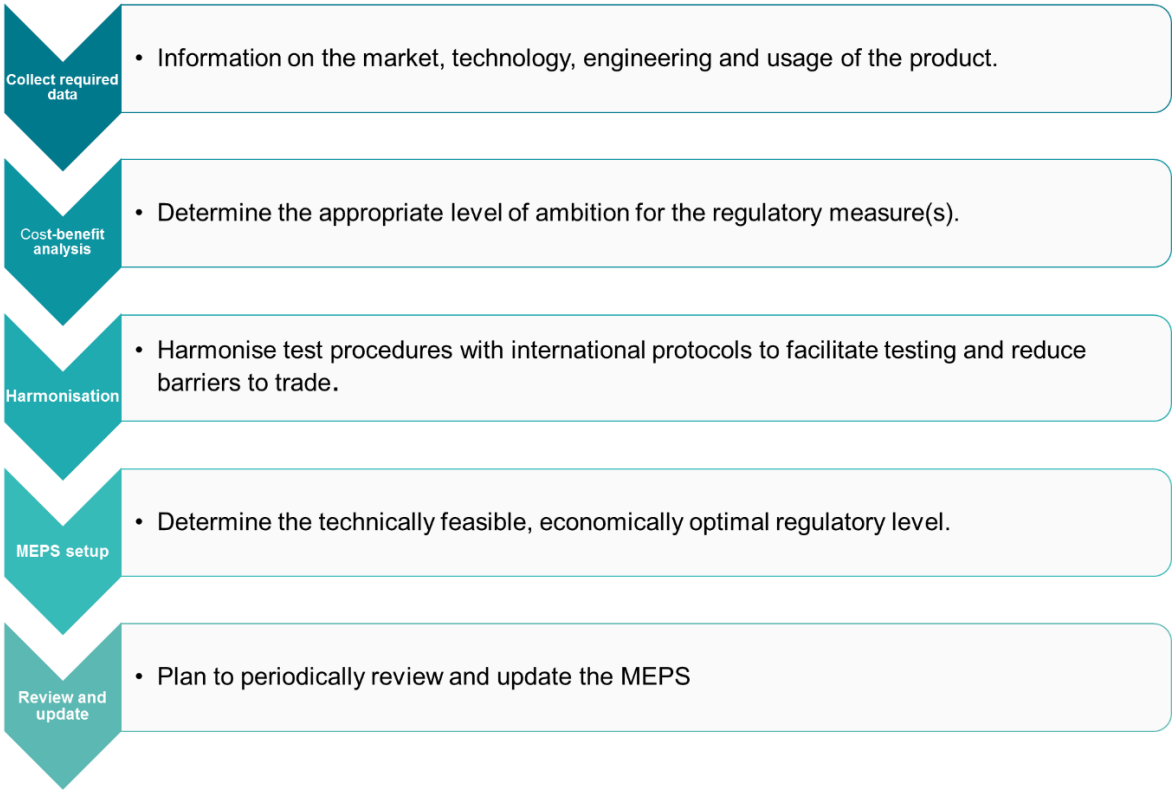
- The baseline thresholds shall be set at least the 80th percentile of units sold in the reference period where the units are sorted from the highest to the lowest baseline energy intensity factor ($EC$90/80;$SEC$90/80; $EEI$90/80) under the condition that the data of the product models available is complete including the sales data.
- Otherwise, where requirements in paragraph 2 cannot be complied with (e.g. sales data are not available), the baseline threshold shall be set at minimum 90th percentile of models available in the reference period where the units are sorted from the lowest to the highest energy efficiency or at the level specified by the mandatory minimum efficiency performance standard (MEPS), whichever is higher

Figure 2-1: Initiation Steps for MEPS Development



Thus, for MEPS programmes, performance parameters, stringency, and implementation periods are subject to definition and variation for each specific programme and product category as informed by market conditions. It should be noted that the degree of stringency applied to the market tends to have an impact on product costs, so the adopted MEPS regulation should always be aimed at being cost effective, and appropriate analyses need to be conducted for this purpose. Additionally, MEPS can be combined with supporting actions to increase their effectiveness and adoption. These may include a green/EE government procurement policy to ensure that government leads by example, and only products that meet or exceed the requirements are purchased by government entities, e.g. ministries, authorities, agencies, as well as commercial entities. The figure below details the actual MEPS development process.

Figure 2-2: Detailed Steps in Developing MEPS for Products



Many national MEPS programmes set a target of two to four years for updating MEPS, depending on the nature of the product. Thus, a roadmap for EE covering the range of products subjected to MEPS should be developed with the aim of revisiting the performance levels of products every two to three years to keep pace with technological and market changes.

2.1.2 Product Labelling

Product labelling is a way to communicate information clearly and consistently to purchasers at the retail point of sale about product energy performance under typical conditions. Labels are usually affixed to products and they can contain a range of consumer information. Labels are typically grouped into three categories: (i) Endorsement (for example Energy Star®); (ii) comparative (for example the EU or China Energy Label); and/or (iii) informative (for example the Yellow Label in North America). It is commonly perceived as a good practice for existing labels to be adopted in a manner that minimises trade barriers and costs for manufacturers, especially where other labels or programmes exist.

