



**ENERGY
EFFICIENT
LIGHTING
AND APPLIANCES**
in East and Southern Africa

BUSINESS OPPORTUNITIES IN ENERGY EFFICIENCY

Energy service business models to foster
energy efficiency in East and Southern Africa

Efficient electricity use in homes, businesses and public facilities in these growing regions is one of the fastest and cheapest ways of accelerating sustainable development.



Energy efficiency as a business opportunity to deliver high quality energy services

Demand for electricity in Africa is growing in step with economic growth. Between 2008 and 2019, many of the East Africa Community (EAC) Member States and Southern African Development Community (SADC) Member States experienced annual economic growth rates averaging between 2.6%-6.2%¹.

In some countries, particularly in the SADC region, investments in energy generation, transmission, and distribution infrastructure have not kept pace with economic growth. Added to this, frequent drought induced supply disruptions led to load shedding in some countries, especially those that depend on hydro as a base load, negatively impacting economic and social activities.

Many countries in EAC and SADC have relatively low electricity access rates, and this is hampering both economic growth and social development. Investing in energy efficient appliances and technologies by households, commercial sector industries, institutions and government will have a positive impact on economic and social activities as well as the environment as they reduce energy costs and utilization.

This booklet showcases business opportunities in energy efficiency. It explains several energy efficiency service business models and how they can be used for the benefit of both private and public sector energy users. In addition to benefiting the energy service businesses, energy users and economies of the 21 countries in the EAC and SADC regions, the energy services models can also contribute towards meeting the Sustainable Development Goals.

¹ East Africa Economic Outlook 2019 – African Development Bank
https://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/2019AEO/REO_2019_-_East_Africa_.pdf

Energy efficiency services business models and operating principles

Energy-as-a-service (EaaS) business models allow customers to pay for energy services without having to make upfront capital investments.

The models can be structured in different ways, but the main objective is that of assisting end users to address the key barrier towards accessing energy efficient appliances and technologies - that of the upfront investment cost.

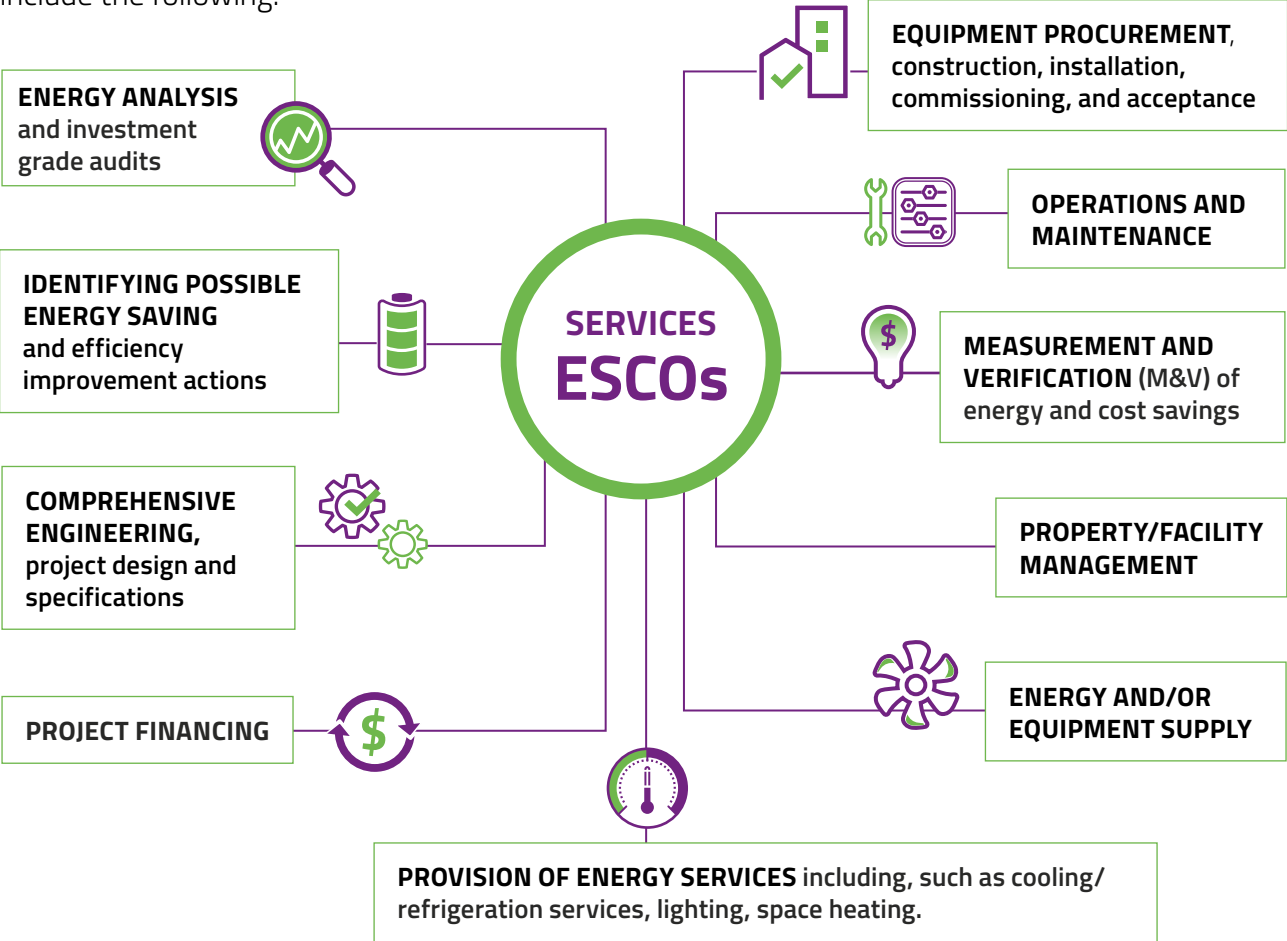
Other features that can be added to the models include guaranteeing energy or cost savings, offering operations and maintenance support, guaranteed appliance uptime or service levels. An example of an entity operating an energy service business model is an Energy Service Company (ESCO).

