Climate mitigation finance strategy to promote higher-efficiency distribution transformers in Malawi

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TABLE OF CONTENT

Figures

Table

Executive Summary

BASE - Basel Agency for Sustainable Energy (BASE) in partnership with the SADC Centre for Renewable Energy & Energy Efficiency (SACREEE) and the International Copper Association (ICA) is providing technical services for the implementation of GCF Readiness projects with CTCN through UNEP on national frameworks for leapfrogging to energy-efficient appliances and equipment in Malawi, Namibia, Zambia, and Zimbabwe through regulatory and financing mechanisms. The objectives of the technical assistance projects are to improve the country programming process regarding refrigerators and distribution transformers and strengthen climate finance strategies. This report was prepared as part of Activity 5 of the projects which aim to identify and develop financing mechanism options for the promotion of higher efficiency domestic refrigerators and distribution transformers (DTs). This report focuses on the climate mitigation finance strategy for the promotion of higher-efficiency distribution transformers. Chapter 1 explains the rationale behind the development of a climate mitigation finance strategy including the objective of such a finance strategy, market barriers for the adoption of energy-efficient distribution transformers in the country, and a quick introduction to potential support mechanisms and enablers, as well as sources of financing. Chapter 2 highlights international experiences and experiences on the African continent on relevant financing mechanisms and programmes to promote energy efficiency investment in the public and commercial sector. Chapter 3 describes the two most promising financing mechanism options: (i) the ESCO model's Energy Performance Contracts (EPC) and (ii) Bulk procurement programs and fiscal incentives to promote investment in higher-efficiency distribution transformers. Chapter 4 presents an initial assessment of the financing mechanisms options through a set of selection criteria, introduces the next steps for the endorsement of the best option by key national stakeholders and partners, as well as aligns expectations for the development of detailed implementation plans for the selected option.

1 Rational behind the development of a climate mitigation finance strategy

1.1 Objective

Climate change is a pressing global challenge that is affecting every part of the planet. To strengthen the global response to climate change, countries adopted the Paris Agreement at the 21st Conference of the Parties (COP21) to the United Nations Framework Convention on Climate Change (UNFCCC) in Paris in 2015. In this

agreement, all countries agreed to limit global temperature rise to well below 2 degrees Celsius, and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius. Addressing the challenge of climate change, and achieving the goals set out in the Paris Agreement, will require a significant global effort.

Energy efficiency (EE), which should be seen as complementary to a wider climate change strategy, is a highly effective and economic way to reduce global greenhouse gas (GHG) emissions and can make a significant contribution to combating climate change. According to the International Energy Agency (IEA), energy efficiency measures could result in 40% of the GHG emissions abatement required to achieve the goals set out in the Paris Agreement.[1] EE also reduces air pollution, lowers spending on energy, enhances energy security, improves competitiveness and provides many other benefits. EE is key to achieving Nationally Determined Contribution (NDC) goals and tackling the energy trilemma of environmental sustainability, energy security and energy access. Effective EE has the potential to drive numerous benefits, such as macroeconomic development, increased public budget, consumer savings, enhanced health and well-being, industrial productivity and energy delivery improvements.

Zooming in to technologies that are covered by the United Nations Environment Programme's United for Efficiency initiative (UNEP U4E) such as refrigeration, air conditioners, lighting, electric motor systems, and power distribution transformers, it is calculated that all of them are expected to consume over half of the world's electricity.[2]

The focus in this report is on the promotion of higher-efficiency distribution transformers. Switching to more energy-efficient distribution transformers would bring significant economic and environmental benefits for different actors involved in the topic, including governments, businesses, and end-users (i.e., utilities, private sector users such as the mining industry and farmers). Between 2015 and 2040, the installed global stock of distribution transformers is expected to increase by a compounded annual growth rate of 3.7%, doubling this way the number of transformers through this time span. Over this period, Africa has the highest projected annual growth rate of 4.9%, with the installed stock in the region more than tripling. Therefore, it is projected that using more efficient distribution transformers can save

[1] IEA (2021), Energy Efficiency 2021 report. IEA has numerous reports and publications on energy efficiency which are released each year. This includes a market report series, global status reports, energy efficiency indicator reports, energy technology research and development reports and others.