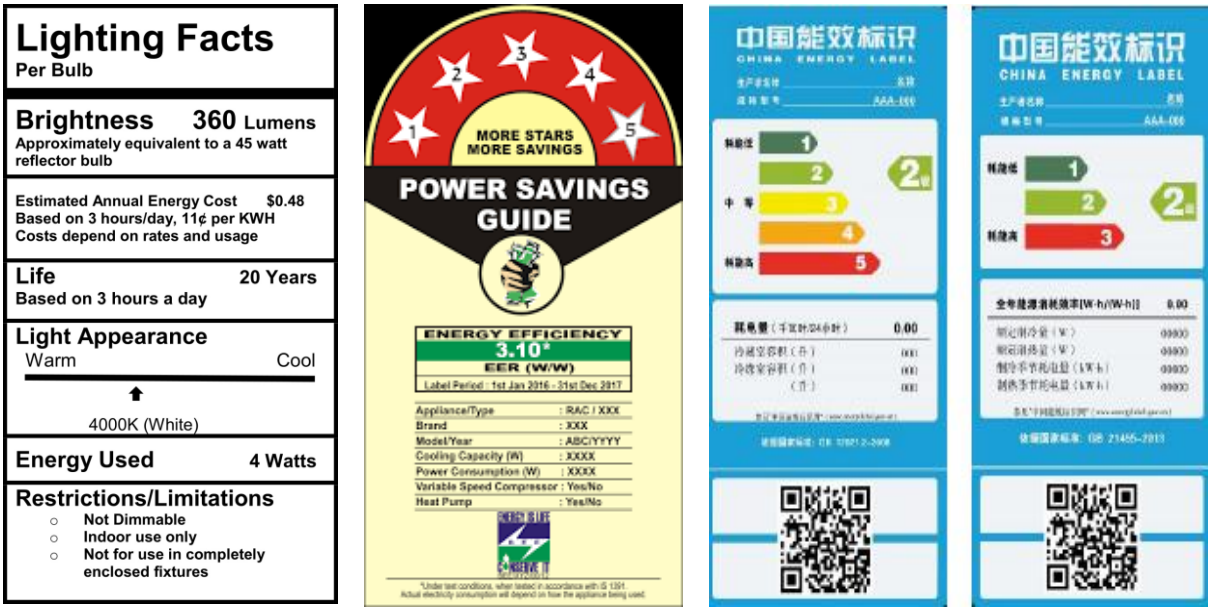
As noted, product labelling programmes can either be mandatory or voluntary. If an existing and proven labelling scheme is already active and well recognised in the market or region (or nearby regions such as the EU or India), it may be more beneficial to adapt such a scheme, especially for imported products, and to ensure that labelling practices are aligned with international and/or regional standards organisations. It is highly recommended that a thorough consumer study be conducted along with a focus group initiative when designing or adopting labels. These recommended practices will help to eliminate market confusion due to the usage of different labelling initiatives and can help to avoid higher compliance costs for manufacturers and importers.

Labelling can work in a complementary fashion with MEPS. They can be integrated with other policy instruments such as financial mechanisms or voluntary agreements that enhance their effectiveness. Successful consumer labelling programmes employ a combination of legal, financial, and social considerations, depending on the structure, economics, and culture of the society to which they apply. Most importantly, although labelling programmes are very helpful, they alone cannot transform the market.

Mandatory Labelling

Mandatory labelling is often implemented through government regulations that require the placement of labels on products such as lighting and appliances to indicate compliance with a specific criterion (e.g. for safety reasons). Energy labels provide end users with information about product energy performance under typical conditions. This information empowers end users to make informed decisions and choose products with high levels of efficiency and quality.

Figure 2-3: Mandatory/voluntary labels for (a) US Mandatory Lighting Label; (b) India Mandatory Appliance Label; and (c) China Mandatory Appliance Label (QR Coded)



(a) (b) (c)

Voluntary Labelling

Voluntary labelling programmes engage product suppliers to label their energy efficient lighting products to inform end users about product performance. Greater awareness about energy performance enables end users to make informed purchasing decisions and contributes to developing a stronger market for energy efficient products.

As with mandatory labelling, voluntary labels are effective if integrated with other awareness-raising campaigns. Such campaigns demonstrate the benefits of energy efficient products to purchasers and manufacturers. Voluntary labelling programmes can serve as an interim step toward mandatory programmes. They can also work in tandem with and complement MEPS.

Many countries also use voluntary labelling as a way to lead a market. In these cases, labelling programmes target high-performing products in the market using high energy performance standards (HEPS). These HEPS typically identify products that are in the top 10% or 25% of their category in terms of energy performance (for example, Thailand's No. 5 programme).

2.1.3 Integrated Policy Approach

It has been documented that an integrated policy approach is essential to successfully transform markets toward energy efficient products. This approach has been proven by programmes that phase out inefficient lighting in many countries. Integrated policy combines policies such as MEPS and product labelling with other policy actions such as monitoring, verification, and enforcement, consumer education, as well as financial incentives where appropriate.

It is highly recommended that a communication and engagement campaign for consumers and other industries as well as government stakeholders be conducted well in advance of S&L enforcement to ensure a smooth transition. Moreover, all interested stakeholders should be involved in the programme design and standard setting stages. In addition, the use of methods and definitions that reference international standards such as those of the International Electrotechnical Commission (IEC) for appliances and/or the International Commission on Illumination (CIE) for lighting equipment are also essential for both market monitoring and product testing in alignment with international and regional practices.

Monitoring, Verification, and Enforcement

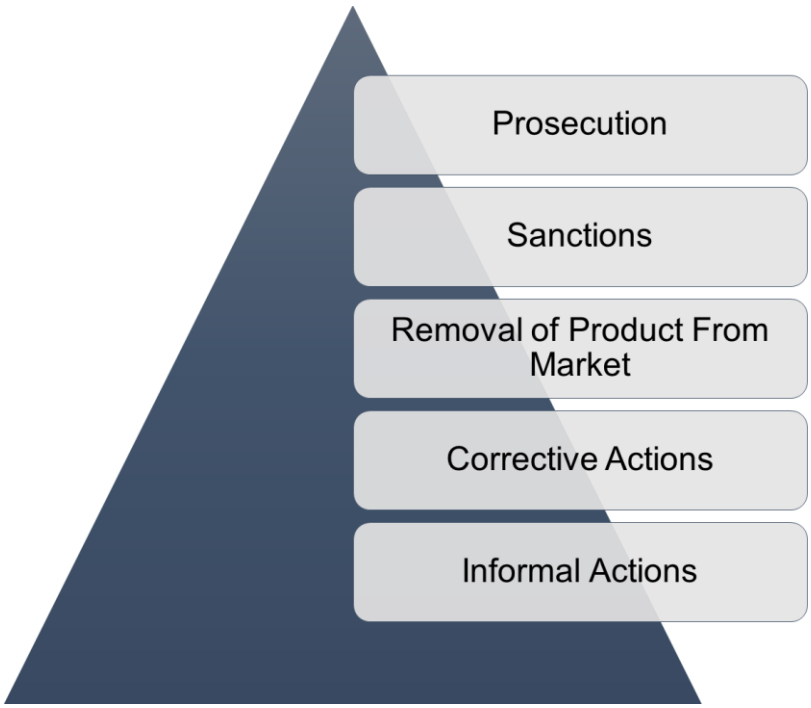
A monitoring, verification, and enforcement (MVE) framework for compliance is critical to ensure programme effectiveness and consists of three main activities:

- Monitoring: Regular market surveillance testing activities to ensure consumer confidence in the programme. If noncompliance cases are discovered, they will require further verification actions;
- Verification: Usually comprised of several levels such as documentation verification, product inspection, as well as third-party testing of product performance to verify that claimed performance thresholds and other programme requirements are met;
- Enforcement: Cases of noncompliance are further processed through consequences in proportion to the harm that they cause to purchasers. This necessary step ensures a level playing field for all programme participants.

