Energy Efficiency Program and activity plan

Ethiopian Energy Authority

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EXECUTIVE SUMMARY

Ethiopia's power sector is expanding rapidly, to meet the demands of a fast-growing economy for reliable electricity. However, reducing the final demand of energy through efficiency and conservation often costs less than expanding generation. As such, the incorporation of an ambitious end-use efficiency program is essential for reducing the cost to society of Ethiopia's power system expansion, freeing up capacity for more connections and helping consumers save money directly.

The EEA's Energy Efficiency and Conservation Directorate leads national efforts on end-use efficiency programs, coordinating a range of actors to plan activities and achieve results. It is important to note that until a cost-reflective tariff is achieved in Ethiopia, energy efficiency brings a direct economic benefit to EEU and EEP, and the distribution utility will have an especially important role to play in implementing efficiency activities.

Since the formation of EEA, a range of energy efficiency programs have been initiated, across different areas and involving different actors. This document sets out the procedures for developing, aligning and coordinating energy efficiency activities, ensuring that top priority areas are addresses first, and that the correct stakeholders are involved. A total of 26 project activities across six programmatic areas are recommended, of which 14 projects are designated high priority, and should start as soon as possible. The top priority is to address industrial energy demand (including fossil fuels), followed by electricity use in residential and commercial buildings.

Table ES.1 – Top priority projects and programs

Program	Project
Awareness, training & accreditation	EE awareness campaign
	Energy auditor and manager training
Building codes & labelling	EE in building codes
	Voluntary sustainability certifications
Energy management & auditing	Energy audits and voluntary agreements for industry
	Energy audits for buildings
Public sector energy efficiency	Efficiency in street lighting
Standards & Labelling	Lighting standards
	Efficiency labelling program
	Electric motor standards
	Injera mitad standards
	Electric cookstove standards
Technology acceleration	Efficient injera mitad manufacture
	Efficient welding systems

These activities are relatively straightforward to implement but can easily save 14% of national electricity consumption. By 2030, this means saving:

- **6,000 GWh** of electricity, equivalent to Ethiopia's total generation in 2012
- Up to **1,800 MW** of demand, equivalent to Ethiopia's peak demand in 2016

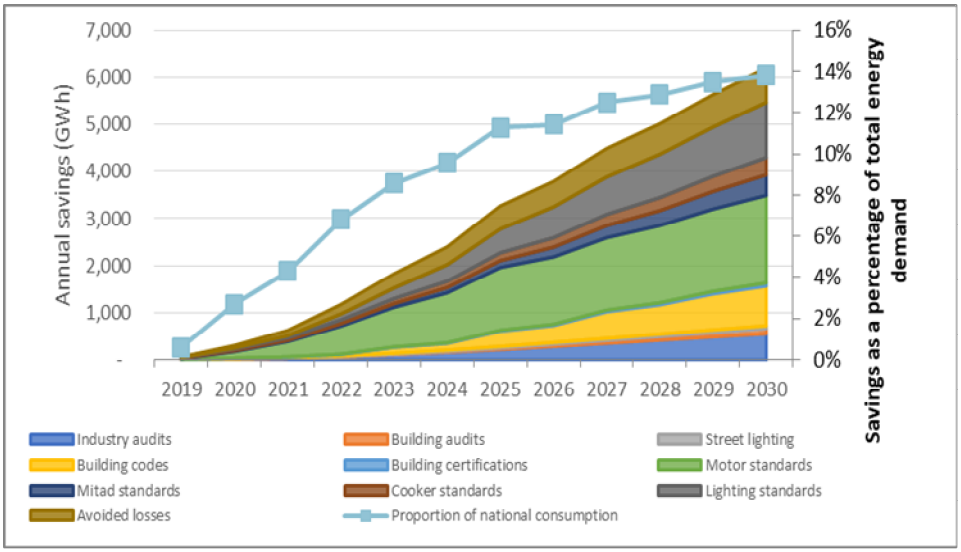


Figure ES.1 – Impact of high priority programs and projects by 2030

The programs recommended in this document build on existing work by EEA and EEU and identify timelines, resource requirements and barriers for the implementation of each program. The high-priority projects are each described in individual datasheets, capturing the key criteria and enabling the development of more detailed project documents that will lay out specific details.

Development of energy efficiency activities will require financial resources from a range of different areas, including development partners and government budgets. Looking forward, the implementation of an energy efficiency fund will make it possible to provide low-cost loans to consumers for implementing cost-intensive energy saving measures, while also funding technical assistance activities and project development from the same resource.

The establishment of data collection and data management procedures will be vital for enabling the tracking, monitoring and evaluation of the programs developed under the mandate of the energy efficiency and conservation directorate. This document includes high-level guidelines for the consideration of data collection and monitoring.

This Action Plan should be updated periodically, to add new projects and reflect the progress being made in implementation by the EEA's Energy Efficiency and Conservation Directorate. As a living document, it can help to prioritize, direct and track activities across the sector in the coming years, ensuring that Ethiopia captures the benefits of energy efficiency and conservation.

CONTEXT

Introduction

Overview

This document has been developed to act as a guide and a register for the actions and activities to be carried out by EEA in the implementation of energy efficiency and conservation (EE&C) in Ethiopia, as laid out in the Energy Proclamation 810/2013.

The document is composed of three main parts: a general context overview; a description of the key processes and methodologies adopted in EEA's activities related to EE&C; and a full list of the energy efficiency programs and projects to be implemented by EEA.

This is not a definitive reference, but rather a living document, which should be regularly updated to reflect progress in the definition and implementation of activities related to energy efficiency and conservation. It is expected that as the projects cited in this document are developed in more detail, further information will be provided on their expected and measured impacts, allowing the project datasheets to be updated with more detailed information. As new projects are proposed and developed, the appropriate project datasheets can be added to this document.

In most cases, it should be possible to update this document by simply updating the individual project datasheets and summary results tables, without carrying out significant alterations to the body text or structure.

The aim of this document is to aid the prioritization and control of EE&C activities, but it does not substitute the need for development of complete, detailed documentation for each program and project cited here.

It should be noted that this document does not address the institutional framework or overarching policy required for EE&C. Relevant legislation is listed in Annex B. In addition, this document builds on a great number of previous studies, strategies, program documents and recommendations prepared on EE&C in Ethiopia in recent years, listed in Annex C.

This document underwent broad stakeholder review and consultation. A stakeholder meeting to review the proposals in the action plan was held in July 2018, with participation from a range of government actors, the distribution utility, the private sector and development partners.

Scope

This Energy Efficiency (EE) Action Plan lays out the activities, programs and projects that are expected to be implemented by EEA. In accordance with the scope laid out for EEA in relevant regulations, this plan covers electricity consumption and some non-electrical energy uses.

All end-uses of electricity in Ethiopia are considered in the activities outlined in this plan, but losses in the transmission and distribution systems are the responsibilities of the generation and distribution utilities (EEP and EEU) respectively and are also not considered in this report.

The uses of thermal energy for water heating and industrial processes – from fossil fuels, biomass or other sources – are within the remit of this plan. However, the use of biomass for cooking – Ethiopia's largest primary energy source – is outside the scope of this plan, as is the use of fossil fuels for transport (petrol and diesel for cars and trucks).

Definitions

Energy efficiency is a reduction in the amount of energy required to provide the same degree of energy-related services, such as lighted space or thermal comfort. Energy conservation is a broader term, which includes both the efficient use of energy and a reduction in the total energy service required.

In this report, both terms are used. Although most activities relate to energy efficiency (abbreviated as EE), there are some activities or projects which may be broadened to "Energy Efficiency & Conservation (EE&C)". While this document is referred to as an Energy Efficiency Action Plan (or EE Action Plan) in the interests of brevity, the plan does refer to all EE&C activities.

Role of efficiency in the Ethiopian economy

Background

Ethiopia's electricity sector is rapidly growing, but highly constrained. It is a regional leader in generation, with 4GW of supply installed and over 6GW being built, at competitive cost. However, significant transmission and distribution bottlenecks limit the delivery of this supply from reaching demand centers, with system peak in 2017 around 2.5GW, despite over 4GW of installed capacity. Poor reliability and power quality affect both residential and industrial consumers, with frequent outages cited as a major constraint by a third of companies.

Continued demand, projected to reach five-fold growth by 2030, will only exacerbate these constraints. In addition, the tariff reform underway to close the cost-recovery gap for the utilities will likely see energy costs triple – a significant burden for largest industrial consumers of electricity such as cement, textile and garment manufacturing, food and beverage processing, and steel and iron. These capacity, reliability, and quality constraints compromise the ability of the electricity sector to support sustained economic growth and human development through rapid electrification and industrialization.

Ethiopia is therefore very actively exploring how demand-side management and energy efficiency can help lower cost and improve economic growth by postponing grid investments, reducing total system cost in the electricity sector, improving quality of service, and offsetting the impact of rising electricity prices on consumers. The Growth and Transformation Plan II aims to halve power losses, increase coverage to 90% and grow industry at an average of 20% per year up to 2020. The Climate Resilient Green Economy Strategy (CRGE) includes energy efficiency and improvement of industrial processes as key parts of the plan. To reduce costs and increase energy availability for export, the CRGE plans to save 20 TWh from efficiency by 2030.

Value of energy efficiency and conservation

Successfully capturing Ethiopia's energy efficiency potential will be critical for the electricity sector – relieving constraints in the current network, lowering total system costs, and improving value and service for customers – with significant benefit to both human and economic development as a result.

1. Demand-side management (DSM) can reduce the cost of grid investments, providing a lower cost alternative to T&D upgrades, or improving service at overloaded feeders while waiting for grid expansion.
2. Energy efficiency (EE) can reduce total system cost of generation, transmission, and distribution in the long-term.
3. Support for EE investment and implementation can help offset the impact of rising electricity prices on consumers and industries.

Until 2018, electricity consumers have paid less than a third of the full cost of energy supply. This means that many of the benefits of energy efficiency accrue to the energy generator and distributor, although the end-user is currently expected to pay the full cost of implementation in most cases.

Figure 1 shows how this might make an energy efficiency project with a cost of 25 USD per MWh saved have negative utility for the end-user, although it brings a significant whole-system benefit. This illustrates the importance of having the utility companies actively involved in promoting energy efficiency, as they will be major beneficiaries of the savings.

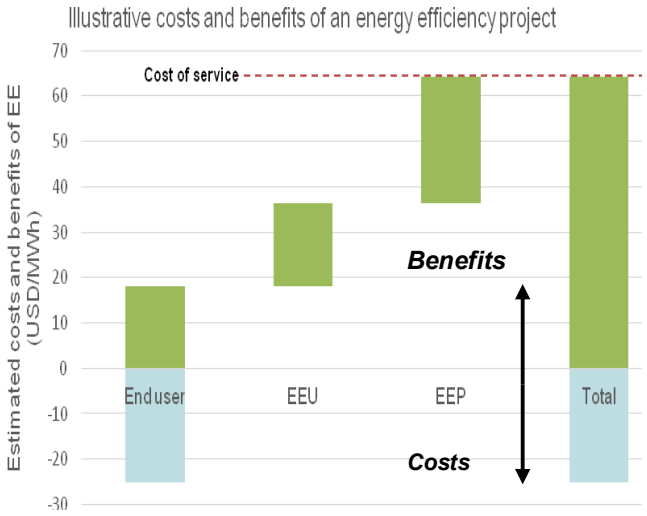


Figure 1 - Illustrative division of costs and benefits of an example energy efficiency project with savings cost of 25 USD/MWh (assuming a cost of service of $65/MWh)

Key challenges and enablers

Despite the significant potential of EE&C in Ethiopia, there are barriers to large-scale implementation.

The regulatory frameworks for implementing EE&C are still under development, and demand-side management has not yet received the funding or attention necessary for achieving its full potential.

Electricity tariffs in mid-2018 were around $0.018/kWh – some of the lowest in the world (although these are set to rise through a set of staged increases through to 2022). This makes it very difficult to incentivize the private sector to take action on energy efficiency and conservation without strong support (financial, regulatory or technical) from government and the electricity utility. In effect, the savings from EE&C must be more adequately shared between the beneficiaries, including the utility and government. The low cost of energy has also meant that the market for efficient systems and services linked to EE&C is smaller and less mature than might otherwise be expected in an economy of this size. This, in turn, is likely to increase the prices of efficient systems to consumers. Finally, there is limited capacity in both the private and public sectors for the planning and implementation of EE&C measures.

Thus, for the Ethiopian economy to reap the benefits of EE&C, several steps must be taken. The impacts and savings for key parties must be clearly identified and quantified; actions must be prioritized to maximize savings from the resources available; coordination and planning between relevant agencies must be improved; and capacity building must be offered to key players.

This Action Plan aims to advance the planning and implementation of activities in a way that will overcome these barriers.

Energy efficiency & conservation directorate

The Ethiopian Energy Authority (EEA) was established in the Energy Proclamation 810/2013, and its roles and responsibilities are laid out in the Regulation 308/2014 – "Establishment of the EEA". The Energy Regulations which detail EEA's responsibilities in licensing, regulation and energy efficiency were approved by the Council of Ministers in early 2019. Key legislation is referenced in Annex B.

The Energy Proclamation and Energy Regulations give EEA a range of core responsibilities in key areas, including:

- Licensing EE&C auditing, consulting and contracting services;
- Setting standards and producing labelling programs for equipment and appliances;
- Creating awareness and disseminating information;
- EE&C programs in industry;
- EE&C programs in buildings; and
- Collection and administration of an EE&C Fund.

To this end, the Proclamation requires that EEA formulate long-, medium- and short-term EE&C strategies and programs, to be evaluated at regular intervals. This Action Plan is a summary and regular update of the programs, projects and activities being carried out by EEA.

In the initial years of EEA's activities, a wide range of reports and studies were developed to demonstrate the importance of EE&C and to propose programs and activities for achieving this potential. Key amongst these were the Demand-Side Management (DSM) studies prepared by HifabOy in 2012 and two sets of studies prepared by the EU Technical Assistance Facility for the SE4All Initiative – Eastern and Southern Africa between 2014 and 2017. These studies laid the ground for many of the ongoing activities and recommendations made in this Action Plan. These and other key studies for the sector are referenced in Annex C.