Energy service companies

Energy service companies (ESCOs) develop, design, build, and arrange financing for projects that save energy, reduce energy costs, and decrease operations and maintenance costs.

The client has an arrangement with the ESCO through which the client pays a fee for the energy services without having to worry about the technical solution or the upfront investment cost. The ESCO is an expert in selecting the best and solution in terms of energy consumption and life cycle cost of the energy efficient appliances. The ESCOs then implement and directly or indirectly finances the energy efficiency project.

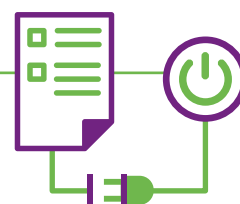
The **ranges of services ESCOs provide** include the following:



Key characteristics of an ESCO

- ESCOs can **offer a full range of energy efficiency services** from project design, engineering, construction, commissioning, and operations and maintenance (O&M) of the energy efficiency measures; training; and measurement and verification of the resulting energy and cost savings.
- The ESCO can also **provide financing** from its own balance sheet or arrange financing for the project from a third-party financier by providing performance guarantees that would enable the client to pay for the energy services and/or service the loan from energy cost savings achieved.
- ESCOs typically **provide performance guarantees**, based on the level of energy or energy cost savings, for the entire project as opposed to individual equipment guarantees offered by equipment manufacturers or suppliers.
- The ESCO **bears most of the technical, financial, construction, and performance risks** of the energy efficiency intervention.

ESCOs can offer services using different business models including Energy Performance Contracting (EPC), Cooling as a Service (CaaS), Lighting as a Service (Laas) and Heating as a Service (Haas)



Energy performance contracting

Energy performance contracting (EPC) involves an ESCO providing various energy services listed above as well as guaranteeing energy or cost savings and arranging financing. The remuneration of the ESCO depends on the achievement of the guaranteed energy or cost savings. EPC can be performed under a shared savings, guaranteed savings or *Chauffage* arrangement.



SHARED SAVINGS

Under a shared savings contract, the ESCO assumes both the performance and credit risks and finances the energy efficiency project from either their own resources, or through a loan from a third-party financier. **The cost savings are split between the ESCO and client for a pre-determined length of time in accordance with a pre-arranged percentage.**



GUARANTEED SAVINGS

Under a guaranteed savings contract, the ESCO guarantees a certain level of energy but will not finance the project. If the actual savings fail to cover the initial investment, then the ESCO must cover the difference. If savings exceed the guaranteed level, then the customer pays an agreed percentage of the savings to the ESCO.



CHAUFFAGE

Under a '*chauffage*' contract, an ESCO is responsible for providing the client with an agreed set of energy services. This can be cooling, heating, or lighting. **The ESCO undertakes to provide the agreed level of energy service for lower than the current bill, or for providing better service for the same bill.** The more efficiently and cheaply it can do this, the greater will be the ESCO's earnings.

Cooling as a Service

Cooling as a Service (CaaS) involves the end-customers paying the ESCO for the cooling service they receive, rather than investing in the appliance or equipment that delivers the cooling.