Best practices require that a designated MVE agency be identified and provided with the proper authority/mandate for market monitoring and enforcement. The agency should be able to adopt and utilise the right methodologies for cost-effective identification and product selection criteria in order to establish a market baseline prior to effecting the regulations. A market baseline survey can also assist in the determination of an effective sampling strategy when conducting product compliance testing pursuant to the implementation of a given regulation.

The enforcement of regulatory and programmatic requirements should be a high priority to ensure that no business receives an unfair advantage or avoid lax enforcement in general. The agency in charge of MVE should be flexible and able to impose proportionate penalties in cases of noncompliance. For that reason, a legislative and regulatory framework should be developed to open opportunities for such actions. In the most common case, the following response strategies are recognised, ranked below according to the most severe consequences (top of pyramid) to the least severe (bottom of pyramid).

Figure 2-4: Enforcement Actions and Degrees of Severity



Appliance and Equipment Testing

The identification of accredited, competent test laboratories is central to an effective MVE scheme, where available. Independent third-party laboratories are preferable than those affiliated with a particular supplier. Laboratories need to be equipped with all the prescribed equipment necessary to credibly verify product performance as specified by the designated testing method or methods.

Significant resources are required in the establishment of energy performance testing labs, as they required specialised equipment and trained technicians in the proper test methodologies as well as accreditation. Thus, it is advisable that these expenses be shared by several countries and that the services of an established domestic or regional independent lab be utilised. It should be noted that the Ghana Energy Commission is in the process of establishing an energy test laboratory for lighting and cooling equipment, which is expected to be fully accredited by 2022. Considerations should be given to utilising this available resource by other S&L authorities in the EA-SA-IO Regions.

Qualified Product Registry

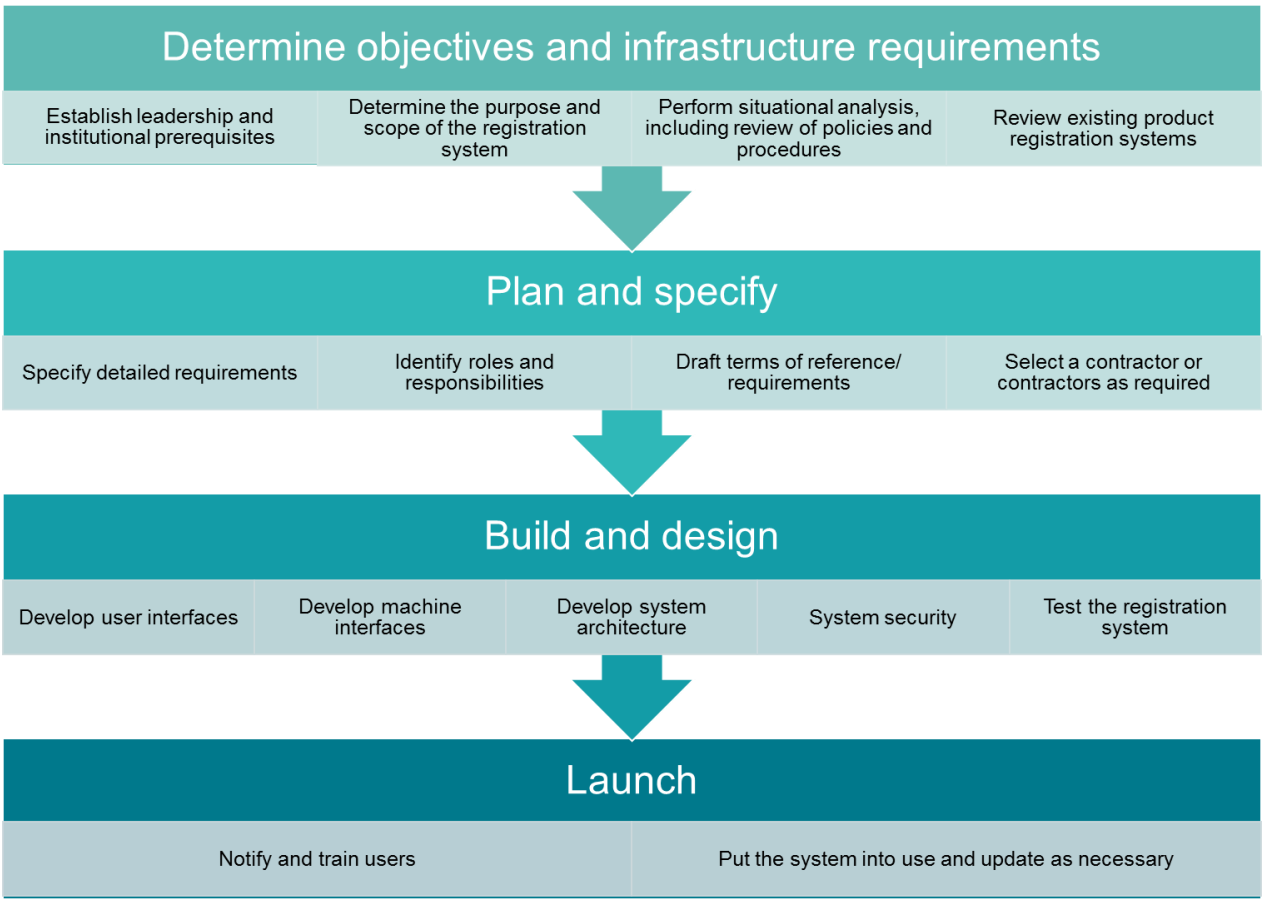
A qualified product registry is another useful programmatic element for a centralised product listing or online registry that identifies products that satisfy programme requirements. This is a necessary tool if a programme allows for self-declarations regarding product compliance by importers and suppliers. A centralised list can also assist in the identification of products requiring closer inspection and possibly verification testing.[4] A registration system can be

[4] According to the "Methodological tool" of the UN's Framework Convention on Climate Change, Appendix 2:

- The baseline thresholds shall be set at least the 80th percentile of units sold in the reference period where the units are sorted from the highest to the lowest baseline energy intensity factor ($EC$90/80; $SEC$90/80; $EEI$90/80) under the condition that the data of the product models available is complete including the sales data.
- Otherwise, where requirements in paragraph 2 cannot be complied with (e.g. sales data are not available), the baseline threshold shall be set at minimum 90th percentile of models available in the reference period where the units are sorted from the lowest to the highest energy efficiency or at the level specified by the mandatory minimum efficiency performance standard (MEPS), whichever is higher.

developed on a national or regional scale and can range from a basic list (or spreadsheet) of policy-compliant products to a more comprehensive, multi-variable searchable online database. It may include both public (i.e. product performance characteristics) and confidential information (i.e. compliance test results). A simplified process for registry development is presented below:

Figure 2-5: Process for Development of A Qualified Product Registry



Source: UNEP 2016

A qualified product registry can present an initial gateway for manufacturers or importers to provide technical documentation to demonstrate product compliance with applicable efficiency policies prior to market entry and to register products with the regulatory authority overseeing product compliance. A registration system also supports the monitoring, verification, and enforcement (MVE) components of an EE programme by allowing regulators to track individual models for performance verification, registration details, or possible enforcement actions.