Roles & responsibilities

Although this document defines EEA's activities, these actions will be carried out in cooperation with a broad range of other organizations and stakeholders including Ethiopian Electric Utility (EEU), Ethiopian Standards Agency (ESA), the Ministry of Trade and others. The coordination of activities with these organizations is a core aspect of the general development of EE&C in the country and each program described in this document lays out the key stakeholders and core responsibilities.

In general, EEA is responsible for proposing, designing, monitoring and evaluating EE&C projects. In some cases, EEA may also carry out the implementation, but in other cases (especially in projects related to localized demand-side management), the distribution utility, EEU, is likely to have a leading role in implementation.

Other government organizations will have crucial roles in several areas, especially related to the regulation of appliances and equipment through standards and labelling programs. Large public-sector energy consumers will also be involved in EE&C

programs and municipal governments will play a role in implementing programs in buildings.

Private sector industry representation bodies will be important in ensuring the regulations; support and capacity building reach a broad cross-section of the manufacturing, agro-processing, construction, retail and import sectors. Finally, universities and the private sector will be involved in implementing the recommendations.

Programs and projects

Energy efficiency projects are generally short-term, concrete activities with measurable outputs, clear deliverables and defined budgets. These projects may be implemented by EEA, EEU, other governmental organizations or the private sector.

Energy efficiency programs consist of a range of coordinated activities and projects within a certain area, with broad energy conservation aims over the long-term. Programs are defined in the Energy Regulations as short-term (1-3 years), medium-term (4-6 years) or long-term (7-10 years), but the program impacts are generally expected to continue well beyond the implementation phase.

Funding

The recurrent budget that forms core funding for EEA's EE&C team was approved by the Ministry of Finance, Economic cooperation (MOFEC) upon establishment of the directorate (Energy Efficiency and Conservation Directorate, or EE&CD). This includes funding for a director and the employees, as well as operating expenses. Annual budget proposals for the directorate are submitted to MOFEC and approved in June of each year, before the start of the new fiscal year in July. Unspent funds must be returned to MOFEC at the end of the year, and previous spending will be analyzed when approving the budget for the coming year.

Capital budgets can be requested for implementing major programs. These requests are accompanied by full project proposals, including: feasibility studies, cashflow analyses, cost-benefit analyses and details of the outcomes and deliverables from the project. These budgets are requested from MOFEC in June of each year, and each capital budget proposal will be analyzed separately.

Additional funding for project or program development and implementation can be provided through external partnerships. These requests can be submitted at any time, in accordance with the requirements of the appropriate funding organizations. These requests allow additional programs to be implemented by EEA. Before any external funding agreement is approved, the detailed proposal should be shared with MOFEC.

Table 1 - Summary of key budget items for EE&CD in EC 2012 (2018-2019)

EE&CD recurring budget items, EC 2012	
Program coordination	Revision of guidelines and issuing of directives
Standards & Labelling	Meetings with importers of electrical equipment to discuss standards
Awareness	Promotional works in media and printed materials
	With gender issues directorate, train women on EE in 3 cities + Addis, awareness creation on efficient appliances and electric stoves
Energy management & auditing	30 walkthrough audits + 5 detailed audits
	Licensing for energy auditors
	Follow up on 10 industrial audits
	Train regional energy bureaus to do audits
	Meetings with stakeholders: industries for support and problem solving
	EMU agreements with 20 additional industries: select industries, give training, sign agreements
Loss reduction	Electric meter inspections (calibration/theft)
	With EEU and EEP, estimation of T&D losses every 3 months
EE&CD capital budget items, EC 2012	
Standards & Labelling	Electric motor MEPs and labelling
	Electric stove MEPs and labelling

Reporting and oversight

MoWIE presents action plans for the water, irrigation and electricity sectors to the parliament every 6 months. In addition, there is a standing parliamentary committee dedicated to overseeing the activities of the Ministry. EEA's Director General reports to this parliamentary committee every three months, with each director giving updates on activities, action plans and progress. This committee will ask questions and give comments on the activities and may request changes in the proposed actions.

Overview of energy efficiency and conservation activities

The later sections of this EE Action Plan provide detailed descriptions of the EE&C programs that are planned or underway. This overview represents a summary of some of the main information on these programs and their underlying projects.

Based on simple, top-priority measures, the EE Action Plan has identified an energy conservation potential that represents nearly 14% of total energy consumption in 2030, and a cumulative saving of 34TWh over the next 12 years. The demand savings from these measures will be up to 1,700MW, significantly reducing strain on the power grid.[1]

[1] Measures such as awareness and training have not been included in these calculations, as they only have indirect impacts on energy savings.

A second tier of more complex measures can increase the energy saving far beyond this. The programs and projects are listed in Table 2, while the estimated savings from several key projects are shown in Figure 2. (Note that for some priority projects, it is difficult to prepare quantitative estimates of savings.)

The EE&C activities to be carried out by EEA are split between the implementation of the projects and ancillary or shared activities which may not fall directly within the funding allocation or scope of a single activity, but which are essential to the implementation of broad programs in this action plan. These ancillary activities include:

- Development, review and update of the Action Plan;
- Development of detailed proposals for individual projects;
- Funding applications for projects and programs;
- Data gathering and management; and
- Reporting and monitoring.

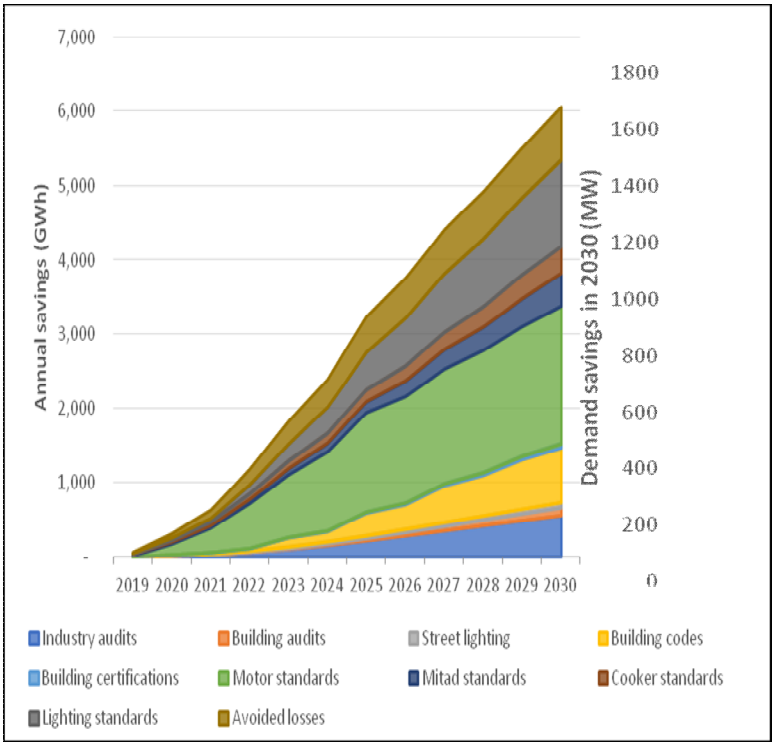
These activities are described in further detail in the Processes and Methodologies section. Individual programs and projects are described in the following EE Programs section. Funding applications must bear in mind the core costs to EEA for developing and running the EE&C programs, as well as the individual project activities.

Table 2 - EE&C programs and projects

Program	Project	Priority
Awareness, training & accreditation	**EE awareness campaign**	**High**
	Energy auditor and manager training	**High**
	EE advice centers	Medium
	Development of university curricula	Medium
Building codes & labeling	**EE in building codes**	**High**
	Voluntary sustainability certifications	**High**
	Benchmarking & performance labelling	Medium
	Efficiency requirements for social housing	Medium
Energy management & auditing	**Energy audits and voluntary agreements for industry**	**High**
	Energy audits for buildings	**High**
Public sector energy efficiency	**Efficiency in street lighting**	**High**
	Efficiency in public buildings	Medium
Standards & Labeling	**Lighting standards**	**High**
	Efficiency labelling program	**High**
	Electric motor standards	**High**
	Injera mitad standards	**High**
	Electric cook stove standards	**High**
	Refrigerator & freezer standards	Medium
	Washing machine standards	Medium
	Air conditioner standards	Medium
	Air compressor standards	Medium
	Television standards	Medium
	Solar water heater standards	Medium
Technology	**Efficient injera mitad manufacture**	**High**

acceleration	**Efficient welding systems**	**High**
	Solar water heater manufacture	Medium

Figure 2 - Estimated energy and demand savings from selected projects to 2030



PROCESSES AND METHODOLOGIES

Demand forecast and energy consumption baselines

To map the energy consumption that can be addressed by EE programs, it is important to consider a consistent baseline for current and future demand.

Calculations should be based on the most reliable energy demand forecasts, linked to data on end-use systems and imports. The source for these estimates is Table 3, which shows the estimated demand by end-use to 2030, according to the current demand forecasts. Some energy efficiency measures will be required to meet these levels of energy consumption, while others will be expected to reduce demand below these forecast levels.

Energy for export is not considered in the energy efficiency opportunities. Similarly, the reduction of losses in the transmission and distribution networks, while important for energy efficiency, is the remit of EEU, and is not part of this EE Action Plan. (Note that the demand forecast already assumes significant improvements in transmission and distribution losses compared to the current baseline.)

Table 3–Electricity demand forecast to 2030, in GWh.

Year	Domestic	Commercial	Street lighting	Industrial LV	Distribution losses	Industrial HV	Irrigation	Transport	Export	Transmission losses	Total
2017	3,509	2,240	47	2,155	1,327	0	168	1,290	499	1,305	**12,540**
2018	3,853	2,360	39	2,739	2,956	0	351	1,408	802	1,533	**16,041**
2019	4,307	2,593	42	3,242	4,046	101	499	1,539	916	1,533	**18,818**
2020	4,770	2,884	45	3,700	6,021	235	698	1,659	1,354	7,218	**28,584**
2021	5,294	3,209	49	4,092	7,716	507	951	1,770	1,517	7,875	**32,980**
2022	5,880	3,571	52	4,453	9,231	760	1,237	1,876	1,941	14,445	**43,446**
2023	6,531	3,974	56	4,806	11,256	1,016	1,520	1,981	2,065	14,445	**47,650**
2024	7,255	4,422	61	5,254	11,445	1,441	1,827	2,096	2,143	15,102	**51,046**
2025	8,059	4,922	65	5,782	11,649	1,866	2,144	2,217	2,222	15,759	**54,685**
2026	8,884	5,442	70	6,310	11,809	2,291	2,430	2,324	2,261	15,759	**57,580**
2027	9,776	6,003	75	6,858	11,979	2,716	2,708	2,422	2,323	16,416	**61,276**
2028	10,751	6,617	80	7,437	12,158	3,141	3,022	2,516	2,382	17,073	**65,177**
2029	11,823	7,292	86	8,057	12,347	3,566	3,326	2,605	2,413	17,073	**68,588**
2030	13,001	8,035	92	8,723	12,548	3,991	3,623	2,687	2,442	17,073	**72,215**

(Source: Power Africa GMSP System Integration Studies technical review presentation, 2018)

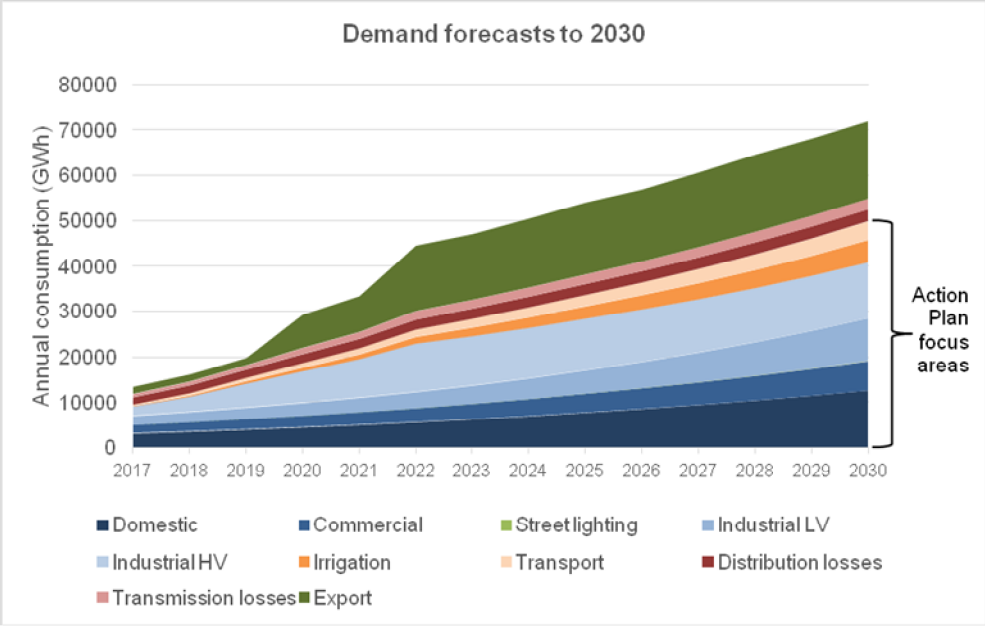


Figure 3: Demand forecasts to 2030, *(*Source: *Power Africa GSMP, 2018)*

As mentioned previously, the use of biomass energy for cookstoves and the use of fossil fuels for transport are outside the remit of this action plan. Although the use of non-electric energy for industry and water heating is included in this EE Action Plan, the demand forecasts for these energy types are not available and savings estimates are based on expected expansion for industry.

Thermal energy use can displace electricity, where it is used in industry or for water heating. The direct use of onsite renewable energy sources for electrical or thermal generation will also have significant impact on potential savings and small-scale onsite generation is considered in this action plan. Cogeneration of electricity in industrial sites with significant heat demand (especially in sugar factories) is an important source of energy but is outside the remit of this document.

Criteria for development and prioritization of EE projects and programs

Well-designed energy efficiency programs have been repeatedly shown to have lower costs than the development of new generation, transmission and distribution infrastructure. Previous publications and studies in the sector have identified a range of EE projects with low costs and rapid financial paybacks.

However, the design and implementation of projects requires time and expertise. In a situation with limited capacity and a range of pressing needs, it is important that the planning of EE activities be carried out in a strategic, coordinated manner. This requires a framework for evaluation of EE projects which allows them to be ranked and prioritized.