By using the CaaS approach, the client avoids the high upfront costs, which are a major barrier in accessing cooling for potential users in East and Southern African countries. Lack of access to cooling causes huge economic and social losses particularly in the agriculture and food value chains as well as in health delivery services.

How it works

- The **ESCO provides or pays a technology provider** to install, operate and maintain the cooling equipment and recovers the costs of the equipment, installation, maintenance, electricity costs and profit margin through agreed periodic payments made by the client.
- **Payments are fixed-cost-per-unit of the cooling service delivered** (e.g. dollars per tones of refrigeration, or cubic metres of cooled air), and are based on actual usage and not dependent on the savings as with the EPC model.
- After entering **several CaaS arrangements**, the ESCO can recapitalize through financial structures that include structuring Sale and Leaseback or Securitization agreements with banks, which would enable the ESCO to re-invest in more cooling technologies.
- **CaaS can be offered through a pay-per-service model** where the cooling plant and equipment is designed and installed for the client who then pays for the cooling service per unit of service delivered as agreed.
- **CaaS can also be offered through a district cooling model** where cooling services are offered to different clients from the same cooling infrastructure with each client paying per unit of service received.

Lighting as a Service

Lighting as a Service (LaaS) involves an ESCO selling lighting to clients, often building users or public lighting for municipalities, rather than the physical infrastructure providing lighting.

The ESCO guarantees uptime and light levels, often specified in contractual lux levels in addition to taking care of recycling and other end-of-life issues. In addition to addressing the major barriers of the upfront cost of a new lighting system, LaaS also addresses the risk of technology installed today being eclipsed by future lighting technology.



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Advantages of the different models

- **The above described models allow potential clients to overcome the high upfront costs** of the energy efficient appliances and technologies.
- **The models effectively turn capital expense into an operational expense for clients**, freeing up capital for other investment priorities.
- The ESCO is incentivized to install and maintain the **most efficient technology** possible.
- The models give ESCOs a **stronger incentive to increase their own profits** by reducing their products' operating costs through innovation, helping overcome 'split incentives' between manufacturers and users.
- The models can **create sustainable long-term revenue streams** for technology providers while providing off-balance sheet equipment financing options for clients.
- The models **provide a transparent and predictable pricing structure** for the client, while reducing the perceived technology risk as well as operating and maintenance costs.

Operating lease model

Leasing can be classified as a capital/finance lease or an operating lease. A capital or finance lease is more like a long-term loan with ownership of the leased asset transferring to the lessee.

The benefits and risks of the asset are transferred to the lessee who also records the asset and the related liability on its balance sheet. On the other hand, an operating lease is a contract that allows for the use of an asset but does not convey ownership rights of the asset. Operating leases are considered a form of off-balance-sheet financing—meaning a leased asset and associated liabilities (i.e. future lease payments) are not included on a company's balance sheet².

Advantages of a leasing model

- **Leasing of equipment provides the lessee an opportunity** to use this equipment without initial investments, helping to overcome the barrier of high up-front costs.
- **Leasing can be structured** in a way that makes optimal use of subsidies and tax deductions.
- In the case of an operating lease, by keeping the asset and attended liability off the balance sheet, the client can access additional financing to invest in other assets.
- **Lease agreements can accommodate clauses** mandating the equipment supplier to offer operation and maintenance services that benefit both the lessor and the lessee.
- Leasing provides an **opportunity to distribute a technology** where the cost is beyond the reach of the client but generates cost savings over its lifetime.
- Leasing provides an **opportunity to distribute a novel energy** technology that customers may not fully trust initially because it is unknown and considered risky.
- For an equipment supplier, **leasing equipment can be an additional revenue line to outright selling.**

² Investopedia

Energy efficiency opportunities and East and Southern Africa

The East and Southern African countries are at different levels when it comes to economic development, economic growth, industrialization, access to energy, policies and regulation governing the energy efficiency sub-sector.

Despite this disparity, member countries are all moving towards higher levels of economic growth through industrialization. Many industries in most of the countries operate inefficient plants and equipment, creating opportunities for upgrades and other energy efficient measures. Given the wide spectrum of the industrial sector across SADC and EAC there is huge scope for intervention by energy service providers utilizing any of the above models. There is also room for innovation and new approaches, which the Energy Efficient Lighting and Appliances Project (EELA) is keen to support.

Agriculture

The agriculture sector still dominates economic activity and provides a source of livelihood for most people in many of the member countries of the two regional blocks.