Regulators can also use the information collected over time to track the evolution of the market as a whole. For application in the EA-SA-IO regions, it may be useful to consider a more regional-focused registry or other means whereby agencies charged with MVE responsibilities can exchange information or other relevant data, including test results, through for example a regional mutual recognition agreement (MRA) for test results or other technical information.

Consumer Incentives

There are a number of consumer-focused supporting activities that can increase awareness about EE products and shorten the transformation period, thereby helping to ensure programme success. These include targeted outreach and education programmes for users and consumers, retailer training on programme requirements and product advantages, as well as a range of financial incentives. Financial incentive programmes can be offered when a market transitions

has the potential to result in significant consumer as well as governmental benefits, thus the potential to offset programme costs.

Generally, financial incentives are an important instrument for spurring investments in energy efficient technologies and services, especially in the market transition of one inefficient technology to a more efficient technology or technologies with higher initial or purchase costs or low availability. Financial incentives can make EE investments more alluring for private and public entities by lowering upfront costs and complementing other efficiency policies such as appliance S&L and energy codes or procurement mandates and overcoming market barriers to energy efficient technologies.

Incentives offered at the government level are generally in the form of tax incentives that target consumers (purchasing home appliances, equipment, lighting, or home envelope items), manufacturers or importers of energy efficient equipment, and businesses that sell (or install) efficient equipment. Electric utilities can also offer a wide array of incentives. Direct incentives refer to direct payments or subsidies to individual customers for the purchase or installation of a specific EE measure. These include:

- Consumer rebates: A payment from the programme to an individual customer, typically made after a qualified item is purchased and a rebate coupon or application is submitted;
- Prescriptive rebates: Fixed amounts (pre-defined for specific products);
- Custom rebates: Defined by formulas or other rules that match the payment to a specific product or project.
- Interest rate reductions;
- Extended payment (installment) plans.

2.2 Funding, Implementation, and Stakeholders

2.2.1 Funding and Implementation

Financing sources for public authorities to implement S&L programmes may come from the state budget, donors, multilateral funds, and banks. The most direct way for governments to pay for energy efficient market transformation programmes is to allocate public funds from the domestic budget. Alternatively, electric utilities may be engaged through a traditional utility DSM approach to fund S&L activities. However, the development and administration of a S&L and MVE framework remain under the purview of the implementation agency or agencies.

Specific to consumer incentives, the main objective of specialised funding such as product incentives is to fully or partially cover initial higher investments in EE products. With these financial mechanisms, consumers may take advantage of targeted grants and/or subsidies or loans and leases. Some examples of frequently used financial mechanisms include on-bill financing, rebates, bulk procurement, and new business models such as equipment leases.

In addition to traditional financial institutions for consumer incentives, other funding sources include:

- Specialised finance: Financial resources may be sought from specialised finance sources including the World Bank (WB), the African Development Bank (AfDB), and the European Bank for Reconstruction and Development (EBRD).
- Climate financing: CO2 emission reduction schemes often provide grants and/or low-cost loan financing mechanisms. These can be blended with other finance sources to help scale up the implementation of EE programmes.

2.2.2 Stakeholders

According to UNEP guidance on the development of MEPS, the many administrative steps in the process include the need to ensure that there is a legal basis for and political commitment to standards and labels with a clear designation for the administrative agency. It is also important to ascertain the institutional capacity for developing, implementing, and maintaining a S&L programme.[5]

Another important recommendation by the U4E Guidance note is the assembly of a stakeholder group consisting of the key relevant stakeholders in a particular product market and who would be interested or will be impacted and invite them to participate in the process. An ad hoc group of stakeholders can be assembled from interested industries and representatives from government agencies in the initial stages of the process. However, going forward, a more formal advisory group will need to be assembled to address the details specific to the local market.

[5] *Developing Minimum Energy Performance Standards for Lighting Products: Guidance Note for Policymakers*. UNEP, 2019

3 S&L in the EA-SA-IO Regions

3.1 Regional S&L Policy Overview

Countries in the EA-SA-IO regions are at different stages of S&L development. Currently, some are in the process of implementing binding MEPS or labelling primarily targeting electrical equipment (including some off-grid appliances); others are starting the development of MEPS as well as the supporting legal and regulatory framework to implement energy efficient S&L policies and supporting actions. In general, it can be said that most EE policies in the EA-SA-IO regions have international climate conventions such as the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement as their impetus.

3.2 Status of S&L Activities and Policies

Supported by climate concerns and agreements, the EE policies and activities in effect have been addressed through approved national laws and regulations, Nationally Determined Contribution (NDC) strategies, as well as EE action plans, activities, and programmes. Notable leaders in S&L implementation include, for example, South Africa in the SA region, Kenya in the EA region, and Seychelles and Mauritius in the IO region. However, it can be said that stronger legal and regulatory frameworks are still required in many countries in these regions, including those identified leaders, to effectively promote EE and S&L implementation and achieve meaningful emission reductions from all member states.

To establish the most effective S&L programmes and transform the market, governments can benefit by thoroughly understanding the characteristics of the product and market they aim to change. Establishing a market baseline or EE baseline for a product category can provide the necessary level of detail about a given market at a specific point in time and provide the basis for developing MEPS, energy labelling, or other EE policy measures. The success of such efforts depend on data availability and quality. To support the analysis for the MEPS of any one appliance across the region multiplies this challenge by many fold.

In the case of EA-SA-IO regions, the available data and their completeness can vary for each member state, and it was not possible to obtain comprehensive market data for any particular appliances other than lighting and select cooling equipment. These product categories are currently being addressed separately by the Energy Efficient Lighting and Appliances (EELA) project in the near term.[6] For the 2021-2024 period, the EELA project will focus its activities on four key areas across the 21 member countries of the Southern African Development Community (SADC) and the East African Community (EAC), which are: (i) Policy and regulations; (ii) building capacities; (iii) awareness raising; and (iv) market incentives.