A range of criteria have been developed for the evaluation of EE projects. These are as follows:

- *Total cost (USD)* – This value represents the investment of the government or public sector in developing and implementing the project, including direct subsidies where relevant. It does not include any additional costs that will be incurred by private sector entities (for example, if they are obliged to acquire more expensive equipment due to higher standards).
- *Total energy savings (GWh/year and GWh)* – These indicators represent the total annual electricity or fuel savings from an energy efficiency project, as well as the global savings for the lifetime of the measures installed by 2030.
- *Cost of energy savings ($/MWh)* – This is the cost to the public sector of the energy savings from the project. If this value is lower than the cost of providing energy to the end-users, the project is viable and should go ahead.
- *Payback to end-users (years)* – In some cases, end-users will be required to pay for equipment or systems that save energy. The financial return for private sector players should be calculated and stated, to ensure that the project is feasible and can be adopted. If there is no additional cost to end-users, this value will be zero.
- *Total demand reduction (MW)* – This value is an estimate of the reduction in local peak energy demand as a direct result of the EE project, usually based on an assumed diversity factor for use of equipment or systems. This value is most relevant for evaluating utility demand-side management programs.

- *Cost of demand reduction ($/kW)* – This is the cost to the utility or public sector of the reductions in peak energy demand from the project. This value is most relevant for evaluating utility demand-side management programs.
- *Ease of capture* – This is a qualitative measure of the complexity and difficulty of implementing the program, based on the existing capacity, infrastructure and specialized knowledge required, bureaucratic complexity and difficulty of guaranteeing and verifying energy savings.

Note that not all criteria will be relevant for all projects. In addition, in some cases it may be impossible or unfeasible to estimate project criteria at early stages in project design.

In general, projects with the lowest cost of energy savings and highest total energy savings will be prioritized across the country, while projects with the greatest total demand reduction and lowest cost of demand reduction will be prioritized in localized demand-side management by the utility. The whole-system payback must be low for the project to be viable, while the end-user payback can be used to define and direct subsidies to EE projects[2].

Distribution utility energy management

This section outlines the role of EEU's Energy Management Department in capturing savings from Distributed Energy Resources (DERs) and project implementation.

Demand-side management

In general, the improvement of energy efficiency brings benefits to the whole energy sector, and hence society, as noted in the introduction. In addition, there are cases where energy efficiency forms a crucial part of the DERs that can be used to lower demand in specific feeders or substations. This can be done to avoid overloading, reduce outages, postpone grid investments and improve overall reliability and system performance. In a system where distribution bottlenecks are responsible for many grid problems, capital expenditure is limited, and capacity is stretched by an ambitious grid expansion program, DERs can play an important role in distribution planning.

The Energy Management Unit in EEU is responsible, among other things, for demand-side management. The unit may choose to implement targeted energy efficiency or demand response programs in selected areas, where this results in direct improvements in grid reliability and cost reductions for EEU. The energy efficiency actions are likely to include some of those developed in this Action Plan but are likely to receive additional subsidies from EEU to ensure rapid implementation. For example, this may include subsidies for exchanging light bulbs, installing solar water heaters or installing remote control switches on chillers so they can be switched off in peak times.

The evaluation of EE&C programs for their application in demand-side management will be carried out using the $/kW and MW savings criteria cited above. The results of

[2] At this level of analysis, a simple whole-system payback (where it can be calculated) is sufficient for categorizing projects. Where more detailed development or project design is carried out, the net present value (NPV) or internal rate of return (IRR) can be used to compare alternative designs and select the options which maximize impact. At this stage, it is important to give careful consideration to the expected lifetime of the measures to be implemented under each EE&C activity.

the programs should be tracked by EEA, in accordance with the appropriate M&V procedures, but the responsibility for funding and implementation rests with EEU. Note that in addition to the demand savings listed here for the projects, it will be necessary to carry out load curve analyses to identify the time of day at which the reductions occur, and hence their impact on peak demand.

Loss reduction

The distribution and transmission utilities (EEU and EEP) are also responsible for the mapping and reduction of losses in the T&D system. These efforts are key to ensuring the overall energy efficiency of the electricity system but are dealt with extensively in EEU's own documentation and are outside the remit of this Action Plan.

Project implementation

Where appropriate, EEU can act as an implementing agent for large-scale EE projects. These projects may include distribution of efficient products and systems to end-users or identification of the potential for energy saving in major customer groups.

Finance for energy efficiency

Internal resources

For effective implementation of EE programs, it is essential that the EEA's operating costs be fully covered. This includes human resources – hiring the necessary staff members and ensuring that they are fully trained – and basic operating costs for the teams.

These resources should be provided by the Ministry of Finance, following recurring budgetary requests made by EEA.

Program finance

Operating and implementing energy efficiency programs is likely to have additional costs; in some cases, these will include direct financial subsidies for energy efficiency. These subsidies may be provided by EEU and EEP, as electricity tariffs are currently subsidized and energy efficiency is likely to be cheaper than energy provision in many cases. Alternatively, EE finance may be sought from development partners or directly from the central government budget. This is likely to be through the Energy Efficiency Fund established in the Energy Proclamation and detailed in the Energy Regulations.

Finance should be sought separately for each EE project, according to the individual project criteria.

The Energy Efficiency Fund cited in the Energy Proclamation and developed in the Energy Regulations can be used to subsidize energy efficiency projects and programs, as well as studies, information dissemination, consultancy, energy auditing, research and capacity building.

Data management and Continuous EE Evaluation

To track baseline energy performance and monitor ongoing projects, EEA must implement basic procedures for data capture and management. The following section outlines these procedures.

Base lining and industry benchmarking studies

Baseline studies and benchmarking of industries form integral parts of energy efficiency program evaluation and reference points for development of EE targets.

An energy productivity baseline should be developed for large or energy-intensive industries. This baseline will establish current energy performance and specific energy consumption (per unit of product) for key industries. These performance levels can be used as the basis for proposing interventions and EE programs in existing and new industries.

By benchmarking the performance of individual factories against the sector and international good practice performance levels, it is possible to estimate the performance improvement potential and savings available from targeted EE programs.

Several industries have been identified priorities for benchmarking:

- Cement
- Textiles
- Steel
- Sugar
- Breweries

EEA should develop energy baselines and benchmarks for these industries and keep them up to date by collecting data from energy audits, voluntary agreements with industry and other sources.

Yearly data on unit production, energy consumption (thermal and electric), raw material input and records on improvements or adjustment should be gathered for the proposed industry categories. Annex D details a possible methodology for baseline development and provides sample data collection forms.

Surveys on appliances

EEA should carry out regular surveys on the cost and availability of key energy-consuming appliances and equipment, including electric motors, lighting, injera mitads, electric cookers, refrigerators, water heaters and air conditioners. Each survey should be updated annually.

These surveys should be carried out with equipment distributors, homeowners and commercial businesses, at the minimum sample sizes necessary to ensure statistical relevance. The outputs should be cross-referenced with import data and national census data to provide a clear view of appliance use and efficiency. These results are used to evaluate the impact of standards & labelling programs, to update the programs and to plan for the implementation of additional programs.

Sample reporting templates for appliance surveys are included in Annex D.

Ongoing data collection from stakeholders

EEA should establish protocols for direct transfer of key data from other stakeholders at regular intervals. This will be necessary for the update of EEA's expected program impacts, for monitoring and evaluation of project performance and for the selection and prioritization of future projects.

- EEU should provide data on energy consumption of all end-users, separated by region and consumer class (residential, industrial, commercial, etc.) This data should be provided annually.
- Customs Authority should provide data on the imports of all key classes of energy-consuming systems and equipment, including electric motors, lights, refrigerators and air conditioners. This data should be provided annually.
- Customs Authority or Ministry of Trade should provide data on the domestic production and sales of injera mitads, electric cookstoves, light bulbs and any other equipment which is defined as having significant energy consumption. This data should be provided annually.
- Ministry of Trade should provide reports on the levels of regulatory compliance with all mandatory product standards. These reports should be provided every 6 months.
- Major industries and industry associations should provide estimates on the production rates of key industrial goods. This data should be provided annually.
- The municipal administrations of major cities (Addis Ababa, Adama, Dire Dawa, Hawassa, Bahir Dar, Mekele, Dessie, Jimma, Bishoftu and Gondar) should provide data on the estimated number and area of commercial and domestic buildings, and the construction permits awarded for buildings over 1000m², with date of construction.

Database development

EEA should have a central database where information on energy consumption, energy performance, efficiency projects and monitoring results are collected, collated and prepared for analysis. The data should be clearly organized, easy to access and available for consultation. Where feasible, this data should be formatted for publication and made available to the public[3].

[3] A good example of centralized databases development and application is the Electricity Regulatory Authority (ERA) of Uganda. All data energy specific data is made easy available through a web that is frequently updated.

Monitoring and evaluation procedures

Every program developed under the Energy Efficiency Action Plan should include adequate monitoring and evaluation (M&E) of impacts and outcomes. This may not involve direct, measurable savings of energy, as many of these programs will have indirect outputs, such as the increase in the number of trained experts operating in the sector.

Each program should submit an M&E plan at the program outset, which should define as a minimum:

- Direct outputs or results of the program (for example: number of people trained, or number of energy audits carried out)
- Indirect results expected from the program (for example: energy saving measures implemented and energy saved)
- Data to be collected and variables to be measured as part of the program monitoring
- Frequency of reporting and evaluation procedures for the program

Direct investments that aim to reduce energy consumption by acquiring equipment or changing procedures, for example in a building or an industry, should be subject to appropriate monitoring and verification (M&V) procedures, as laid out in the EU SE4All TAF Deliverable 11 (July 2015) – "Guidelines for a measurement and verification strategy". This ensures adequate measurement of the direct savings achieved by the investment and is a crucial part of the financial reporting of energy efficiency-related investments.

ENERGY EFFICIENCY PROGRAMS

Definition and selection of EE&C Programs

The International Energy Agency defines the following types of energy efficiency policy measures[4]:

1. Information measures
2. Regulatory and target setting measures
3. Capacity building measures
4. Finance measures
5. Energy management measures
6. Technology acceleration measures
7. Supply chain measures

The Energy Proclamation and Energy Regulations make it clear that most or all of these measures can be considered within the scope or regulatory capacity of EEA.

Effective EE&C programs will often be implemented using a range of policy measures. For example, a target setting measure should be supported by capacity building and information, while a technology acceleration measure may require finance.

[4] IEA Energy Efficiency Policy Training Week, 2017

Generally, the cost of EE&C programs will be lower than the whole-system cost of providing equivalent supply, transmission and distribution. Programs should be developed with clear objectives, measurable outputs and an understanding of the barriers to efficiency they are designed to overcome, whether this be quick wins or deeper structural development which may take several years to produce outputs.

The following sections of the document outline the principal EE&C programs and projects that have been identified, proposed or developed. These program areas are defined as follows:

Standards and labelling– development of product standards, minimum energy performance standards and energy performance labels for appliances and systems, both imported and locally manufactured. These measures are primarily regulatory but will also include some information and supply chain aspects.

Energy management and auditing – monitoring of energy performance, identification of opportunities and implementation of energy saving measures in existing buildings and industry.These projects will include information measures, target setting, capacity building and energy management.

Awareness, training and accreditation – development of general awareness campaigns around efficiency, provision of structured training programs and licensing for energy efficiency specialists. These projects involve information and capacity building measures.

Public sector efficiency – direct cost reduction for the public sector through implementation of energy efficiency projects or retrofits. These projects are likely to include target setting, supply chain and finance measures.

Building codes and labeling–voluntary or mandatory energy performance levels for new or existing buildings. These are primarily regulatory and target setting measures, supported by capacity building.

Technology acceleration – support for the development of local manufacturing capacity in systems that can have a large impact on energy efficiency or conservation of energy. These are technology acceleration and supply chain measures

Finance and subsidies – the structuring of financial support and subsidies to the programs identified above. These are finance measures.

Each program area includes several activities or projects which are evaluated individually against the criteria developed above. These lists are not exhaustive and new projects should be evaluated and added where appropriate upon each revision of this Action Plan. It may also become necessary to add a full program area in a future update of the document.

There is significant interaction between the different programs and this Action Plan should help them to be developed in parallel and achieve synergies.

Standards and labeling

Overview

The implementation of Standards and Labelling (S&L) programs is one of the core responsibilities of EEA and represents one of the greatest opportunities for energy saving at low cost to the public sector. For effective implementation and regulation, activities must be coordinated between various stakeholders.

Individual projects describe the development and implementation of standards or labelling programs in relatively short time periods. However, ongoing curatorship and regular updates are required for long-term effectiveness of the program. As such, the overarching program is considered to be a long-term activity.

Significant work has already been done in this area, and many projects are well underway.

Key stakeholders

- EEA
- Ethiopian Standards Agency (ESA)
- Ethiopian Conformity Assessment Enterprise
- Ministry of Trade
- Ethiopian Customs and Revenue Authority
- Ethiopian Consumer Protection Authority
- Manufacturers
- Traders (Importers and distributors)

Processes

The Energy Regulations make a provision for EEA to set minimum energy performance standards (MEPS) and develop labelling programs to communicate energy performance to consumers. The responsibility for developing national standards lies with ESA, and these standards are regulated by the Ministry of Trade. As such, MEPS may be developed as a part of broader product standards, or as stand-alone efficiency standards. The adoption of international standards can be carried out on a fast-track basis. Where appropriate international standards exist, this is likely to be the most appropriate method for imported systems.

To develop a new efficiency standard, a committee should be formed with relevant stakeholders (including industry and the private sector). This committee should be chaired by EEA and have ESA acting as the secretariat. The committee will develop a standard and submit it for approval by the National Standards Council, at which time it will become a nationally adopted standard. Each standard should be reviewed every five years.

Once a national standard becomes mandatory, the Ministry of Trade assumes responsibility for regulating the implementation. This is done both through the import/export quality directorate, which verifies performance at the point of import alongside the Customs Authority, and through the market surveillance directorate, which carries out spot checks on manufacturers, sellers and distributors of equipment.

Testing of products for conformity with the standards is generally carried out by the Ethiopian Conformity Assessment Enterprise (ECAE), in accordance with the organization's scope. Pre-export Verification of Conformity (PVoC) can be adopted for use in regulating equipment which is imported and for which local testing facilities may be unavailable or prohibitively expensive. PVoC has been applied successful in many countries to fast track enforcement of MEPS. In implementing the MEPS, the EEA and Ministry of Trade should review the success of other East African countries with implementation of PVoC programs.