Productivity in this sector is often extremely low due to poor infrastructure, use of inefficient appliances and equipment, underdeveloped agriculture value chains and poor access to markets. These challenges are compounded by high post-harvest losses partly due to limited access to energy for storage and agro-processing. For these reasons, there are opportunities for energy efficiency interventions. The EELA project is interested in supporting energy efficiency initiatives aimed at promoting productive end-use appliances that increase productivity and add value across the agriculture sector using any of the above models. CaaS to address post-harvest losses across the agriculture value chain, including in the fishing sector, is also be of interest to the project.

Urban migration

Another common feature in East and Southern African countries is rural and urban migration as people, particularly youth, seek better economic opportunities.

This is putting a strain on city infrastructure and authorities are struggling to deliver acceptable service levels. These municipalities and their residents can realize economic and social benefits from energy efficiency initiatives aimed at addressing some of these infrastructure challenges. The EELA project is looking to work with energy service providers on initiatives aimed at increasing access to public/street lighting in partnership with municipalities. Public/streetlight is a priority area for the EELA project given the economic and social benefits of well-lit public spaces in urban areas.

Towards a vibrant energy efficient market

With limited electricity supply, growing demand for energy to support economic and social activities and a big inventory of old inefficient appliances, plant, and equipment across many sectors in most of the countries, there is a strong need for a vibrant energy efficient market. **EELA is helping promote a conducive environment for a market for energy efficient products.**

With a few exceptions, the private sector is significantly better positioned than government to mobilize finance and skills towards any economic activity. By unlocking this potential of the private sector in energy efficiency, EELA seeks to complement government efforts in the member states. Improved access to energy is an important driver for the countries in the two regions to achieve their economic and social development objectives and utilizing the available energy resources efficiently.

Opportunities for support through EELA

The EELA project aims at creating vibrant markets supported by enabling policies and regulations, where suppliers offer quality products and services, and governments have the capacity to enforce standards, while consumers are aware of and are demanding quality energy efficient options.

There is a need to raise demand for efficient appliances and equipment and manufacturers need to be incentivized to supply energy efficient products. The reasons for this include some consumers' sensitivity to purchase price (efficient appliances tend to have higher upfront costs); lack of consumer awareness about the benefits of energy efficiency; lack of regulations promoting energy efficient products as well as limited affordable funding with an appropriate tenure.

By supporting energy service providers, the EELA project will help the private sector to enter the energy efficiency sector.

Targeted energy service providers will include:

- suppliers of efficient technologies,
- energy consulting firms,
- energy services providers,
- energy efficient equipment leasing firms,
- energy utilities.

The project will also support energy users, including:

- municipal services like street lighting,
- agricultural enterprises,
- cold chain operations and similar high-volume energy users.

The benefits to energy service suppliers of engaging with EELA

- **Access to advisory support** for strengthening their capacity to offer energy efficiency services, including support in carrying out energy audits, structuring energy performance contracts and designing measurement and verification frameworks.
- **Apply for co-financing** to cover upfront costs when entering an energy service contract (i.e. for purchasing equipment)
- **Opportunity to participate** in workshops and other knowledge sharing platforms on energy efficiency opportunities and initiatives in the 21 East and Southern African countries.

The benefits to energy service users of engaging with EELA

- **Potential to upgrade appliances, plant or machinery** with expert backstopping support, thus reducing energy costs and GHG emissions without investing their own capital.
- **Potential to access energy services, including lighting** (for private and public institutions and street lighting), cooling or heating without capital outlay.
- **Opportunity to participate in workshops** and other knowledge sharing platforms on energy saving and implementing energy efficiency projects.
- **Potential to receive technical assistance** to develop an energy efficiency service business model and assist with the procurement of an energy service provider.

The EELA private sector support facility

The EELA Private Sector Support facility will promote the implementation of proven and innovative business models. Among these models are the Energy Service Company (ESCO) model, Cooling as a Service (CaaS), Lighting as a Service (LaaS), Heating as a Service (Haas), and Operating Lease models.



The EELA private sector support facility offers the following type of assistance:

- ➔ **Technical assistance to Energy Service Users** such as, for example, municipalities, cities or industries to design the right energy efficiency service business model and to engage an energy service company.
- ➔ **Financial support is provided to Energy Service Companies** to particularly support the upfront costs for the purchase of equipment (co-financing facility).
- ➔ In addition to these two windows, EELA also **offers support to manufacturers in the transformation towards more efficient products.**

For full details about the Energy Efficiency Private Sector Support Facility visit the websites of the two regional centres: www.sacreee.org and www.eacreeee.org

The Swedish International Development Cooperation Agency (Sida) is funding the Energy Efficient Lighting and Appliances project (EELA), which is being implemented by United Nations Industrial Development Organization (UNIDO) and its partners, the SADC Centre for Renewable Energy and Energy Efficiency (SACREEE) and the East African Centre of Excellence for Renewable Energy and Energy Efficiency (EACREEE). The EELA project seeks to create market and institutional conditions to transform the market environment to stimulate increased diffusion of efficient lighting products and appliances in the 21 EAC and SADC member countries.