3.3 Market Assessment

As stated above, countries in the EA-SA-IO regions are at different stages of either the development or implementation of legally binding MEPS targeting electrical appliances. It may

[6] The project is implemented by the United Nations Industrial Development Organisation (UNIDO) and executed with support from the East African Centre of Excellence for Renewable Energy and Efficiency (EACREEE) and the Southern African Development Community Centre for Renewable Energy and Energy Efficiency (SACREEE). Technical support is provided by the Swedish Energy Agency (SEA) and CLASP. The project is funded by the Swedish International Development Corporation (SIDA).

be useful to examine the current status in each country with respect to: (i) Their EE policy framework; (ii) their S&L framework; and (iii) notable programmes and related activities. This subsection provides a summary of the status of energy policies and S&L in the member states, as well as recent S&L activities by select countries.

3.3.1 EA Region

Burundi: As of 2021, Burundi has not established S&L requirements.

Kenya: Kenya is implementing S&L activities through the Appliances Energy Performance and Labelling (Amendment) Regulations of 2018, which established MEPS and labelling requirements for several appliances including:

- Self-ballasted lamps;
- Double-capped fluorescent lamps;
- Ballasts for fluorescent lamps;
- Refrigerating appliances;
- Non-ducted air conditioners; and
- Three-phase squirrel cage induction motors.

Rwanda: In 2013, the Rwanda Utility Regulatory Authority (RURA) published the Guidelines Promoting Energy Efficiency Measures, which addressed the following:

- Voluntary MEPS on motors, refrigerators, and CFLs;
- Rwanda cooling initiatives to develop MEPS and regulations.

In addition to the above, a ministerial decree also established MEPS for solar home systems.

South Sudan: As of 2021, South Sudan has not established S&L requirements. However, for 2021-2022, a UNIDO-supported project is implementing the design and framework for lighting and cooling appliances.

Tanzania: As of 2021, Tanzania has not established S&L requirements. However, an EU-supported project resulted in the development of a 20-year Tanzania Energy Efficiency Strategy to improve EE in charcoal and firewood consumption, industry and public utilities, the transport sector, and buildings. The strategy includes the formulation of a roadmap for the development and implementation of an energy performance in buildings regulatory framework to establish an Energy Performance Certificate (EPC).

Uganda: The Power Africa and the United Nations Sustainable Energy for All (SE4ALL) initiatives collaborated with more than 24 stakeholders in Uganda to develop the Energy Efficiency Roadmap for Uganda in 2016. As of 2021, the Draft Energy Efficiency and Conservation Bill is still in process and has been submitted to the First Parliamentary Council for drafting. The Bill seeks to provide for the legal, regulatory, and institutional framework for EE; it also consider the establishment of MEPS for equipment such as refrigerators, freezers, air conditioners, motors, and lighting.

3.3.2 SA Region

In the SA region, the SAPP has collaborated with power utilities through an EE Framework to reduce electricity consumption and demand during peak periods. This EE Framework consists of implementing DSM measures and initiatives such as the promotion of CFLs, light-emitting diode (LED) lamps, hot water load controls, solar water heating, and commercial lighting.

However, with respect to S&L activities, only South Africa has an established and long-standing programme so far.

South Africa: South Africa has set up legally binding MEPS through the programme entitled Market Transformation Through Energy Efficiency Standards and Labelling of Appliances in South Africa. The programme currently covers the following products:

- Air conditioners
- Electric lamps
- Washer-dryer combined units
- Washing machines
- Tumble dryers
- Audio and video equipment
- Electric geysers
- Electric ovens
- Fridge-freezer combined units
- Freezers
- Fridges
- Dish washers

Malawi, Namibia, Zambia, and Zimbabwe: These countries are receiving technical assistance through GCF Readiness projects with the Climate Technology Centre and Network (CTCN) to improve the national frameworks for leapfrogging to energy efficient appliances and equipment through regulatory and financing mechanisms.7 The projects are aimed at putting in place mandatory MEPS and a labelling schemes that will create an enabling policy and regulatory environment for refrigerators and distribution transformers in Southern Africa. In addition, the projects will include key components such as national policy roadmaps and enabling environments for the implementation of standards and labels, appropriate financing mechanisms to accelerate the deployment of energy efficient refrigerators and distribution transformers, as well as strengthened national capacity to develop future standards and labels for other appliances.[7]

3.3.3 IO Region

Mauritius: Mauritius has mandatory EE labelling for appliances such as refrigerators, dishwashers, and electric ovens. It applies a 25% levy on these appliances that have an EE index below set thresholds. The recent Energy Efficiency (Labelling of Regulated Machinery) Regulations of 2017 came into effect on 1 July 2017 and provides for mandatory EE labels on certain types of domestic appliances, namely electric ovens, refrigerating appliances, and electric dishwashers.

Seychelles: The Seychelles Energy Commission has set EE standards for five types of electrical home appliances entering Seychelles. These standards will be mandatory for lamps, freezers and refrigerators, air conditioners, electric water heaters, and washing machines. These new categories of purchases will qualify for a break on the Value Added Tax.

[7] Basel Agency for Sustainable Energy (BASE) in partnership with the Southern African Development Community (SADC) Centre for Renewable Energy and Energy Efficiency (SACREEE) and the International Copper Association (ICA) is providing technical services for the implementation of GCF Readiness projects with the Climate Technology Centre and Network (CTCN) through UNEP.

4 Model Policy for Electric Fans and Television Sets (Grid-connected)

4.1 Model Policy Overview

Specific to the development of MEPS and labelling requirements for appliances in the EA-SA-IO regions, some key activities are currently being implemented under the Energy Efficient Lighting and Appliances (EELA) project. EELA, which started in June 2019, is aimed at supporting the development of vibrant markets for energy efficient lighting and appliances across East and Southern Africa and address the large energy saving potentials offered by these product categories. Outside of lighting and refrigeration equipment, there are a number of other consumer product categories with potential for significant savings. Household electric fans and televisions (grid-connected) are two electrical appliance categories with significant market penetration in these regions and that offer good energy saving potential.

4.2 Model Policy: Household Electric Fans

4.2.1 The Regional Market for Electric Fans

Household electric fans in the EA-SA-IO regions consist of three popular types, namely ceiling, desk, and standing fans. All three fan types are available in different shapes and sizes to meet specific functions. The most popular type in use being standing fans and desk fans, these serve the middle to lower income segment of the market – those who cannot afford to purchase and operate air conditioners. Ceiling fans are popular with the hospitality industry and tend to be ubiquitous in hotel rooms.