[2] UNEP U4E (2021), website

nearly 5% of the global electricity consumption[3]. Based on this growth, the electricity consumption for distribution transformers could increase over 60% by 2040. Through appropriate policies and measurements and adoption of tailored financing mechanisms to promote energy efficiency, this increase can be reduced to 30%. For instance, according to IEA[4], standards and labels have helped reduce the energy consumption of distribution transformers between 20-50% over life of such programmes. The efficiency of a typical distribution transformer is in excess of 97%. In other words, up to 3% of all electrical power generated is wasted in transformer losses. When thinking of single transformers this might not seem a lot. However, considering the overall stock of distribution transformers, the large amounts of energy that they operate and their typical lifetime of 20-50 years, this translates to very large electricity loses that cannot be neglected easily. The cumulative cost of losses can be more than double the original purchase price of a distribution transformer[5].

Considering an aggregate figure of the 156 developing countries and emerging economies for which the country savings assessments have been produced, the annual electricity savings for transformers could reach almost 60 TWh in 2040. This would translate in reducing CO2 emissions by 50 million tonnes annually and saving consumers up to US$ 6 billion on their electricity bill.[6]

Looking at the electricity losses in different African regions, it is estimated that in ECOWAS region, the technical and commercial energy losses due to theft and/or illegal operators lie in the range of 25% to 30% (with a number of sources pointing to 40%). In the Central Africa CEMAC countries, electricity losses over transport and distribution networks account for approximately 40%, and in the SADC region the average losses are between 25% and 30%. This is quite high in comparison to the 7% to 10% range of energy theft and technical losses in Northern America and Western Europe[7].

However, investments in EE are not currently happening at the rate needed. Population growth and economic growth have outpaced energy efficiency gains over

[3] UNEP U4E (2021), https://united4efficiency.org/wp-content/uploads/2021/06/U4E_Transformers_Model-Regulation_Final_20190920_2.pdf

[4] IEA (2021), Energy efficiency 2021 report

[5] UNEP, U4E (2019), https://united4efficiency.org/wp-content/uploads/2021/06/U4E_DT_Model-Procurement-Specs_Final_20191002_2.pdf

[6] UNEP U4E (2021), Distribution Transformers

[7] UNEP U4E (2021), https://au-afrec.org/publications/u4e-brief-agenda-new-eco-efficient-power-transformers-for-africa_13th-july-2021_final.pdf

recent years, and this growth trend is set to continue. With this growth, global energy demand is expected to increase, and with it comes a huge need and opportunity for energy efficiency gains.

Achieving these energy efficiency improvements will require a significant increase in global investments in energy efficiency. Government policies are expected to help energy efficiency investment rise by 10% in 2021 to almost US$ 300 billion. However, to be consistent with levels foreseen in the IEA Net Zero Emissions by 2050 Scenario, overall annual investment would need to triple by 2030. Recent investment growth has been concentrated largely in Europe, suggesting polices are needed in other regions to achieve global climate goals.[8] International development assistance alone will not be enough to meet these targets. Much of this finance will need to be mobilised locally, and from private sources.

In order to scale up the adoption of energy-efficient solutions, investments must be suitably enhanced with an effective targeted climate mitigation finance strategy. This generally includes demand-side management (DSM) interventions that focus on process optimization, which achieve reductions in energy use, as well as equipment and technology interventions to ensure that the infrastructure in place is energy-efficient (e.g., purchasing energy-efficient appliances and equipment, replacing/retrofitting existing infrastructure with energy-efficient alternatives and upgrading from old infrastructure to energy-efficient systems). In particular, an effective targeted climate mitigation finance strategy will require the review, development, and implementation of financial mechanism options that overcome the key barriers, facilitate the flow of financing for relevant technology solutions and address the untapped market potential. When developing such a strategy, it is essential to understand the technical, financial, institutional, legal, and social barriers that are constraining investments in new energy-efficient solutions.

The aim of the strategy is to build on international experiences and the national framework in order to enable the conditions required to mobilize investments in new energy-efficient and climate-friendly technologies in the public and commercial sectors, and motivate end-users such as utilities and large industries to shift towards higher-efficiency distribution transformers.

1.2 Barriers

[8] IEA (2021), Energy Efficiency 2021 report. IEA has numerous reports and publications on energy efficiency which are released each year. This includes a market report series, global status reports, energy efficiency indicator reports, energy technology research and development reports and others.

There are several barriers that hinder investments in climate-friendly and energy-efficient distribution transformers. These barriers can be categorized into three groups – end-users, technology providers and financial institutions.