The Energy Regulations give EEA the power to request product samples from manufacturers for energy efficiency testing; the development of some of EEA's activities may involve the creation of laboratories or structures for testing energy performance. In all cases, this should be aligned with the Conformity Assessment Enterprise, which should ideally be responsible for oversight and control of performance testing.

Energy efficiency labelling should be developed by the Ethiopian Energy Authority, in accordance with the procedures laid out in the National Standard for Labelling. The lowest level of efficiency on the label should match that of the MEPS for the equipment, if applicable. The relevant consumer authorities should be consulted in the process of development of the labels. A typical PVoC process is illustrated in Figure 4.

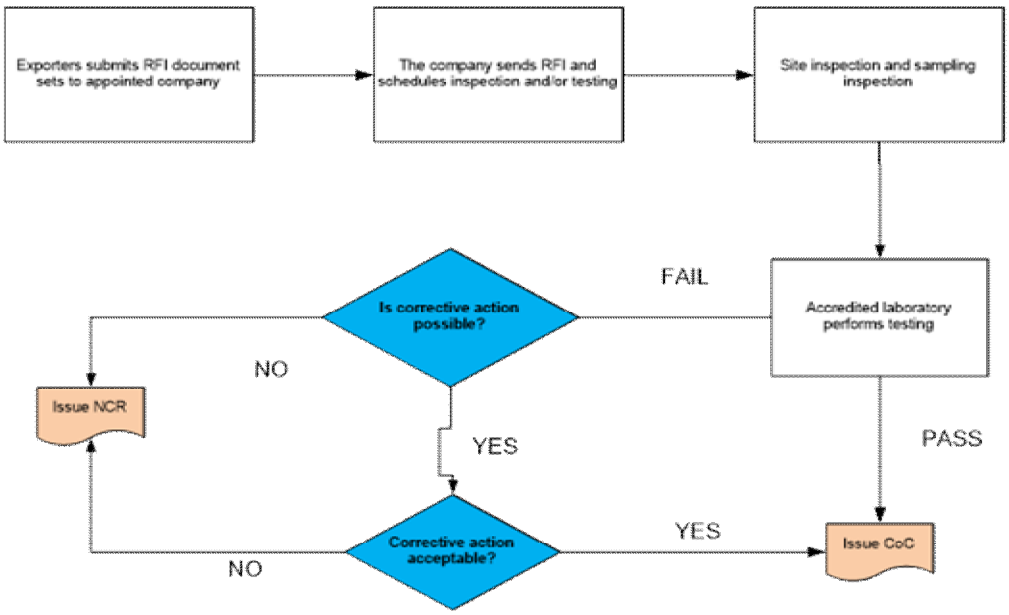


Figure 4: PVoC Process ***(Source: Adopted from UNBS Pre-export verification for conformity to standards operation manual, UNBS 2015. CoC = Certificate of Compliance. NCR = Non-Compliance Report)***

Energy performance standards and labelling programs should be accompanied by broad, general awareness raising programs to maximize impact and consumer adoption.

Priority activities and expected impacts

Projects have been selected according to the following criteria: total savings potential; cost of savings; ease of implementation; demand savings; and existing stage of development. Table 4 shows estimates of energy savings from high-priority minimum energy performance standards, while Figure 5 provides indicative timelines for both top-priority and secondary projects.

The priority projects identified for immediate implementation are:

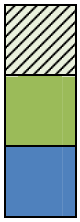
- Minimum energy performance standards for lighting
- Minimum energy performance standards for electric motors
- Minimum energy performance standards for injera mitads
- Minimum energy performance standards for electric cookstoves
- Development of a broad labelling program across a range of products

Table 4: Priority activities and expected impacts

System	Estimated 2017 consumption (GWh)	Savings from standards	Annual savings by 2030 (GWh)
Electric motors	1,700	16%	1,860
Injera cookers	585	26%	435
Electric cookers	857	13%	368
Lighting	1,467	Up to 50%	1,172

Figure 5 - Example of possible timelines for S&L implementation

Standards	Year 1				Year 2				Year 3			
	Q1 2018	Q2 2018	Q3 2018	Q4 2018	Q1 2019	Q2 2019	Q3 2019	Q4 2019	Q1 2020	Q2 2020	Q3 2020	Q4 2020
Injera Mitads												
Electric motors												
Electric cook stoves												
Lighting												
Refrigerators & freezers												
Washing machines												
Air conditioners												
Televisions												
Solar water heaters												



Standard development

Standard implementation

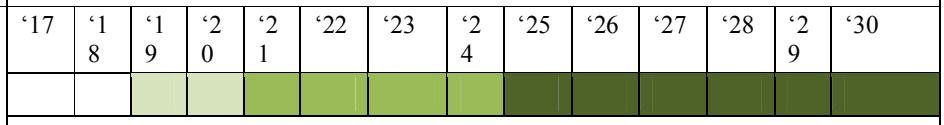
Label implementation

Reporting framework

Customs Authority should provide high-fidelity data to EEA at regular intervals, preferably every 6-12 months. This data should cover the imports of all key energy consuming electrical equipment. Where possible, the data should be classified by equipment type, rated capacity and efficiency rating.

EEA should carry out regular market surveys of the costs and performance of key equipment and cross-check these with the information received from Ministry of Trade, Customs Authority and the Ethiopian Conformity Assessment Enterprise.

Project datasheet	**Lighting standards**		
Project status	**Product standard proposed**	**Type: Long-term**	
Key project indicators	**Cumulative energy savings by 2030: 5,867 GWh**	**Cumulative cost savings by 2030: ETB 13.7bn**	**Demand reduction in 2030: 309 MW**
Baseline energy consumption (2017)	21,000,000 units/year	1,467 GWh/year	17% growth
Proposed measures	Proposed program to develop and implement minimum energy performance standards for lighting products.		
Expected impact by 2030	98% of new lighting with LEDs	1,172 GWh saved per year	ETB 3bn/year of electricity costs avoided by consumers
Key stakeholders and responsibilities	▪ **EEA** will be responsible for developing and implementing minimum energy performance standards that will drive the widespread adoption of high-efficiency lighting ▪ **ESA and Min Trade** will cooperate with EEA in the development and enforcement of the standards ▪ **Local manufacturers** will be encouraged and supported to improve the efficiency of their products ▪ **Public buildings** can be first adopters, helping to reduce the cost of LEDs through bulk procurement		
Results and status	Importation and sales of incandescent lamps banned		
Ongoing activities	A lighting standard is being proposed by ESA and EEA.		
Challenges and limitations	Currently, less efficient lighting and poor-quality lighting are often cheaper than alternatives. A mature market for high-quality, high-efficiency systems that have long lifetimes needs to be established quickly.		

	EEA product testing capacity or similar capability at national level needs to be established
Timeline of activities	
Resources required	Cost of administering the program: to be defined by ESA and EEA. Significant training and capacity building are required. It may be necessary to subsidize equipment costs for some consumers.
Interactions with other EE program areas	• Training programs will provide expertise for this project • Future programs may give support to local manufacturers
Key project documents and references	No project documents have yet been developed

Project datasheet	**Electric motor standards**		
Project status	**Standards developed**	**Type: Long-term**	
Key project indicators	**Cumulative energy savings by 2030: 12,532 GWh**	**Cumulative cost savings by 2030: ETB 28.5bn**	**Demand reduction in 2030: 382 MW**
Baseline energy consumption (2017)	64% share of industrial energy consumption	1700 GWh/year	17% growth
Proposed measures	Implementing IE-2 electric motors as MEPS, initially for large consumers and later for all motors.		
Expected impact by 2030	95% of new motors meet IE-2 standard	1,859 GWh saved per year	ETB 4.7bn/year of electricity costs avoided by consumers
Key stakeholders and responsibilities	▪ **EEA** will be responsible for developing and implementing minimum energy performance standards that will drive the widespread adoption of high-efficiency lighting ▪ **ESA and Min Trade** will cooperate with EEA in the development and enforcement of the standards		
Results and status	No measured results to date.		
Ongoing activities	Standards are currently under development.		
Challenges and limitations	• There is a need to develop a mature market and increase consumer awareness of the impacts of increasing motor efficiency, especially as electricity prices rise.		

	• EEA product testing capacity or similar capability at national level needs to be established
Timeline of activities	‘17 ‘18 ‘19 ‘20 ‘21 ‘22 ‘23 ‘24 ‘25 ‘26 ‘27 ‘28 ‘29 ‘30  Planning and ramp-up Partial coverage Full coverage
Resources required	Cost of administering the program: to be defined by ESA and EEA. Significant training and capacity building are required.
Interactions with other EE program areas	• Training programs will provide expertise for this project
Key project documents and references	Electric motor standards project documents (2015)

Project datasheet	**Electric injera mitad standards**		
Project status	**Standards developed**	**Type: Long-term**	
Key project indicators	**Cumulative energy savings by 2030: 2,017 GWh**	**Cumulative cost savings by 2030: ETB 4.7bn**	**Demand reduction in 2030: 363 MW**
Baseline energy consumption (2017)	530,000 units 60% of household peak demand	483GWh/year	10% growth
Proposed measures	Implement standards for electric injera mitads, through artisanal trainings, and labeling of stoves and awareness/ sensitization		
Expected impact by 2030	Mitad peak power reduced from 3.8kW to 2.8kW	435 GWh saved per year	ETB 1.1bn/year of electricity costs avoided by consumers
Key stakeholders and responsibilities	▪ **EEA** will be responsible for developing and implementing minimum energy performance standards that will drive the widespread adoption of high-efficiency lighting ▪ **ESA and Min Trade** will cooperate with EEA in the development and enforcement of the standards		
Results and status	No measured results to date.		
Ongoing activities	Standards are currently under development.		
Challenges and limitations	• There is a need to give strong support to local manufacturers in the adoption of high-efficiency technologies for injera mitads. • Cooking quality must be maintained as efficiency improves. • EEA product testing capacity or similar capability at national level needs to be established		
Timeline of activities	‘17 ‘18 ‘19 ‘20 ‘21 ‘22 ‘23 ‘24 ‘25 ‘26 ‘27 ‘28 ‘29 ‘30 Planning and ramp-up / Intermediate standards / Final standards		
Resources required	Cost of administering the program: to be defined by ESA and EEA. Significant training and capacity building are required. It may be necessary to subsidize equipment costs for some consumers.		
Interactions with other EE program areas	• Training programs will provide expertise for this project • Market development and technology support for local manufacturers will be essential for the success of this project.		
Key project documents and references	Injera Mitad Project Documents (2015)		

Project datasheet	**Electric stove standards**		
Project status	**Standards under development**	**Type: Long-term**	
Key project indicators	**Cumulative energy savings by 2030: 2,017 GWh**	**Cumulative cost savings by 2030: ETB 4.7bn**	**Demand reduction in 2030: 363 MW**
Baseline energy consumption (2017)	~25% of domestic energy consumption	857 GWh/year	10% growth
Proposed measures	Development and implementation of minimum performance standards and efficiency labels, training and awareness raising, support for manufacturers.		
Expected impact by 2030	XX units per year	GWh saved per year	
Key stakeholders and responsibilities	▪ **EEA** will be responsible for developing and implementing minimum energy performance standards that will drive the widespread adoption of high-efficiency lighting ▪ **ESA and Min Trade** will cooperate with EEA in the development and enforcement of the standards		
Results and status	No measured results to date.		
Ongoing activities	Standards are currently under development.		
Challenges and limitations	• There is a need to give strong support to local manufacturers in the adoption of high-efficiency technologies for locally produced cook stoves. • EEA product testing capacity or similar capability at national level needs to be established.		
Timeline of activities	‘17 ‘18 ‘19 ‘20 ‘21 ‘22 ‘23 ‘24 ‘25 ‘26 ‘27 ‘28 ‘29 ‘30 Planning and ramp-up MEPs in place		
Resources required	Cost of administering the program: to be defined by ESA and EEA. Significant training and capacity building are required. It may be necessary to subsidize equipment costs for some consumers.		
Interactions with other EE program areas	• Training programs will provide expertise for this project • Market development and technology support for local manufacturers will be essential for the success of this project.		
Key project documents and references	Efficient Cook stove project documents (2017)		

Energy management and auditing

Overview

The broad term of energy management is used to encompass a range of activities that lead to improvement in the operational performance of buildings and industry, and hence reductions in energy consumption.

Industry is responsible for a large proportion of forecast growth in national energy consumption (42% of end-use excluding exports in 2017, rising to 55% in 2022), while commercial buildings are also a fast-growing consumer (19% of end-use excluding exports in 2017) and have significant demand concentrated in a few large or new buildings.

The provision of expertise and knowledge on energy saving through energy audits and ongoing energy management are important for ensuring the energy users can make informed decisions regarding energy consumption and reduce demand. Creating conditions for effective energy auditing and energy management are key responsibilities of EEA.

With very low tariff rates, the provision of expertise and information may not always be sufficient to drive energy efficiency projects to implementation. Until cost-reflective tariffs are achieved, energy management and auditing activities are likely to be linked to the provision of subsidies or loans for implementation of energy saving measures (described in a separate section).

As the end-goal of EEA's intervention should be to create, monitor and regulate a market for energy efficiency services. This is a short- or medium-term program.

Key stakeholders

- EEA
- Private sector consultants and energy efficiency specialists
- Major industries, especially in textiles, cement, steel, sugar, food & beverage
- Owners and operators of large commercial buildings
- Public building operators

Processes

The Energy Regulations define EEA's role in licensing specialists for carrying out energy audits and energy conservation contracting and consultancy activities. In addition, the regulations lay out a remit for EEA to promote energy efficiency in buildings and industry through voluntary agreements and designation of industries or buildings which shall be required to undertake energy auditing and conservation activities.

Initially, EEA is expected to have a significant role in carrying out energy efficiency analyses and audits. As more professionals join the market and the commercial drivers of efficiency become clearer, it is expected that a significant proportion of this work will be handed over to licensed companies and individual specialists.

Priority activities and expected impacts

The priority activities identified are:

- *Energy auditing in industry* – provision of financial and technical support to carry out energy audits in large or energy-intensive industries across the country.
- *Voluntary agreements for energy management in industry* – agreements between EEA and individual industries, in which EEA offers technical support and the industries implement energy management procedures and report on their performance.
- *Building energy audits* – provision of financial and technical support to carry out energy audits in large buildings or commercial users with high energy consumption across the country.