While it is difficult to estimate the current population of fans in these regions due to a scarcity of data, it has been estimated that, on average, there is one household electric fan per 10 or more persons in the SADC region.[8] It is expected that the demand for fans in the regions will continue to grow with countries approaching or surpassing this average.[9] Except for large diameter and industrial fans, most of them are considered small household appliances. As such, they tend to be handled by importers and distribution companies that carry a large number of different small appliances and brands. Many of them are value or second-tier brands.

Available data indicate that each electric fan consumes an average of 90 kWh per year. In 2010, the use of fans in South Africa accounted for about 450 GWh. Research has shown that, for all fan types, further efficiency improvements can be achieved especially if old inefficient models are replaced by more efficient units on the market. The typical replacement cycle for most fans is estimated by the US Department of Energy's Lawrence Berkeley National Laboratory (LBNL) at approximately 10 years. In addition, because the majority of electric fans in use are imported into the EA-SA-IO regions, it is expected that the implementation of MEPS for fans will have little effect on local manufacturers.

[8] A stock of 34 million was estimated for base year 2010, with 45% growth until 2020.

[9] For RSA, the fan stock was projected by the South African National Energy Development Institute (SANEDI) to grow by 50% between 2010 and 2020.

4.2.2 Energy Efficiency Requirements for Electric Fans

A number of sources of fan energy efficiency requirements exist that can be used for input into a model policy for the EA-SA-IO regions:

- The Economic Community of West African States (ECOWAS) recently developed MEPS for standing electric fans in 2019;
- Indonesia recently completed an analysis of MEPS in 2020 for both standing and ceiling fans; For ceiling fans, the analysis by PwC for Indonesia also includes ceiling fan performance;[10]
- The US EPA's Energy Star programme is another source of ceiling fan requirements.

It is important to note that the performance analysis by Indonesia of the fans available on their market confirms that the EE requirements developed by ECOWAS remain valid for current market conditions and are comparable to those used in Asia, including those used in China for their domestic market since that country is presumed to be the largest exporter of such products.

4.2.3 Test Procedures for Electric Fans

Energy performance testing for fans requires a dedicated testing facility with a laboratory setup and testing management in accordance with ISO/IEC 17025: 2008, which covers general requirements for competence of testing laboratories, equipment calibration, and accreditation.

A new IEC standard for fans was adopted in 2019 (IEC 60879:2019 comfort fans and regulators for households and similar purposes - Methods for measuring performance). As this is the most up-to-date testing methodology, it is recommended that this IEC standard be referenced or adopted as the national standard. Most significantly, this recent international standard allows for the use of analog or digital vane anemometers for measuring air speed. Air movement must be measured using propeller anemometer blades that have an inner diameter not exceeding 100 mm. It also uses a different measurement method with measurement points spaced further apart and along the test chamber's semi-diagonal axis rather than perpendicular to the fan axis.

The new IEC standard specifies test protocols, testing conditions, instrumentation, and a calculation methodology to measure five parameters relevant to electric fan performance: (1) total air delivery; (2) fan speed; (3) power factor; (4) acoustical testing for noise; and (5) standby power. The standard further requires manufacturers to mark each fan with the size of fan in addition to the information specified in IEC 60335-2-80. The methodology covers all the requirements for test set-up, instrumentation, air flow, and power consumption. Tests must be carried out based on each product type (standing or ceiling) with a sample size of two units.

4.2.4 Model MEPS for Electric Fans

Please refer to Appendix A.

4.3 Model Policy: Television Sets (Grid-connected)

4.3.1 The Regional Market for Television Sets

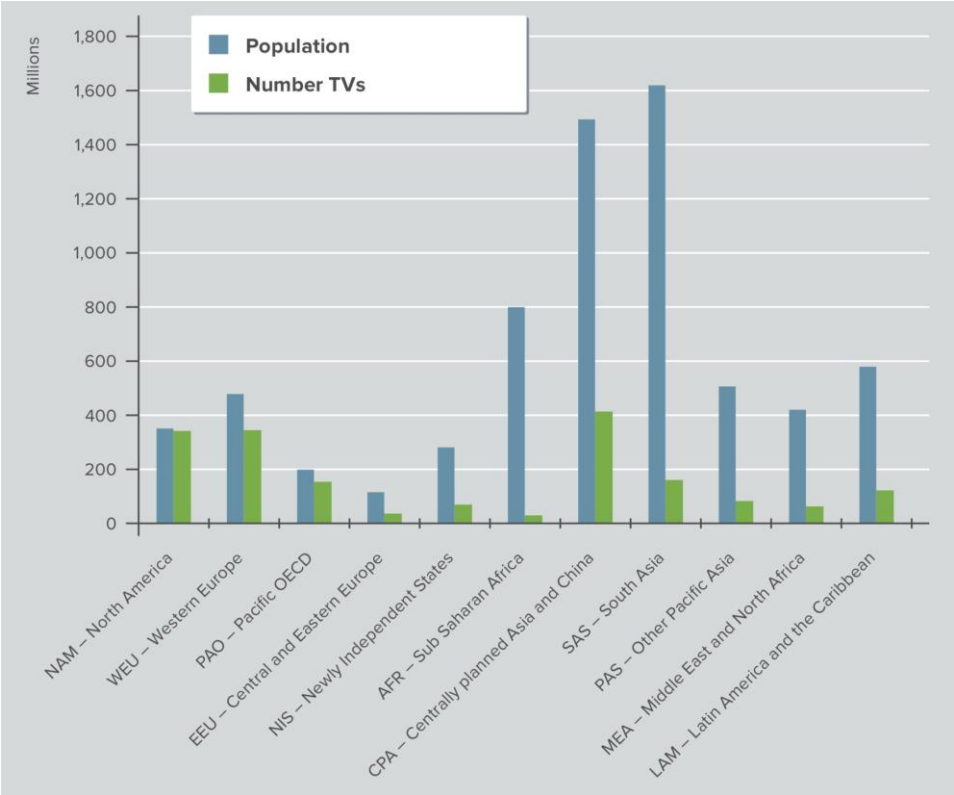
Television sets are one of the most desirable electrical appliances for households worldwide. Currently, the distribution of televisions and related electricity consumption is still uneven between different world regions due to differences in household living standards, but demand for television sets are expected to continue to grow worldwide. This growth is primarily driven by

[10] *Indonesia Fan Market Study and Policy Analysis - Final Report*. Prepared by PwC India for the Indonesian Ministry of Energy and Mineral Resources. 2020.

lower product prices, ready availability, higher living standards, and increasing access to electricity. Note that off-grid television sets belong in a new appliance category and are not covered in this discussion.