End-users. Key barriers from the perspective of end-users, including utility companies and non-utility market players, such as mining companies, industries and farmers are:

- **High upfront cost of energy-efficient equipment**. High quality energy-efficient and climate-friendly equipment typically has a higher upfront capital cost. The cost savings that result from energy-efficient and climate-friendly equipment are generally realised over a number of years. This means that customers do not typically see the financial benefits of energy-efficient equipment immediately, which can discourage investment. This is particularly important in countries which have a high cost of capital and low financial sources by users. Moreover, the high number of refurbished DTs available in the market with more competitive prices, makes it more difficult for the utilities to invest in new energy efficient equipment.

- **Highly-perceived risks or lack of trust in new technologies and promised energy savings**. End-users can be risk averse towards new or unknown energy-efficient and climate-friendly technologies, and often perceive that there are hidden costs or that the equipment will not achieve the savings that were promised. Investment decisions are typically based on the client's risk and return perception. Energy efficiency is often perceived as relatively high risk. Even though the cost savings are promising, they are not seen as commensurate with the perceived level of risk. This is enhanced as well by lack of warranties that ensure the quality of the products and lack proper market regulatory framework to build trust in the market of distribution transformers.

- **Competing investment priorities.** Most end-users have limited access to capital and at the same time many competing investment priorities. Investments in energy-efficient and climate-friendly equipment have to compete with other investment needs. End-users may choose to invest in alternative solutions which brings a faster return to investment in the short run and are perceived as more secure.

- **Lack of knowledge or awareness of energy efficiency and its benefits.** Many end-users are not aware of the energy efficiency improvements they could make, the scale of the recurring savings to be made, or of the multiple benefits of energy efficient technologies such as better equipment performance, as well as energy bill savings potential and electricity saving potential. This is due to the poor promotion of dissemination of information on these technologies.

Moreover, lack of knowledge in the country due to the brain drain and non-availability specialised educational institutions on the topic, makes it difficult to properly identify, track and analyse energy data and compute best solutions for energy efficient investments.

- **High rate of vandalization of equipment.** Vandalised or stolen transformers are common issues. The unsecure market and environment on DTs, makes it more difficult to invest in more expensive and new energy efficient equipment in the country.

- **Split incentive:** Utility companies lack the incentive to invest in energy efficient distribution transformers because losses are passed as a cost of business to the end-use consumer of electricity[9]. When the end-consumer of electricity (households, private sector, etc) pays the costs of losses of inefficient distribution transformers through their electricity bill, then the incentive of the supplier of electricity to invest in more energy efficient equipment is reduced.

- **Limited availability of energy-efficient transformers.** The local manufacture and import of energy-efficient transformers can be challenging due to macroeconomic factors such as the inflation rate, economic growth, import costs or tariffs. Therefore, even when the possibility of the utility is there to purchase such equipment, the availability in the market makes it more difficult.

- **Lack of facilities** such as maintenance and testing facilities, or collection, recycling and proper disposal waste systems lowers the incentive of the utilities to invest towards newer equipment.

Technology providers. From the supply side, manufacturers, importers and sellers of distribution transformers face significant challenges in selling energy-efficient equipment:

- **High upfront capital,** the price of energy-efficient equipment is higher than conventional equipment. It is thus even more difficult to gain trust from end-users in respect to promised future benefits (energy savings). The shortages of foreign currency and high inflation also mean that technology providers can face challenges in importing components and in maintaining production costs low and competitive.

[9] UNEP U4E (2021), https://united4efficiency.org/wp-content/uploads/2017/11/U4E-TransformersGuide-201711-Final.pdf

- **Lack of policy**, or policy enforcement is also a barrier. Due to the lack of enforcement of energy efficiency regulations such as Minimum Energy Performance Standards (MEPS) for distribution transformers, high quality technology providers typically have to compete with cheaper products on the market, and often struggle to convince clients to invest more upfront capital in higher quality equipment and future cost savings. Though there is a lack of effective financial mechanisms to help technology providers of high-efficiency equipment sell their more premium products.

- **The price of energy** can also be a barrier for energy efficiency technology providers. Electricity or fuel prices, if not indexed to import prices in foreign currency, are implicitly subsidised due to the inflation. Therefore, they do not include the cost of import in foreign currency, and the cost of carbon or other externalities. This means that energy efficiency investments and energy savings are undervalued. Conversely, energy efficiency can however also offer a hedge against energy price increases.

Financial institutions. From the perspective of financial institutions, the key barriers include their limited familiarity with, or technical capacity to assess energy efficiency investments in general, applicable in this case to the distribution transformers as well. Many local financial institutions, have little experience with energy efficiency investments for distribution transformers. In markets where capital is scarce, more traditional investments such as power plants, industrial expansion, renovation or extension of the power grid, often receive investment priority. Moreover, limited familiarity with energy efficiency also means that financial institutions perceive high risk of non-performance of energy efficiency projects.