Energy audits in industry are already underway – these should be scaled up and there should be a focus on handing the activities over to the private sector to free up EEA's capacity.

Voluntary agreements for energy management with industry are currently at an early stage of development.

Building energy audits have not yet begun – this program has a lower total potential for savings than industrial energy audits or industrial management and requires the development of additional training and certification regimes.

Future work should focus on the improvement of energy efficiency in new industries through design optimization, availability of finance for efficiency and technical support. This could be done in cooperation with the Industrial Parks Development Corporation.

Reporting framework

EEA should keep records of all the energy audits carried out in buildings and industries, as well as savings identified. Follow-up questionnaires should be sent to all recipients of energy audits 12 months and 36 months after the audit completion, to ask for information on projects implemented and savings achieved, as well as updated specific energy consumption.

All voluntary agreements signed with industries shall include detailed requirements on monitoring energy performance and reporting on the implementation of energy management systems and energy savings. These reports should be shared with EEA on a regular basis and used to track savings from the energy management programs.

Project datasheet	**Energy audits and voluntary agreements for industry**		
Project status	**In progress**		**Type>: Medium-term**
Key project indicators	**Cumulative energy savings by 2030: 2,693 GWh**	**Cumulative cost savings by 2030: ETB 6.3bn**	**Demand reduction in 2030: 191 MW**
Baseline energy consumption (2017)	2,651 GWh/year energy consumption in industry	15% growth rate	
Proposed measures	A program to build expertise and conduct energy audits in large energy consumers and energy-intensive industries in Ethiopia and support the development of energy management systems to ensure implementation of audit recommendations. Start with voluntary agreements and subsidized implementation of energy audits, later moving to regulations that require audits to be provided and a fully functional marketplace.		
Expected impact by 2030	120 industries audited per year	556 GWh saved per year	ETB 1.4bn saved per year
Key stakeholders and responsibilities	▪ **EEA**: support energy auditors, develop guidelines for energy audits, reviews and certify audits ▪ **Network of energy auditors:** (internal in industry and freelance); conduct the audits and guide implementation of energy management opportunities identified. ▪ **Industries**: develop and implement energy management systems to act on the results of the energy audits.		
Results and status	Several audits conducted annually, all fully subsidized.		
Ongoing activities	Ongoing audits in several industries per year.		
Challenges and limitations	• Implementing identified energy management/ saving opportunities • Quality of audit documentation and proposed projects • Rapidly building a mature service industry, with highly-qualified auditors providing a level of service that maximizes energy savings across hundreds of industries. • EEA over sighting and regulating capability of energy auditors and ESCos needs to be developed.		
Timeline of activities	‘17 ‘18 ‘19 ‘20 ‘21 ‘22 ‘23 ‘24 ‘25 ‘26 ‘27 ‘28 ‘29 ‘30 Planning and ramp-up — Subsidized operation — Unsubsidized operation		
Resources required	Estimated cost of administering the program: ETB 2m/year. Total cost of subsidizing energy audits: ETB 201m. Total cost to users of energy audits: ETB 553m. Significant training and capacity building are required.		
Interactions with other EE program areas	• Training programs will provide expertise for this project • Voluntary agreement program in industry		
Key project documents and references	Energy efficiency training and market development proposal, October 2018		

Project datasheet	**Energy audits for large commercial buildings**

Project status	**No development initiated**		**Type>: Medium-term**
Key project indicators	**Cumulative energy savings by 2030: 453 GWh**	**Cumulative cost savings by 2030: ETB 1.1bn**	**Demand reduction in 2030: 40 MW**
Baseline energy consumption (2017)	2,084 large buildings	624 GWh/year	10.3% growth
Proposed measures	A program of energy audits in all commercial and public buildings with consumption over 60MWh/year. • Start with 175??? buildings in 2019, then 350 buildings in 2020. Ramp up gradually to 600 buildings/year by 2030. • Government subsidizes 100% of audit cost in 2019 (pilot), then 75% from 2020, gradually phases out subsidy by 2028.		
Expected impact by 2030	500 buildings audited per year	111 GWh saved per year	ETB 0.28bn saved per year
Key stakeholders and responsibilities	**EEA** will be responsible for administering the program, training and licensing auditors, quality assurance in audits. **Consultants** (companies or individuals) will obtain auditing licenses and carry out the audits. **Public sector buildings** will be obliged to undertake regular energy audits. **Private sector building owners** will be encouraged to carry out energy audits.		
Results and status	To date, no work has been done on developing energy audits for buildings.		
Ongoing activities	No activities are currently underway.		
Challenges and limitations	• There is a need to train and license energy auditing professionals, as there are currently few on the market. • There must be demand for energy audits from building owners and recognition of the benefits. • Energy audits must be effective in identifying and driving implementation of EE measures – this requires strong capacity building and availability of measures.		
Timeline of activities	‘17 ‘18 ‘19 ‘20 ‘21 ‘22 ‘23 ‘24 ‘25 ‘26 ‘27 ‘28 ‘29 ‘30 Planning and ramp-up Subsidized operation Full operation		
Resources required	Cost of administering the program: ETB 2m/year. Cost of subsidizing audits: ETB 151m. Cost to users of audits: ETB 717m. Significant training and capacity building are required.		
Interactions with other EE program areas	• Training programs will provide expertise for this project		
Key project documents and references	No project documents have yet been developed		

Awareness, training and accreditation

Overview

Creating awareness of the benefits of energy conservation is noted as a priority for EEA's activities in the Energy Regulations. In addition, EEA has a responsibility to provide training, accreditation and licensing of professionals in the energy efficiency space. This requires development of structured capacity building and training programs across a range of areas.

This is a long-term program, aiming to ensure the availability of highly qualified professionals and market demand for energy conservation services in the coming years.

Key stakeholders

- EEA
- Selected universities
- Energy consultancies and energy specialists
- Communications agencies and media

Processes

An awareness campaign on electric mitads is underway, led by EEA. This has included printing and distribution of materials, as well as awareness creation and training given to manufacturers.

An awareness campaign on LED lamps includes radio, television and promotional material (brochures, stickers and banners). An additional awareness campaign has been carried out on energy-consuming household appliances. Annually, 4-5 programs give training to people from communities on how to select and use efficient appliances. On solar water heaters, a campaign aims to make the commercial and residential sectors aware of the potential.

Awareness creation on standards and labelling is also carried out by EEA's EE&CD.

Priority activities and expected impacts

The priority activities identified are:

- Efficiency awareness campaign
- Energy auditor and energy manager training

Future activities to be planned by EEA include:

- EE advice centers
- Development of university curricula

Reporting framework

EEA shall retain records of the number of people trained in each training program and their professional registries and activities following completion of the training programs if they become accredited.

The universities which take part in development of new curricula or programs related to EE shall retain records of the course content, number of students and reported satisfaction with the courses.

EEA shall also retain records of the outputs of any marketing campaigns, and shall endeavor to measure their impacts, for example through regular surveys, in order to plan future campaigns more effectively.

Public sector efficiency

Overview

The implementation of energy efficiency projects in the public sector can represent direct savings for all parties involved. The energy distributor will have more energy available to increase access and reliability in underserved areas, public organizations and ministries will reduce costs (making savings to the taxpayer and the national budget) and the implementation of programs at scale can help drive the maturity of the EE market in Ethiopia.

A streamlined decision-making process should make it possible to directly finance EE programs for the public sector, with an initial focus on street lighting and buildings.

This is considered a medium-term project.

Key stakeholders

- EEA
- EEU
- Ministry of Finance
- Municipal roads authorities
- Ministries and large public-sector organizations

Processes

Projects should be identified and planned by EEA in conjunction with the relevant authorities - those responsible for maintenance of public buildings and the municipal roads authorities for street lighting. This could include conducting detailed energy audits in public buildings and will involve the preparation of strong financial cases for investment.

Finance for the projects should be sought from the energy utilities or the Ministry, as all projects to be funded should have clear financial returns.

The implementation of the energy efficiency projects, including sourcing of materials and contracting the supply and installation of equipment, should be carried out by EEU's Energy management division.

Priority activities and expected impacts

The priority activities identified are:

- Street lighting efficiency
- Public building energy efficiency

The expected impacts have not yet been estimated – these will depend on the provision of further data and information on the current energy consumption of the public sector.

Reporting framework

Detailed reports should be prepared for each stage of activity carried out in the context of this program. This will include:

- Energy audits carried out and savings identified
- Mapping of the energy saving potential from street lighting
- Implementation of projects, including total costs and both estimated and measured savings

Project datasheet	**Street lighting efficiency**		
Project status	**Initial proposals**	**Type>: Long-term**	
Key project indicators	**Cumulative energy savings by 2030: 453 GWh**	**Cumulative cost savings by 2030: ETB 1.0bn**	**Demand reduction in 2030: 18 MW**
Baseline energy consumption (2017)	320W standard streetlamp	42 GWh/year total consumption	8% growth rate
Proposed measures	Use of LED lamps for all new street lights and replacement of existing street lights at an annual rate of 5%, saving 50% on energy consumption and demand compared to the existing systems.		
Expected impact by 2030	100% of streetlamps are LED (120W)	72 GWh saved per year	ETB 0.18bn saved per year
Key stakeholders and responsibilities	**EEA** will be responsible for designing the program and raising funding. **Municipal roads authorities** will be responsible for coordinating the implementation. **EEU** will support implementation.		
Results and status	Some streetlamps have been exchanged, primarily as pilot projects and test cases.		
Ongoing activities	EEU is carrying out discussions with suppliers to increase the availability and reduce the cost of locally manufactured, adequate LED solutions for street lighting.		
Challenges and limitations	• There is a need to ensure an adequate supply of lighting systems, preferably from local manufacturers at competitive prices. • There is a need to guarantee compliance with standards and ensure lamps procured will have long life spans. • Market aggregation for the procurement of LED lights by municipalities needs cross regional coordination.		
Timeline of activities	‘17 ‘18 ‘19 ‘20 ‘21 ‘22 ‘23 ‘24 ‘25 ‘26 ‘27 ‘28 ‘29 ‘30 Full operation		
Resources required	An initial estimate of the cost of changing all new lamps for LED equivalents is ETB 195m by 2030.		
Interactions with other EE program areas	• Finance will be required, possibly through the EE Fund. • Lighting standards and labels program will help to ensure the quality of lamps procured.		
Key project documents and references	No project documents have yet been developed		

Building codes and labelling

Overview

The improvement of energy efficiency in buildings is a highly effective way of ensuring that efficiency is locked into Ethiopia's built environment, as construction grows rapidly across the country. The Energy Regulations give EEA the remit to develop energy codes, standards or labels, and to designate building types which shall be affected by these requirements.

The responsibility for building codes generally lies with municipal governments, while other aspects can be carried out through market-based instruments, with government support in building capacity and awareness.

Whilst important, these projects are considered less urgent than industrial or S&L programs. They are defined as medium-term projects.

Key stakeholders

- EEA
- Municipal governments (especially in Addis Ababa and other large cities)
- Private developers
- Ministry of Urban Development and Construction
- Ministry of Water, Irrigation and Electricity

Processes

Building codes should be developed in conjunction with relevant municipal authorities, who will be responsible for regulating the implementation and compliance with the energy efficiency sections of building codes. Energy efficiency criteria for building envelopes and systems should be developed by EEA for the principal climatic zones in the country so that these criteria can be adopted by the relevant municipal governments as they reach maturity in regulating the building stock more broadly. This is likely to apply initially to Addis Ababa, and later to a few other large or fast-growing cities. In general, the roll-out of efficiency codes should be gradual, starting with just the largest and most energy-intensive buildings.

Benchmarking and labelling of performance in buildings can be used as a tool to support the management and reporting of energy performance. The relevant technical bases and tools should be developed by EEA, allowing adoption of mandatory benchmarking by organizations or cities. This development should be carried out in close consultation with the owners and operators of commercial and public buildings.

Social housing can incorporate several important energy efficiency improvements at low cost, especially when being built at scale. EEA should provide the EE criteria to the Ministry of Urban Development and Construction, with strong analyses of the costs and benefits of implementation. This may lead to the development of pilot projects to test and evaluate performance of these systems.

International real estate markets have increasingly moved towards the use of voluntary sustainability certifications to demonstrate environmental awareness, corporate responsibility and performance. Whilst some of the higher-end certifications are

expensive and complex, others have been developed specifically for emerging markets and would be entirely appropriate to implement in the Ethiopian real estate market. The role of EEA should be to develop the technical underpinnings and awareness for these certifications and help to implement them on the market, ensuring that the relevant stakeholders are aware of their benefits.

Priority activities and expected impacts

The priority activities are:

- Code requirements for efficiency in new buildings
- Voluntary sustainability certifications

Future programs to be developed by EEA include:

- Benchmarking and performance labelling
- Efficiency requirements and solar hot water for social housing

Reporting framework

EEA should receive regular reports from all major municipalities on the estimated total number of buildings and new construction licenses by building type, end-use and area. In addition, all construction certificates or voluntary certifications issued to new buildings should be registered and recorded, with the expected energy saving against a local baseline.

Any mandatory or voluntary energy benchmarking program should also report the results of energy benchmarks and operational energy evaluations.

The organizations responsible for building and maintaining social housing should maintain regular reports on the cost of implementing energy efficiency measures and the challenges or benefits during operation of the buildings. EEU should provide data on the energy consumption of social housing with and without energy efficiency measures.