While it is difficult to precisely determine the current population of television sets in the EA-SA-IO regions due to a scarcity of data, it has been estimated that there are at least 34 million to 40 million televisions in use in sub-Saharan Africa, consisting of both flat-panel/plasma and cathode tube technologies (from an estimated worldwide population of nearly 2 billion units). Television ownership in sub-Saharan Africa was projected to grow by 45% from 2010 to 2020 and will grow by another 75% until 2030.[11]

Figure 4-1: Worldwide Distribution of Population and Television Sets



Studies have estimated that televisions account for about 7% of household electricity consumption worldwide, with households in wealthier regions accounting for a higher percentage. The average annual consumption of each television ranges between 150 and 200 kWh. In the past decade, television technologies have evolved from cathode ray tubes (CRT) to plasma and LCD. Another technology change that has recently taken place is a move from analog broadcasts to digital in many parts of the world, which has allowed the introduction of high-definition broadcasts and screens. A high-definition tuner and screen requires more power than a standard screen and tuner of the same size.

Significant efficiency improvements can be achieved with televisions, especially in cases where old and inefficient models are replaced by modern efficient units. The typical replacement cycle for most televisions is estimated at five to seven years. While the majority of television sets in use are imported to the EA-SA-IO regions, there is some local manufacturing. Therefore, the implementation of television MEPS will have significant effects on local manufacturers.

[11] Base year 2010.

4.3.2 Energy Efficiency Requirements for Televisions Sets (Grid-connected)

A number of sources on fan energy efficiency requirements exist that can be used for input into a model policy for the EA-SA-IO regions:

- ECOWAS recently developed MEPS for televisions in 2019;
- The Japan Ministry of Economy, Trade and Industry (METI) promulgated and enforced a Ministerial Order and Public Notice that stipulate energy consumption efficiency (EE standards) for television sets in May, 2021;
- The US EPA's Energy Star programme is another source of requirements for television sets (Version 9.0, 2021).

4.3.3 Test Procedures for Television Sets

The IEC has developed test methods to measure the energy consumption of audio/video devices, including televisions (IEC 62087). The testing methods are split into six parts. The three relevant test components for TVs are as follows:

- IEC 62087-1:2015: Audio, video, and related equipment - Determination of power consumption - Part 1: General;
- IEC 62087-2:2015: Audio, video, and related equipment - Determination of power consumption - Part 2: Signals and media;
- IEC 62087-3:2015: Audio, video, and related equipment - Determination of power consumption - Part 3: Television sets.

The remaining parts of IEC 62087 cover video recording equipment (Part 4), set top boxes (Part 5), and audio equipment (Part 6). Countries around the world currently use or reference IEC 62087 Edition 3 (2015) as the test procedure for televisions, including the US EPA Energy Star programme.

4.3.4 Model MEPS for Television Sets (Grid-connected)

Please refer to Appendix B.

5 S&L Best Practices and Recommendations

5.1 Recommendations for Best Practices

As documented in Chapters 2 and 3 of these Guidelines, many countries in the EA-SA-IO Regions are working to introduce and implement energy efficient S&L policies. Some countries are further along this process, while others have just begun.

It is important to note that implementation of S&L policies share a number of key success factors. First, national efforts to transform market for efficient appliances need to adopt an integrated policy approach to maximise the impacts of S&L. Second, countries should develop S&L programs that best suit their current market situation and conditions. This second success factor – a country-specific approach – requires specific adjustments to the integrated policy approach as informed by local conditions, which is only obtainable through a comprehensive market assessment.

In brief, the best policy practice is the integrated approach consisting of the following main elements:

- MEPS to ensure the efficiency and performance of efficient products.
- Supporting policies and mechanisms that restrict the supply of inefficient products, increase awareness and promote market demand.
- An MVE framework to prevent non-compliant products from entering the market.

Appendix A Proposed MEPS for Electric Fans

Version 1.0

1. Scope

This standard covers requirements for domestic electric appliance for circulating air (comfort fan) via the rotation of fan blades, operating on a single electric driven motor, including:

a) ceiling fans.

b) pedestal fans, table fans, wall fans, louvre fans, tower fans

Appliances can be portable or ceiling mounted, and are manufactured, assembled, imported or sold in any of the EA-SA-IO countries. This standard does not cover bladeless fans.

This standard covers equipment with up to 125W rated power that are designed to be plugged on the electric grid and powered directly by the grid. It does not include appliances not powered by alternate current (AC) and those that use non-electric energy or off-grid sources.

2. Normative References

The following referenced documents are required in the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

- IEC 60879:2019: “Performance and construction of electric circulating fans and regulators”.
- IEC 60335-3:2008 “Household and similar electrical appliances – Safety”.
- IEC 62301:2011 Ed 2 “Household Electrical Appliances: Measurement of standby power”.

3. Terms & Definition

For the purpose of this standard, the following definitions shall apply:

- Ceiling fans: A non-portable device designed for home use that is suspended from the ceiling (at a fixed point) for circulating air via the rotation of fan blades operating on a single electric driven motor of up to 125W rated power.
- Desk or Table fans: A portable device with a base designed for home use for circulating air via the rotation of fan blades operating on a single electric driven motor of up to 125W rated power.
- Standing fans: A portable device with a base designed for home use for circulating air via the rotation of fan blades operating on a single electric driven motor of up to 125W rated power.
- Air Flow: is the displaced air volume by appliance measured in cubic meter per minute.
- Rated Power: the maximum power of the equipment in W.

- Fan sweep: The radius of the circle described by the fan blades.
- Off Mode: The condition in which the fan is connected to the mains power and is not operating.
- Standby mode: The condition where the equipment is connected to mains power and is not operating, but provides the following functions: reactivation function or/and information status/display only.

4. Fan Efficiency

The cooling efficiency of a fan is assessed by assessing the volume of air that is displaced by the fan over time (measured in cubic meter per minute) against the expended or required power (measured in Watts), under specified laboratory conditions.

5. Energy Performance Requirements

a. Ceiling Fans:

Fan Sweep (in mm)	Minimum Efficiency (m^3/minute/W)
<900	2.75
900<1050	2.79
1050<1200	2.93
1200<1300	3.04
1300<1400	3.15
1400<1500	3.33
1500<1600	3.33
1600<1800	3.33
>1800	3.33

b. Table/Desk/Standing Other Fans:

Fan Sweep (in mm)	Minimum Efficiency (m3/minute/W)
200<230	0.54
230<250	0.64
250<300	0.74
300<350	0.80
350<400	0.90
400<450	1.00
450<500	1.10
500<600	1.20
>600	1.30

c. Off and stand-by mode requirements for all fans

All fans shall comply with the following specifications for off and stand-by modes (for remote controls), if so equipped. Power off mode and standby are given by manufacturers:

- Maximum power, off mode ≤ 0.5 W

- Maximum power, stand-by mode ≤ 0.5 W (for reactivation function only)
- Maximum power, stand-by mode ≤ 1 W (for reactivation function and only an indication of enabled reactivation function, and/or information or status display).