Successful examples

PRIVATE SECTOR

Cooling as a service case study³



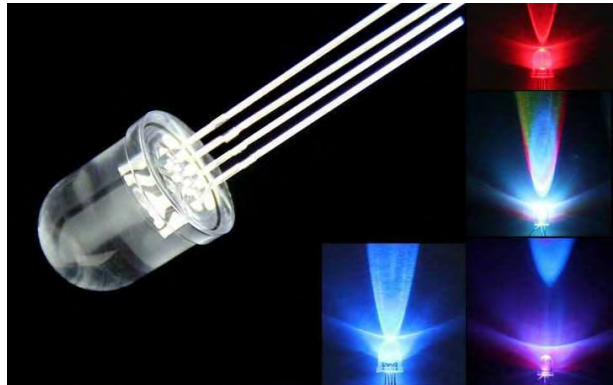
Afrupro, a South African fruit packing company, was experiencing consistent problems with its existing industrial ammonia plant. The cold rooms were operating above the required temperature specifications and the glycol tanks were leaking.

This resulted in rising maintenance and electricity costs compounded by expensive product losses. Following a thorough evaluation, Energy Partners Refrigeration proposed an outsourced cooling solution (financed, owned and optimized by Energy Partners). This involved an upgraded ammonia plant to provide better, more reliable cost-efficient cooling.

The upgrade involved the installation of a new liquid receiver (including valves and instrumentation) and new stainless-steel glycol tanks. Existing mechanical controls were replaced with a new computerized control system with remote monitoring capabilities and a full re-commissioning process commenced. This was all financed through a Cooling as a Service (CaaS) agreement, with no upfront cost to the client.

PUBLIC SECTOR

Asian electronics limited (AEL) in India⁴



AEL is an Indian private company located in Mumbai (<http://www.asianelectronics.co.in>).

This company developed an LED street lighting project based on the proven delivery model and set up energy performance contracts with nine local urban bodies. The financing mechanism is through carbon finance and domestic Indian bank loans accessed by AEL, and expected energy savings are 50 per cent.

The projects have been implemented on a build-own-operate-transfer basis through an ESCO shared savings model since 2005 and are planned until 2022. A report was published in 2016, summarizing the experiences so far.

³ https://www.caas-initiative.org/wp-content/uploads/2020/05/200526_SouthAfrica_links.pdf - CaaS Initiative led by The Basel Agency for Sustainable Energy (BASE), and implemented by Energy Partners.

⁴ <http://documents.worldbank.org/curated/en/476841477929749774/Proven-delivery-models-for-led-public-lighting-ESCO-delivery-model-in-Central-and-Northwestern-India>

HEALTH SECTOR

Solarex in South Africa⁵



Solarex (<https://solarex.co.za>) is a South African based developer of renewable energy projects.

The company developed and installed a solar thermal system providing a sanitary hot water supply to the Melomed Private Hospital in Cape Town. The system built in 2017 and was co-financed by the SOLTRAIN project (www.soltrain.org).

The pumped system with a collector power of 70 kWth and a collector area of 100.2 m² consists of evacuated tube collectors and has a storage capacity of 20,000 litres. A heat pump serves as the back-up system.

HOSPITALITY SECTOR

Swimsol in Maldives⁶



Swimsol (<https://swimsol.com>) is an ESCO based in Austria, specializing in tropical-proof, large-scale photovoltaic (PV) systems.

Swimsol offers customers a zero-investment option and, in addition to financing, is responsible for the planning, installation and operation of the system. The company works closely with local companies. A large tropic-proof rooftop solar system with 838.35kWp was installed on the staff buildings of the Four Seasons Landaa Giraavaru Resort, representing one of the largest PV installations in the Maldives.

The grid setup is a solar-diesel hybrid system: The Photovoltaic (PV) system works together with the Island's diesel powerhouse and reduces the diesel consumption of combustion generators by up to 300,000 liters per year. The project launch was in 2018.

⁵ <https://soltrain.org/systems/melomed-private-hospital/detail>

⁶ <https://swimsol.com/solar-projects/heavy-duty-roofsolar-power-photovoltaics-maldives-four-seasons/>



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