Project datasheet	**Voluntary building certifications**		
Project status	**Not started**	**Short-term**	
Key project indicators to 2022	**Cumulative energy savings by 2030: 251 GWh**	**Cumulative cost savings by 2030: ETB 0.6bn**	**Demand reduction in 2030: 28 MW**
Baseline energy consumption (2017)	2,084 large buildings	624GWh/year	10% growth
Proposed measures	Strong supports for the adoption of voluntary building sustainability certifications by the private sector, for example the IFC EDGE program. This assumes at least 20% energy savings in new buildings that meet the certification requirements, which will be principally high-end new developments. The levels of savings will be calculated using the existing building codes as a baseline, so voluntary certifications will always show additional savings.		
Expected impact by 2030	160 buildings per year	61 GWh saved per year	ETB 0.15bn saved per year
Key stakeholders and responsibilities	**EEA** will be responsible for awareness and training. **Third party certifiers** will provide the certifications. **Private developers** will pay for the certification procedures and upgrade their buildings accordingly. **Municipal governments and the Ministry of Construction** will provide strong support for the implementation of appropriate certifications.		
Results and status	To date, no work has been done in this area.		
Ongoing activities	No activities are currently underway.		
Challenges and limitations	• There is a need to train a large number of professionals and create awareness in the marketplace around the importance of energy efficiency in buildings.		
Timeline of activities	‘17 ‘18 ‘19 ‘20 ‘21 ‘22 ‘23 ‘24 ‘25 ‘26 ‘27 ‘28 ‘29 ‘30 Scale-up Full operation		
Resources required	Total cost of administering the program, with training and awareness campaigns: ETB 1.4m/ year. Significant training and capacity building are required.		
Interactions with other EE program areas	• Training programs will provide expertise for this project • Awareness campaigns will drive demand • Some financial support to developers may help drive the initial stages of the project		
Key project documents and references	No project documents have yet been developed. Examples of a potential certification program are available at: www.edgebuildings.com		

Project datasheet	**Efficiency in building codes**		
Project status	**Not started**	**Type>: Long-term**	
Key project indicators to 2030	**Cumulative energy savings by 2030: 3,383 GWh**	**Cumulative cost savings by 2030: ETB 8.0bn**	**Demand reduction in 2030: 253 MW**
Baseline energy consumption (2017)	2,084 large buildings	624GWh/year	10% growth
Proposed measures	Gradual implementation of building codes in large cities, starting in 2020 with 15% of large buildings impacted. Over time, these should scale up to impact 85% of large new buildings from 2025 and 40% of other new buildings from 2027, with 12-20% savings compared to buildings constructed using standard practice.		
Expected impact by 2030	543 large buildings and 22,000 small buildings per year	725 GWh saved per year	USD 8.3m saved per year
Key stakeholders and responsibilities	**EEA** will be responsible for developing models for building codes in Ethiopia's climatic zones, providing technical support to municipal governments, training building designers and licensing auditors to verify compliance. **Municipal governments** of Addis Ababa and other large cities will be responsible for enacting local laws, regulations or ordinances (as appropriate) and implementing EEA's recommendations. **Developers and construction companies** will be responsible for meeting the building code performance levels in new projects.		
Results and status	To date, no work has been done on building codes.		
Ongoing activities	No activities are currently underway.		
Challenges and limitations	It will be necessary to develop locally relevant and applicable building codes, train professionals, build awareness of their impacts and implement quality assurance procedures.		
Timeline of activities	‘17 ‘18 ‘19 ‘20 ‘21 ‘22 ‘23 ‘24 ‘25 ‘26 ‘27 ‘28 ‘29 ‘30 Planning and ramp-up Partial operation Full operation		
Resources required	Cost of developing initial codes proposals: ETB 2.2m. Cost of administering the program: ETB 0.3m/year. Cost of implementation oversight and QA: ETB 27,000 per large building, ETB 4000 per small building. Additional cost to developers of meeting standards: low (<2.5 year payback) Significant training and capacity building are required.		
Interactions with other EE program areas	• Training programs will be required to develop expertise within municipalities and in the private sector. • Public awareness of the benefits will increase uptake.		
Key project documents and references	No project documents have yet been developed		

Technology acceleration

Overview

Technological development has an important role to play in improving energy efficiency and conservation. There are likely technologies that could have a large impact on energy consumption and conservation in Ethiopia if rolled out at large scale, and which are capable of being manufactured or assembled locally. Initially, these are likely to be more efficient versions of systems already manufactured locally (like injera mitads), or established technologies which are already widely available internationally, but which could be adapted for local manufacture to promote local development, import substitution and cost reduction (for example, solar water heaters).

Although this is not specifically provided for in the Energy Regulations, EEA has assumed a role supporting the development of key technologies. These technology acceleration projects are identified where there is a clear benefit to the Ethiopian economy and energy sector from overcoming barriers and scaling up production and use of the systems.

These are short-term projects, as the technologies should reach economic viability swiftly.

Key stakeholders

- EEA
- Selected universities
- Local manufacturers of selected systems
- Ethiopian Standards Agency
- Ministry of Industry
- Ministry of Trade

Processes

Technical support can be provided by EEA or by external technical consultants (sometimes donor funded) to help upgrade existing manufacturing plants or develop new manufacturing capacity.

Significant support is likely to be required to overcome regulatory and bureaucratic barriers to the implementation of new manufacturing facilities. ESA and EEA can support these projects by ensuring that there is clarity on the required standards and performance so that the products can receive regulatory approval. In addition, coordination with other EE programs can ensure that the products are eligible for use in major EE projects and can benefit from any subsidies introduced in future.

Universities and training institutions may implement technical training to build expertise in the manufacture of the equipment and to create an understanding of the system requirements to meet performance standards.

Priority activities and expected impacts

The following priority projects have been identified:

- High-efficiency injera cookers
- Solar water heaters

Injera cookers have been a focus of work for some time, due to their highly visible impact on national energy consumption and peak demand. Several prototypes have been built and high-efficiency systems are already being rolled out.

Solar water heating has had much lower levels of interest, but clearly represents an important opportunity for reducing consumption first in hotels, and later in high-end or middle-class urban dwellings.

Reporting framework

EEA should ensure regular collection of data on the total manufacture and sales of the systems supported in these projects.

In addition, market surveys should aim to map recurring performance defects or operational problems with the systems, in order to give feedback on performance.

Subsidies and financial incentives

Overview

Given the established benefits of energy efficiency to the Ethiopian energy sector and the overall cost savings while electricity is sold at a price below the cost-reflective tariff, there is a clear and strong argument for the provision of direct subsidies to promote energy efficiency in cases where these subsidies will be efficient and effective. These subsidies would still represent whole-system cost savings by replacing the subsidy currently provided in every unit of electricity sold. Even after a cost-reflective tariff has been reached, subsidies or financial incentives can have an important role in driving the uptake of energy efficiency and creating a mature market for efficiency products and services.

Key stakeholders

- EEA
- Ministry of Finance
- EEU
- Major energy consumers

Processes

The Energy Proclamation provides for the establishment of an Energy Efficiency and Conservation Fund to provide loans and financial support to EE&C activities. This fund may include budget allocation from government, loans and grants from financial institutions, grants from non-governmental organizations, charges on inefficient buildings, industry and appliances, or other sources.

There is a range of financial instruments which can be used to deliver efficiency through the fund – the SE4All Task Force (Deliverable 9 – “Financing options for setting up the EEC fund”) identifies the following instruments:

- Dedicated EE credit lines

- Partial risk guarantees for EE
- ESCO financing
- Consumer financing for EE and RE products

Priority activities and expected impacts

The development of an Energy Efficiency Fund should consider the priority areas for use of the fund, the development of a pipeline of projects to be financed and the needs for an appropriate administrative structure for the fund. Examples in other countries (such as Uganda's Energy Efficiency Fund) should be examined and learnt from. As shown in Figure 6, an EE fund can include finance from different sources, that can be applied to different types of projects, as required.

A specific strategy and proposal for the development of an EE Fund should be prepared by EEA and submitted to potential financiers.

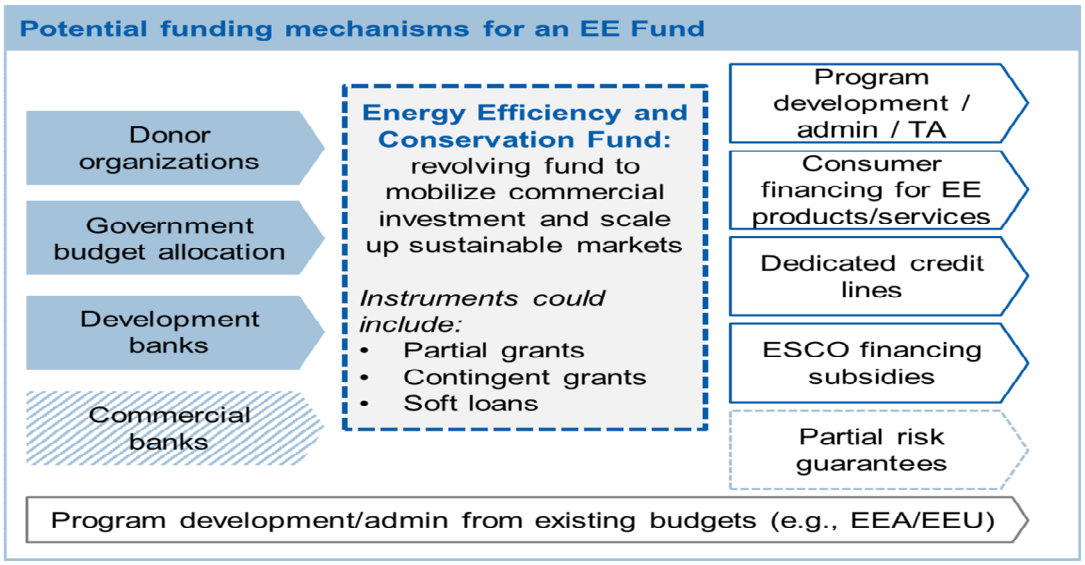


Figure 6 - Potential mechanisms for an energy efficiency fund

Reporting framework

All the activities and investments of the fund should have full reports including disbursement, impact, energy saving and monitoring & verification processes to ensure the effectiveness of the funds.

ANNEXES

Annex A – List of acronyms

CRGE	Clean, Resilient, Green Economy
DSM	Demand-side Management
EE	Energy Efficiency
EE&C	Energy Efficiency and Conservation
EE&CD	Energy Efficiency and Conservation Directorate, at EEA
EEA	Ethiopia Energy Authority
EEU	Ethiopian Electric Utility
EMU	Energy Management Unit
ESA	Ethiopia Standards Authority
ESCo	Energy Services Company
DER	Distributed Energy Resource
GTP	Growth and Transformation Plan
MEPS	Minimum Energy Performance Standard
NEP	National Electrification Plan
PVoC	Pre-export verification of Conformity
RMI	Rocky Mountain Institute
S&L	Standards and Labels

Annex B – Relevant legislation

Energy Proclamation 810/2013[5]

The Energy proclamation was enacted in November 2013 and proclaimed on in January 2014. Its main impact in the energy sector is that it contains the regulatory frameworks for "economic and technical regulation" of the energy sector and EE&C.

It also created the Ethiopian Energy Authority (EEA) as a regulatory institution with the mandate to promote competitiveness in the energy sector; ensure efficient, reliable, fair, economical, and safe electricity supply; and promote and implement EE&C programs.

The Powers and Duties assigned to the EEA and its Board regarding EE&C are:

- Formulate long-, medium- and short-term energy efficiency and conservation strategies and programs at national and sectoral levels and, based on periodic reports to be submitted, evaluate their implementations.
- Promote energy efficiency and conservation at national and sectoral levels.
- Issue an energy audit code, energy efficiency standards, energy efficiency labelling codes, a grid code, a customers' service code, a technical inspection code, a quality service standard code, an electrical installation code for buildings, a technical standard code and other codes; and supervise their implementation.
- Cooperate with training institutions and regional and international forums for promoting energy efficiency and conservation, energy development and power trade.
- Establish energy efficiency testing laboratories and issue and implement testing procedures.
- Promote and coordinate energy efficiency and conservation research, development and demonstration and technology transfer activities.
- Collect, analyze, organize and disseminate information relating to energy efficiency and conservation.
- Where necessary, delegate part of its powers and duties to the appropriate regional executive organs and provide them with capacity building support.

[5]The following text is adapted from SE4All Task Force Deliverable 1: Energy Strategy

Regulation 308/2014 – Establishment of EEA

The Council of Ministers Regulation No. 308/2014 legally established the Ethiopian Energy Authority (EEA) and laid out its primary objectives, powers and duties.

The three objectives of EEA are as follows:

- Promote competitiveness in the energy sector;
- Ensure efficient, reliable, fair, economical and safe electricity supply; and
- Promote energy efficiency and conservation.

Energy Regulations 4472018

The energy regulations lay out procedures and principles for EEA's activity across a range of areas, including licensing and tariff setting for electricity. Part Five of the regulations details EEA's role in energy efficiency and conservation, as follows:

- Chapter 1: licensing of EE auditors, contractors and consultancy services
- Chapter 2: promoting EE awareness and regulating EE activities
- Chapter 3: setting minimum energy performance standards and creating efficiency labels for equipment and appliances
- Chapter 4: promoting energy efficiency in industries
- Chapter 5: promoting energy efficiency in buildings
- Chapter 6: creation of an energy efficiency fund

Thus, the energy regulations give EEA a remit for actively developing the EE activities laid out in this Energy Efficiency Action Plan.

Annex C – Existing documentation and studies

A range of activities and studies related to energy efficiency and conservation in Ethiopia has been carried out in recent years. The most relevant documents, cited throughout this Action Plan, are listed here for ease of reference.