6. Safety Requirements

All fans shall fulfil the safety requirements as indicated in norms IEC 60335-3-2008.

Appendix B Proposed MEPS for Grid-Connected Television Sets

Version 1.0

1. Scope

This standard covers requirements for electronic display products that are intended to reproduce dynamic video and sound, which contains an internal TV receiver/tuner, and is capable of receiving dynamic visual content from:

(1) Broadcast and similar services for terrestrial, cable, satellite, and/or broadband transmission of analog and/or digital signals;
(2) Display-specific data connections, such as HDMI, Component video, S-video, Composite video;
(3) Media storage devices such as an external USB drive, a memory card, or a DVD/Bluray player;
(4) Network connections using Internet Protocol, typically carried over Ethernet or Wi-Fi.

Appliances can be manufactured, assembled, imported or sold in any of the EA-SA-IO countries.

This standard covers equipment that are designed to be plugged on the electric grid. It does not include appliances not powered by alternate current (AC) and those that use non-electric energy or off-grid sources.

2. Normative References

The following referenced documents are required in the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

- *IEC 62087:2015, Methods of measurement for the power consumption of audio, video and related equipment.*

3. Terms & Definition

For the purpose of this standard, the following definitions shall apply:

- Television: An electronic appliance designed to reproduce and display dynamic video and sound, which contains an internal TV tuner within the product housing, and is capable of receiving dynamic visual content from wired or wireless sources including but not limited to the following:
  1. Broadcast and similar services of analog and/or digital signals;
  2. Display-specific data connections, of standard industry input formats;
  3. Network connections using Internet Protocol
  4. Media players or storage devices;

- Off Mode: The condition in which the appliance is connected to the mains power and is not operating.

- Standby Mode: The condition where appliance is connected to mains power and is not operating, but provides the following functions: reactivation function or/and information status/display only.
- Standby-Passive Mode: The mode of operation in which the appliance is connected to mains power, is not reproducing video, but can be switched into another mode with only the remote control unit.
- Standby-Active Mode: The mode of operation in which the appliance is connected to mains power, is not displaying video, but is exchanging/receiving data with/from an external source, and can be switched into another mode with the remote control unit.
- On Mode: The mode of operation in which the appliance is connected to mains power, and displaying dynamic video.
- Preset Picture Setting: A preprogrammed factory setting with pre-determined display parameters such as brightness, contrast, color, sharpness, etc.
- Brightest Selectable Preset Picture Setting: A preprogrammed factory setting in which the TV produces the highest screen luminance within either of the configurations below:
- Home Configuration: The TV configuration selected from the TV Controls Menu designed for typical consumer viewing and is recommended by the manufacturer for home environments.
- Retail Configuration: The TV configuration selected from the TV Controls Menu which is designed to highlight the TV features in a retail environment. This configuration may demonstrate the display color or brightness range, disable configurable settings, or increase screen brightness beyond those designed for typical consumer viewing.
- High Dynamic Range (HDR) Upscaling: A user-selectable function from the TV Control Menu that extends the luminance of the brightest scene elements and apparent saturation of colors of standard-dynamic range content in a manner similar to those provided by HDR 10 or Dolby Vision encoding.
- TV Controls Menu: A built-in software function accessible by remote control or hardwired controls allowing users to select various display parameters such as brightness, color temperature, sleep timer, etc.
- Automatic Brightness Control (ABC): The self-acting mechanism that controls the brightness of the TV display as a function of ambient light.
- Luminance: The photometric measure of the luminous intensity per unit area of light traveling in a given direction, expressed in units of candelas per square meter (cd/m2).
- Screen Area: The viewable area of the display screen, calculated by multiplying the viewable image width by the viewable image height.
    - Note: For curved screens, the measurements shall be made along the curvature on the face of the screen rather than along a straight line/chord from between the two corners of the display.
- Native Vertical Resolution: The number of visible physical lines along the vertical axis of the display screen.

4. Television Efficiency

The energy efficiency of a TV is related to the main tasks of receiving a broadcast signal and its conversion into a picture and its associated sound. The average power consumption for a TV to undertake these tasks is assessed relation with the size of the screen area and brightness of the display, using a standard video and sound segment.

5. Energy Performance Requirements

On Mode power requirements:

The maximum on mode power in watts for a TV of any given size shall be equal or less than the value as determined by the equation below:

$$P_{ON_MAX} = 78.5 \times \tanh [0.0005 \times (A - 140) + 0.038] + 14$$

Where:

- P_{ON_MAX} is the maximum allowable On Mode Power consumption in watts;
- A is the viewable screen area of the display in square centimeters; and
- *tanh* is the hyperbolic tangent function.
- For TVs with ABC or any other energy saving feature enabled during testing:
  1. TVs with up to four Preset Picture Settings shall have one or fewer Preset Picture Settings without ABC and any other energy saving feature enabled by default;
  2. TVs with more than four Preset Picture Settings shall have two or fewer Preset Pictures Settings without ABC and any other energy saving feature enabled by default.
  3. If the TV does not meet these requirements, it is not eligible for having the energy saving feature enabled during testing.
  4. In TVs that offer both Home and Retail configurations, only the total number of Preset Picture Settings available under the Home configuration under test conditions shall be considered.

a. On Mode power requirements for TV with Native Vertical Resolution greater than or equal to 2160 lines:

TVs with Native Vertical Resolution greater than or equal to 2160 lines of resolution or “High Resolution” (HR) are eligible for an On Mode High Resolution Power Allowance. The maximum on mode power for a HR TV of any given size shall be equal or less than the value as determined by the equation below:

$$P_{ON_MAX_HR} = P_{ON_MAX} + P_{ON_HR}$$

Where:

- P_{ON_HR} is the high resolution On Mode Power Allowance in watts, as calculated by the below equation:
  $P_{ON_HR} = 0.5 \times P_{ON_MAX}$

- P_{ON_MAX} is the maximum allowable On Mode Power consumption in watts, as calculated in “a” above.

b. Standby-Passive Mode power requirements:

Standby-Passive Mode shall be less than or equal to 0.5 W.

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