Though there are many barriers inhibiting investments in energy efficiency in the public and commercial sectors at the regional and national level. Many of these barriers can be overcome, at least in part, with well-designed financing mechanisms, together with complementary measures such as policies, regulations, awareness raising activities and behaviour change initiatives.

1.3 Support mechanisms and enablers

Financing mechanisms for energy efficiency can and should be supported by other complementary mechanisms, such as policies, regulations, and awareness raising

activities. These mechanisms work alongside each other in a complementary manner. The key supporting mechanisms and enablers are described briefly below.[10]

- **Standards and regulations, and procurement specifications.** Standards and regulations, such as MEPS, energy conservation laws, or procurement specifications for purchasing energy efficient distribution transformers, can successfully deter investments in less efficient technologies, and encourage investments in more efficient technologies. These mechanisms can help define which products can be sold or procured, and those that should be blocked from the market. Standards and regulations are an important part of energy efficiency programmes.
- **Supporting Policies.** Supporting policies such as labelling are necessary to ensure the smooth implementation of standards and regulations, and to increase public awareness and acceptance of energy efficiency and energy efficiency programmes. Reliable under easily understandable labelling systems are becoming common practice in many parts of the world. They impact the energy efficiency market directly by giving customers accurate and reliable information on the products' energy efficiency. According to U4E, mandatory or voluntary labeling is one of the most cost-effective energy efficiency policy measures (even though not widely spread yet). For DTs there are two labels available: endorsement labels (for DTs that meet or exceed a specified set of criteria) and comparative labels (facilitates comparison between products on energy or other performance aspects).[11]
- **Awareness raising, information, education and communications.** Raising awareness about the benefits and opportunities provided by energy efficiency is important to ensure buy in from all parties. Training can inform end-users, and provide them with the information needed to make changes in equipment or practices based on the Total Cost of Ownership analysis. Enhancing the dissemination of such information through digital tools such as online apps would facilitate a lot the awareness raising.
- **Monitoring, verification and enforcement.** Effective implementation of energy efficiency standards and regulations also requires monitoring, verification and enforcement systems to ensure compliance. This incorporates testing of products in the market.
- **Disposal and waste management.** Replaced inefficient energy systems should not find a way back into the market as second-hand equipment. Effective systems should also be in place for the proper disposal, and recycling of

[10] BASE (2019), Manual of Financing Mechanisms and Business Models for Energy Efficiency

[11] UNEP U4E (2017), Transformers Guide

equipment as well as the management of hazardous waste and of ozone depleting substances.

- **Creating support and advice** on different areas such as on the procurement energy-efficient equipment, supporting the research and development and demonstration of real case successful projects of investing in this equipment is as well a mechanism that would enable more investment in the market[12].

Supportive policies and programmes can also be a key driver of energy efficiency investments, and an enabler of market-based mechanisms. However, policies and regulations alone are often not enough to stimulate industry investment in sustainable energy. Financing mechanisms can support markets to move in the right direction, towards more efficient products, making ambitious policies easier to achieve.

Regional and national policy frameworks that support energy efficiency, or set efficiency or emissions reduction targets, can also encourage markets to move in a complementary direction, and encourage public and private investments in energy efficiency. Integrating energy efficiency into national or regional energy and climate change strategies can help make energy efficiency a long-term investment priority. Since energy efficiency measures involve goods that are traded across borders, implementing standards, labels and testing requires regional coordination. Regional coordination can also increase the cost-effectiveness of capacity building and awareness raising and other measures.

To this extent, SACREEE has been mandated by the SADC Member States to play a key role in the implementation of the recently adopted Southern Africa Renewable Energy and Energy Efficiency Strategy and Action plan (REEESAP). SACREEE's focuses on programs and projects that can best be implemented at the regional level. These actions include harmonisation of policy approaches, regulation and standards, investment coordination, and regional capacity building and knowledge building measures.[13]

A multi-faceted approach that includes policies, regulations, awareness raising activities and market-based financing mechanisms guided by a national strategy can help ensure sustainable growth in energy efficiency investments over the longer-term in the residential sector.