Project/Author	Document title	Date
EU SE4All TAF Stage 1	D1 Energy Strategy	June 2015
	D2 Prioritization for implementation of EE programs	June 2015
	D3 Five Year Work Plan	June 2015
	D4 Capacity Building Awareness Raising Plan	June 2015
	D5 Specific measures for industrial, residential, tourism	June 2015
	D6 Roadmap for EE testing labelling and standards	June 2015
	D7 Manual for energy audit procedures in textile industry	June 2015
	D8 Roadmap for establishment of an EEBC	June 2015
	D9 Financing Options for setting up EEC fund	June 2015
	D10 ToRs for baseline study and EE fund development	June 2015
	D11 Guidelines for M&V strategy	June 2015
EU SE4All TAF Stage 2 (ES-0051)	D1 Information database	October 2016
	D2 Current Assessment Report	October 2016
	D3 Demand forecasting	June 2016
	D4 Energy system model	October 2017
	D5 Least cost energy development plan	October 2017
	D6 DSM and list of LCEE projects	October 2017
	D7 Pre-feasibility studies	March 2017
	D9 Awareness plan	November 2017
	D10 Final report	March 2017
Hifab Oy/Nordic Climate Fund	DSM for Climate Change - Adaption for Ethiopian Power Sector. DSM Potential and Proposed Actions	October 2012
TERI Energy Efficiency Framework Strategy	EEA Framework Strategy	May 2014
	Bahir Dar textile energy audit	April 2014
	Finchaa Sugar Energy Audit	April 2014
	Kaliti Metal Energy Audit	April 2014
	Mugher Cement Energy Audit	April 2014

EE Standards and Labelling	Project document on Electric Motors (draft report)	June 2015
	Project document on locally manufactured Electric Stoves (draft report)	January 2017
	Project document on Electric Injera Mitad	May 2015
Ethiopian Standard for Injera Mitads	ES ISO 04090:2016 Technical and performance requirements for house hold single plate resistor based electric injera mitad/stove	2016
Council of Ministers/Federal Government	Regulation 308/2014: Establishment of EEA	May 2014
	Proclamation 810/2013: A Proclamation on Energy	January 2014
	Climate Resilient Green Economy (CRGE)	November 2011
	Growth and Transformation Plan II	May 2016
GOE, MoWIE	National Energy Policy	February 2013
GIZ	Solar Water Heating Symposium report	February 2010
EIAF Energy	EEU Corporate Planning Workshop	February 2017
ECOEYE E&C	Steely RMI Detail Energy Audit Report, 2016	2016
Korean Energy Agency (KEA)	Awassa Group energy audit	

Annex D – Data collection and management

Annex D is enclosed as a separate document, incorporating the following sections:

Annex D1 – Sample questionnaire for conducting a survey on energy efficiency and use of appliances for consumers

Annex D2 – Sample questionnaire for conducting a survey on energy efficiency and use of appliances for businesses

Annex D3 – Sample questionnaire for conducting a survey on energy efficiency and availability of appliances for importers, distributors and retailers

Annex D4 – Sample methodology for establishing energy efficiency baselines in industry

Annex D5 – Energy efficiency baseline questionnaire for buildings

Annex D6 – Energy efficiency baseline questionnaire for industries

Annex E – Contacts and organizations

Organization	Contact name	Position	Email	Phone number
EEA leadership	Getahun Moges	General Director	getahunmoges@gmail.com	
EEA EE&CD	Zewge Worku	Acting director of EE&CD	wzewge@yahoo.com	091 179 4007
EEU Leadership	Shiferaw Telila	CEO	shiftelsen@gmail.com	094 430 3313
	Solomon	Head of corporate planning	danisolo7@gmail.com	011 157 4072
	Melkemu Abebe	Advisor to corporate planning	melkamu.abe@gmail.com	091 124 5469
EEU Energy Management	Demeke Robi	Head of ICT	demeke_rob@yahoo.com	091 110 3613
	Abay Admasu	Head of energy management	admasuabay@gmail.com	
	Abadi Gebrehiwot	Energy management	abadigebrehiwot@gmail.com	092 233 5876
Ethiopia Standards Agency	[To be updated/ confirmed]			
Ministry of Trade	Simeon Eyasu		eyasusimeon@gmail.com	0911733473
Ministry of Water, Irrigation and Energy	Sahele Tamiru	Director of energy planning	saheletf@yahoo.com	091 242 5094
	Mesfin Dabi	Senior energy analyst	dabimesfin@yahoo.com	091 193 5803
RMI	Edward Borgstein	Manager	eborgstein@rmi.org	097 998 6793 (+34 682 071 375)
	Alexander Komakech-Akena	East Africa coordinator	akomakech@rmi.org	098 847 6813 (+256 777 757 541)

Annex D – Data collection and management

Ethiopian Energy Authority

Energy Efficiency Action Plan, January 2019

Annex D1 – Sample questionnaire for conducting a survey on energy efficiency and use of appliances for consumers

Annex D2 – Sample questionnaire for conducting a survey on energy efficiency and use of appliances for businesses

Annex D3 – Sample questionnaire for conducting a survey on energy efficiency and availability of appliances for importers, distributors and retailers

Annex D4 – Sample methodology for establishing energy efficiency baselines in industry

Annex D5 – Energy efficiency baseline questionnaire for buildings

Annex D6 – Energy efficiency baseline questionnaire for industries

Annex D1: Sample questionnaire for conducting a survey on energy efficiency and use of appliances for Consumers

S&L Appliance Market Survey

1. **Introduction**: **Consumer Questionnaire**

1.0 Identification

Questionnaire Number:	
Town/City:	
Area/Place:	
Building Number:	
Surveyor:	
Date of Survey	

2.0 House Hold Characteristics

For multiple choice questions, Mark the choice that best applies to this residence.

2.1 Are you the head of the household?

Yes

No

2.2 What is your relationship to the head of the household? (if you are not the household)

2.3 How many people in each age category are in your household, including you?

16 years old or younger

17 to 59 years old

60 years or older

2.4 What is monthly household income (total for everyone)?

Lowest quintile

Second quintile

Third quintile

Fourth quintile

Highest quintile

2.5 Do you rent or own this residence?

Rent

Own

Don't know

2.6 In what year was this building built? Your best estimate is fine.

Year

2.7 When did you move into this residence?

Year

2.8 Are you a male or a female?

Male

Female

2.9 What is your age range?

20 years old or less

21 to 35 years old

36 to 50 years old

Older than 50

2.10 What level of education have you completed?

8 years or less

12 years or less

More than 12 years

3.0 Lighting

Lighting (Interior & Exterior)

3.1 Provide the information requested in the table for each light fixture. For exterior fixtures use

Ext for location. For interior fixtures use one of the following room types: **Bath**, **Bed**, **LR (Living Room) DR (**Dining Room), **K**itchen, **Hall**, and **Other**.

Bulb Types are **I**=Incandescent, **F**=Fluorescent, **C**=CFL (Compact Fluorescent), **LED**

Fixture #	**Location**	**Number of Lamps (Bulbs)**	**Bulb Type (I, F , LED or C)**	**Watts per Lamp (Bulb)**	**Usage (hrs/day)**
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					

3.2 Have you purchased a LED or CFL lamp in the last year?

(Yes/No)_____

3.3 a) what brand was the LED?

3.3 b) what brand was the CFL?

3.4 a) In what country was the LED made?

3.4 b) In what country was the CFL made?

3.5 a) How many watts was the LED lamp?

3.5 b) How many watts was the CFL lamp?

3.6 How much did you pay for the LED or CFL lamp?

	Lamp type	**Brand**	**Wattage**	**Purchase Price**
1	LED			
2	CFL			

4. 0. Electric stove

Unit #	TYPE I, H or C	Price (Birr)	Purchased New or Used (N or U)	Brand	Rated capacity (kW)	Cooking time	
						Hrs/Day	Months/Yr
1							
2							
3							
4							
5							
6							

4.1 Do you have an electric stove for cooking?

Yes

No

4.2 Electric stove type

Types are **I**=Induction cooker, **H**=Hotplate, **C**= Coil

4.3 Electric Injera Mitad

4.3.1 Do you have an electric Injera mitad?

Yes

No

4.2 Electric Injera mitad type and use

Types are **C**=Backside of clay and grooved, **G**=Sealed with Gypsum, **A**= Assemble

Unit #	TYPE C,G and A	Price (Birr)	Purchased New or Used (N or U)	Size (diameter)	Rated capacity (kW)	Cooking time	
						Hrs./Day	Months/Yr
1							
2							
3							
4							
5							
6							

5.0 Refrigerators

5.1 How many refrigerators are in the household?

None

One

Two

More than two

5.2 Please provide information for all refrigerators in the household

	Purchased New or Used		Doors			Size			Freezer Compartment					Defrost		
	New	Used	One	Two	Three	Small (Table-Top)	Medium	Large	None	Inside Ref. Comp.	Top Mounted	Bottom Mounted	Side by Side	Manual	Semi-Automatic	Automatic
1																
2																
3																

5.3 Please provide information for all refrigerators in the household

	Brand	Purchase Price	Age (years)	Number of months used per year
1				
2				
3				

6.0 Freezers

6.1 How many freezers are in the household?

None

One

Two

More than two

	Purchased New or Used		Doors			Size			Freezer Compartment					Defrost		
	New	Used	One	Two	Three	Small (Table-Top)	Medium	Large	None	Inside Ref. Comp.	Top Mounted	Bottom Mounted	Side by Side	Manual	Semi-Automatic	Automatic
1																
2																
3																

6.2 Please provide information for all freezers in the household

6.3 Please provide information for all freezers in the household

	Brand	Purchase Price	Age (years)	Number of months used per year
1				
2				
3				

6.4 Please provide information for all freezers in the household

	Vertical or Horizontal		Size			Purchase Price	Age (years)	Number of months used per year
	V	H	Small	Medium	Large			
1								
2								

7.0 Water heating

7.1 Do you have a domestic water heating system, to heat water for washing?

Yes

No

7.2 If so, what is the system used for heating water?

Electricity

Firewood

Solar water heaters

Gas

Other (please describe)

8.0 Energy Bills

8.1 Is there an electric meter just for this business?

Yes

No

8.2 Please provide energy usage and cost for as many of the past 12 months as possible in table below.

Month	Kilowatt-hours		Piped Gas		Billing Period Dates	
	(kWh)	Cost	Therm	Cost	from	to
Jan						
Feb						
Mar						
Apr						
May						
Jun						
Jul						
Aug						
Sep						
Oct						
Nov						
Dec						

Annex D2 : Sample questionnaire for conducting a survey on energy efficiency and use of appliances for Businesses

S&L Appliance Market Survey

2. Introduction: Commercial Customers/Businesses

1.0 Identification

Questionnaire Number:	
Name of Business	
Address	
Primary Contact	
Surveyor:	
Date of Survey	

2.0 Business Characteristics

For multiple choice questions, Mark the choice that best applies to this business.

2.1 Indicate below the type of business (Tick where appropriate)

1. Assembly place (church, theatre, sports arena, night club)
2. Food and Refreshment vending (cafeteria, bar, restaurant, fast food)
3. Food sales (grocery, convenience store)
4. Health Care (hospital, clinic, doctor, dentist or veterinarian office)
5. Hospitality Business (hotel, motel, dormitory, retirement or nursing home)
6. Office (includes banks and government offices)
7. Mercantile (stores, malls, car dealerships)
8. Education (preschool, daycare, elementary or secondary school, college or university)
9. Service (auto service or repair, barber shop, car wash, copy center, dry cleaner, gas station)
10. Warehouse and Storage
11. Other

2.2 What is total number of employees at this location?

3 or less

4 to 10

11 to 20

More than 20

2.3 During a normal work week, what is the total number of operating hours?

2.4 When did your business move into this building?

2.5 Do you rent or own this building/space?

Rent

Own

Don't know

2.6 How many more years are left on your lease (if you rent the building)?

Two years or less

Three years

Four years

Five years

More than 5 years

2.7 What is the area of the floor space for this business?

sq. meters

3.0 Lighting

Lighting (Interior & Exterior)

Provide the information requested in the table for each light fixture. For exterior fixtures use **Ext** for location. For interior fixtures identify each room in the **Location** column. Bulb Types are **I**=Incandescent, **F**=Fluorescent, **C**=CFL (Compact Fluorescent), **LED**

Fixture Number	Location	Number of Lamps (Bulbs)	Bulb Type (I, F , LED or C)	Watts per Lamp (Bulb)	Usage (hrs/day)	# of days per week
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

3.2 Have you purchased a LED or CFL lamp in the last year?

(Yes/No)_____

3.3 a) what brand was the LED?

3.3 b) what brand was the CFL?

3.4 a) In what country was the LED made?

3.4 b) In what country was the CFL made?

3.5 a) How many watts was the LED lamp?

3.5 b) How many watts was the CFL lamp?

3.6 How much did you pay for the LED or CFL lamp?

	Lamp type	Brand	Wattage	Purchase Price
1	LED			
2	CFL			

4. 0. Electric stove

4.1 Does the business use an electric stove for cooking?

Yes

No

4.2 Electric stove type

Types are **I**=Induction cooker, **H**=Hotplate, **C**= Coil

Unit #	TYPE I, H or C	Price (Birr)	Purchased New or Used (N or U)	Brand	Rated capacity (kW)	Cooking time	
						Hrs/Day	Months/Yr
1							
2							
3							
4							
5							
6							

4.3 Electric Injera Mitad

4.3.1 Do you have an electric Injera mitad?

Yes

No

4.2 Electric Injera mitad type and use

Types are **C**=Backside of clay and grooved, **G**=Sealed with Gypsum, **A**= Assemble

Unit #	TYPE C, G and A	Price (Birr)	Purchased New or Used (N or U)	Size (diameter)	Rated capacity (kW)	Cooking time	
						Hrs/Day	Months/Yr
1							
2							
3							
4							
5							
6							

5.0 Air Conditioner

5.1 Does your business have air-conditioning equipment?

Yes

No

5.2 Is the air-conditioning for your business supplied by a central system for all businesses in the building?

Yes

No

Air-conditioning equipment

Types are **W**=Window/Package, **Mini**=Mini-Split, **Multi**=Multi-Split,**C**=Cabinet

Unit #	TYPE W, Mini, Multi or C	Date Purchased	Purchased New or Used (N or U)	Brand	Cooling Capacity (Btu/hr)	Cooling Usage		
						Hrs/ Day	Days/ Week	Months/ Yr
1								
2								
3								
4								
5								
6								

5.3 Are you considering buying an air-conditioner within the next year?

Yes

No

6.0 Refrigerator

6.1 How many refrigerators are in the business?

None

One

Two

Three

More than three

6.2 Please provide information for all refrigerators in the business (if you have any).

	Purchased New or Used		Doors			Size			Freezer Compartment					Defrost		
	New	Used	One	Two	Three	Small (Table-Top)	Medium	Large	None	Inside Ref. Comp.	Top Mounted	Bottom Mounted	Side by Side	Manual	Semi-Automatic	Automatic
1																
2																
3																
4																

6.3 Please provide information for all refrigerators in the business

	Brand	Purchase Price	Age (years)	Number of months used per year
1				
2				
3				
4				

7.0 Freezers

7.1 How many freezers are in the business?

None

One

Two

Three

More than three

7.2 Please provide information for all Freezers in the business.(if you have any)

	Purchased New or Used		Doors			Size			Freezer Compartment					Defrost		
	New	Used	One	Two	Three	Small (Table-Top)	Medium	Large	None	Inside Ref. Comp.	Top Mounted	Bottom Mounted	Side by Side	Manual	Semi-Automatic	Automatic
1																
2																
3																
4																

7.3 Please provide information for all Freezers in the business

	Brand	Purchase Price	Age (years)	Number of months used per year
1				
2				
3				
4				

7.4 Please provide information for all freezer units in the business

	Vertical or Horizontal		Size			Brand	Purchase Price	Age (years)
	V	H	S	M	L			
1								
2								
3								

(V: Vertical, H: Horizontal, S: Small, M: Medium, L: Large)

8.0 Electric Motors

8.1 How many electrical motors do you have

None

One

Two

Three

More than three

8.2 Please provide information for all electrical motors.

	Purchased New or Used	
	New	Used
1		
2		
3		
4		

8.3 Please provide information for all electrical motors you have

	Brand	Size of motor (power rating)	Purchase Price	Age (years)	Number of months used per year
1					
2					
3					
4					

9.0 Energy Bills

9.1 Is there an electric meter just for this business?

Yes

No

9.2 Please provide energy usage and cost for as many of the past 12 months as possible in table below

Month	Kilowatt-hours		Piped Gas		Billing Period Dates	
	(kWh)	Cost	Therm	Cost	from	to
Jan						
Feb						
Mar						
Apr						
May						
Jun						
Jul						
Aug						
Sep						
Oct						
Nov						
Dec						

Annex D3: Sample questionnaire for conducting a survey on energy efficiency and use of appliances for Importers, Distributors and Retailers

S&L Appliance Market Survey

Introduction:

Questionnaire for Importer

Name of Importer:	
Location:	
Address/contact:	
Phone:	
E-mail:	

No	Lighting					
1	**Brand and country of origin**	**Brand**	**Origin of country**	**Remark**		
	List imported brands					
2	**Types of Lamp/technology**					
	Which of the following do you import?	Incandescent [ ]		(Tick where appropriate)		
		CFL [ ]				
		LED [ ]				
		Fluorescent [ ]				
		Metal Halide [ ]				
		Sodium [ ]				
		Halogen [ ]				
		Mercury [ ]				
3	**Technical Specification**	**Type**	**Wattage**	**Lumen**		
	What Wattage /Lumen do you mainly import? [Indicate with a No the	Incandescent				

	most frequent]				
	[1-least frequent; 5-most frequent]	CFL			
		LED			
		Fluorescent			
		Metal Halide			
		Sodium			
		Halogen			
		Mercury			

5	**Import volume/sale volume**	Brand	2016	2017	
	How many of each brand listed was imported?				
7	Price per unit of sell in bulk	Brand	Price		
8	Do you have a distribution channel?	Yes [ ] No [ ]			
9	Who are your Distributers/wholesalers?				
10	For what purpose do you import?	Market [ ] Project [ ] specify if, other [ ]			
11	Are You aware of any Energy Labeling?	Yes [ ] No [ ]			
12	Do you import labeled product? If it is, which label?	Yes [ ] No [ ]			Explain the importance
		Endorsement [ ] Comparative [ ]			
13	Are you aware of existing standard [energy, safety]?	Yes [ ] No [ ]			
14	Are you aware of certificate of Conformity?	Yes [ ] No [ ]			
15	How often does the importer import the product?	**Lamps**	**Frequency of importing**		
		Incandescent			

		CFL		
		LED		
		Fluorescent		
		Metal Halide		
		Sodium		
		Halogen		
		Mercury		
16	Do you pay tax on your imported products? If it is, which type of tax you pay? And how much tax paid per product?	Yes [ ] No [ ] VAT [ ] Excise tax [ ]		
17	Which of the following barriers/ challenges for your importation of energy efficient light?	Expensive [ ] Market availability [ ] Lack of awareness [ ] Quality [ ] Specify If Others:		

Annex D4: Sample methodology for establishing energy efficiency baselines in industry

Baseline Survey Methodology

To accomplish the objectives of an energy efficiency baseline, two main approaches shall be employed:

- A questionnaire (Annex D5) shall be designed and administered to collect energy consumption, energy management and facility production data
- Key personnel shall be interviewed to gain more insight into a facility's production and energy usage.

Past records and background information of the selected industry's operation and energy use for the recent last two years will be collected. Data collected includes: utility bills (directly from EEU, if possible), Diesel and HFO/LFO consumption, energy audit reports and production records.

Figure D1 illustrates the steps followed to reach the baseline, within the context of an energy planning exercise.

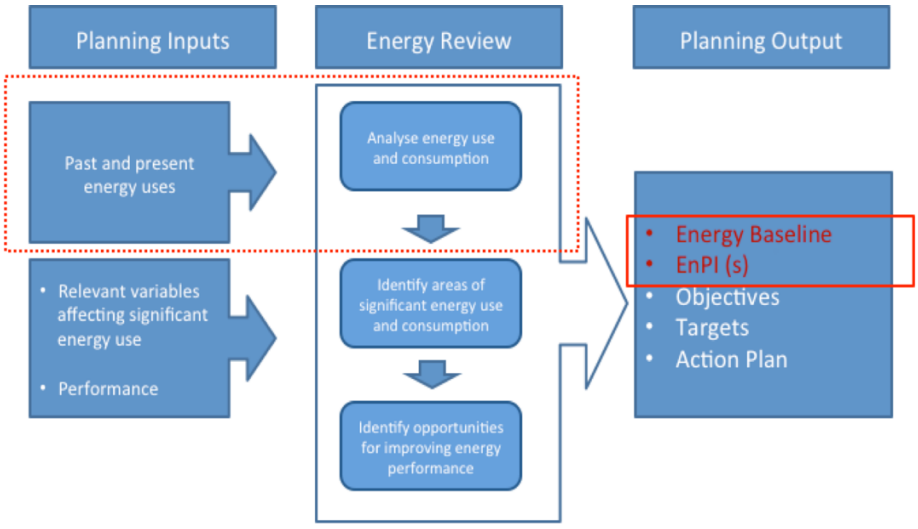


Figure D7: Schematic of energy planning

Baseline indicators

Energy indicators or energy indices used to determine and establish baselines of energy consumption in the industries surveyed consider two complementary methods for defining the state of efficiency or inefficiencies in the production process of an industry. Indicators also identify main drivers of energy consumption in the production process or service delivery.

a) Specific energy consumption (SEC)

SEC is the energy in (kWh) used per unit of a finished product or process. The parameter is used to evaluate energy efficiency in a facility. SEC establishes if inefficiencies in processing or processes are due to efficiency of equipment or human factor (poor energy management).

$$\textit{Specific Energy Consumption} = \frac{\textit{(Electrical) energy input (kWh)}}{\textit{Unit of product or service produce}}$$

b) Energy Performance Indicator (EnPI)

The energy performance indicator (EnPI) measures energy intensity and can be used to evaluate the effectiveness of an energy management effort. The EnPI describes the relationship between energy consumption drivers such as Production, temperature, operational times and the dependent variable (energy consumption in kWh). This relation is best performed using a regression and correlation mathematical methods; an example is shown in Figure D2.

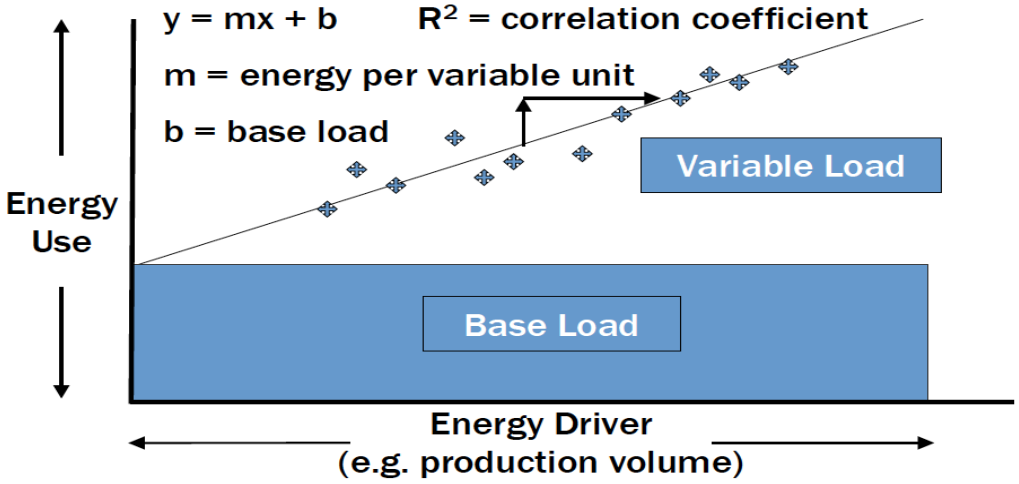


Figure D2: Simple Regression Method for evaluating EnPIs in industry

In the example of Figure D2, Energy used is the dependent variable (y), Production is independent variable (x). A simple, linear regression line (method of least squares) provides a direct relationship, the accuracy of which is measured by a regression coefficient (R^2). Other regression or statistical correlation methods can also be adopted.

Used properly, these baselining methods can provide:

- Accurate understanding of improvement required by the industry
- Identification of abnormal situations
- Easily understood quantitative measure of performance

Application of industry baselines

Baselines developed for individual industries should be aggregated to develop.

Annex D5: Energy efficiency baseline questionnaire for buildings

NATIONAL ENERGY EFFICIENCY & MANAGEMENT PROGRAMME FOR HIGH ENERGY CONSUMING FACILITIES IN ETHIOPIA

SURVEY QUESTIONNAIRE

(BUILDINGS)

SECTION A: GENERAL INFORMATION

Organisation/Business Name				
Main Business Activity				
Address				
Contact	Telephone:	Email:		
Number of staff	Permanent:	Temporary:		
Contact Person	Name:	Title:		
Email				
Telephone				
Industry type (Please tick)	Manufacturing	Processing	Service	
Sector (Please tick)	Steel	Plastics	Textile	Brewery
	Beverages	Food processing	Cement	Tea
	others (specify)			

Confidentially

The Ethiopia Energy Authority (EEA) understand the legality of Confidentially and Non-disclosure of information shared; therefore, any information you provide shall be considered and treated as confidential. The information will be used by only for the purpose of establishing a baseline for high energy consuming industries in Ethiopia geared towards creating an enabling environment for energy performance improvement. On fulfilling its purpose, the information will by no means be shared or stored in an archive or retrieval system or disclosed.

SECTION B: ENERGY PRODUCTIVITY

1. Do you keep records of area occupied and energy consumption in your facility?
   Yes ☐ No ☐
2. If yes, please fill in the area and energy consumption data for 2017 and 2018 as indicated below.

Year	Occupancy Rate (%)	Energy consumption						
Month		Electric energy Off Peak (kWh)	Electric energy Shoulder (kWh)	Electric energy Peak (kWh)	Maximum Demand (kVA)	LPG (kg)	Diesel (Litres)	others
Jan								
Feb								
March								
April								
May								
June								
July								
Aug								
Sept								
Oct								
Nov								
Dec								

3. How many offices
4. Number of persons per office
5. Total Building Square Area (Area per floor, if applicable)
6. Present power factor (PF)

SECTION C: ENERGY AUDITS

7. Has there been an energy audit conducted at your facility before?

Yes ☐ No ☐

If yes, state reason(s) for conducting Audit

Reason	Please tick where applicable
1. High energy bills	
2. Power fluctuation at facility resulting into sudden machine shut downs	
3. Management recommendation	
4. Mandatory requirement as per policy	
5. As part of participation in Government programme	
6. Others (specify)	

8. When was the most recent energy audit done? (please state date and year)

9. Please share with us your audit recommendations or audit report for us to take note of the recommendations?
10. Which one of the measures in 5 above was implemented and what was the impact?

Measures implemented	Impact

11. Who carried out the energy audit?

a) Individual consultant ☐ b) Company ☐

12. Would be willing to pay for an energy audit of your facility (Building Complex)?

Yes ☐ No ☐

SECTION D: ENERGY MANAGEMENT

1. Does your firm have an energy management system (EnMS)?

   Yes ☐ No ☐

   (If yes, name and comment on the features of the system)

2. Do you have someone responsible for energy management in your facility?

   Yes ☐ No ☐

   (If yes, please state the title of the person)

3. Does your daily or monthly reporting include discussions on energy management?

   Yes ☐ No ☐

4. If yes, what is your target_____

SECTION D: ENERGY AUDIT AND MANAGEMENT TRAINING

5. Is some of your staff trained in energy audits or/and energy management?

   Yes ☐ No ☐

   If no, would you want some of your staff trained?

   Yes ☐ No ☐

6. Which specific areas would you like the training to focus? (please tick where applicable)

Area for training	√
Boiler and Steam system efficiency	
Diesel Generators and Co-generation systems	
Industrial Furnace efficiency	
Electrical systems and drives	
Compressed air systems	
Refrigeration and air-conditioning	
Lighting systems	
Waste Heat recovery	
Energy management	
All the above	
Others (please specify)	

7. Would you be willing to meet the cost of your staff during the training?

8. Would you wish your factory to participate in the energy audits done as part of the practical training?

Yes ☐ No ☐

SECTION E: AWARENESS ON ENERGY MANAGEMENT

13. Have you participated in energy awareness sessions/trainings?

Yes ☐ No ☐

14. If yes, what kind of information did you receive and through which channels have you received this information and how have you use this information?

S/N	Energy Efficiency Information	Channel of dissemination	How you used the information
1.			
2.			
3.			
4.			
5.			
6.			

15. Please give an account of the energy efficiency practices you are aware of Mark those that have been implemented in your industry

S/N	Energy Efficiency Practices	Implemented? (Yes/No)
1.		
2.		
3.		
4.		
5.		
6.		

16. Is there any information concerning energy efficiency that you are interested in specifically?

17. How would you use this information to improve energy efficiency in your facility?

18. Please rate the following information channels according to their relevance to you in regard to obtaining information on energy efficiency and energy management *(1 – Most useful; 2 – Useful; 3 – Sometimes useful: 4 hardly useful; 5 – useless; 6 – annoying)*

Information channels	**Rating**
Newspaper publications and articles/pullouts	
Radio adverts & Talk shows	
Television adverts & Talk shows	
Internet (Websites)	
Trainings and workshops	
Social Media (e.g. Facebook, twitter)	
Bill boards	
Public Information Posts and Stands	
Exponential awareness campaigns (e.g. road drives and road shows)	
Others (please specify)	