[12] UNEP U4E (2017), Transformers Guide

[13] SACREEE (2021), website

1.4 Types of financing

Unlocking investments in energy efficiency requires a wide range of financial sources and solutions. Enabling a proper financial environment for investing in distribution transformers, would create trust and more confidence for the end-users of these equipment. There are different types and sources of financing that can be used for supporting this environment and unlock investments for distribution transformers. Some of these are described below (non-exhaustive).[14]

- **Debt.** Borrowers commit to pay to the lender the principal and interest (cost of funding) on an agreed schedule. Borrowers use assets as collateral as reassurance to the lender. Typical debt instruments include credit, mortgages, leasing.

- **Grants.** Grants are non-repayable fund contributions (in cash or kind) bestowed by a grantor (often government, corporation, foundation or trust) for specified purposes to a recipient. Grants are usually conditional upon specific objectives on use or benefit, and might require a proportional contribution by the recipient or other grantors.

- **Risk mitigation instruments.** Financial instruments that are available in the market to mitigate the risks of investing in energy efficiency. The beneficiaries of risk mitigation instruments can be end-users, lenders, project developers, or the government. Insurance and credit guarantee instruments are the most common financial risk mitigation instruments.

There are many variations of these types of financing types applicable to energy efficiency; some of these are described below (non-exhaustive).

- **Blended loans.** Blended loans mix grants or subsidised loans with additional funds raised from other sources (e.g., capital markets). Blended loans might reduce borrower costs and increase the capacity of funds to take higher risks. Blended mechanisms are increasingly used by MDBs and bilateral financial institutions.
- **Performance Based Financing (ESCO).** This type of financing enables funding of energy efficiency upgrades from energy cost reductions. Under this arrangement, a third-party organisation, typically called an Energy Service Company (ESCO) implements an energy efficiency project, and uses the stream

[14] BASE (2019), Manual of Financing Mechanisms and Business Models for Energy Efficiency

of income from the cost savings to repay the project costs. The ESCO only receives full payment if the project delivers predicted energy savings.

- **Securitisation.** The process by which a company groups different financial assets/ debts to form a consolidated financial instrument sold to investors. In return, investors receive interest payments; e.g., an energy efficiency company can trade its future cash flow with investors.
- **Aggregation:** It refers to aggregating demand, such as aggregating a portfolio of projects (normally small enterprises or projects) with similar technologies or business models. Some of the benefits of aggregation include transaction cost reductions and limited risk exposure because aggregation distributes costs and diminishes the associated risks of a portfolio's execution; that is, risks are distributed if a project underperforms.
- **Green bonds.** Bonds are loans made to large organisations from one or many investors for a specific period of time and at a particular interest rate. A green bond is a bond specifically earmarked to be used for climate and environmental projects. A bank may sell a green bond to raise money to finance energy efficiency projects

The above-mentioned financial sources and types can be used individually or complementary to each other. The above types of funding are provided by different financial sources, which can be international or national entities including banking institutions, National Development Banks (NDBs), Multilateral Development Banks (MDBs), guarantee institutions, and Energy Service Companies (ESCOs). For instance, MDBs and NDBs can provide credit/leasing, credit guarantees, grants (i.e., concessional funding) to the government, to trigger market transformation toward energy-efficient investments. They foster this way a more secure environment of energy-efficient investment, raise the confidence of the investor and attract commercial local financial institutions and investors to engage in energy-efficient projects. As for governments, the most direct way to pay for energy-efficient distribution transformers is through allocating public funds from the domestic budget. Though this is quite challenging for developing countries where the government has to prioritize investments and fund allocations along many sectors in need, while keeping a healthy macroeconomic balance sheet. Finally, the typical energy efficiency funding for ESCOs is performance-based financing, debts/loans, aggregation, and securitization.

1.5 Unlocking investments through financing mechanisms

The pathway to overcome these barriers largely depends on facilitating access to the utilities and non-utility market players, and providing financial strategies that are feasible for implementation, cost-efficient, financially self-sufficient, aligned with the

national policy framework and engaging all key stakeholders. Some examples of financing mechanisms include (i) the ESCO model's Energy Performance Contacts (EPCs) and (ii) Bulk procurement programs and fiscal incentives for the promotion of investment in energy-efficient distribution transformers (see Chapter 3). Each of these models has different advantages and can use a different financing source and path to overcome specific barriers. Among others, these include the reduction of the burden of the initial investment and the reduction of the client's risk perception. These models need to be tailored to local conditions informed by national and regional experiences (see Chapter 2), and combined with financial and non-financial risk mitigation mechanisms. Their success heavily depends on a thorough understanding of the market, a strong engagement of the key stakeholders, the successful creation of an environment of trust and a well-designed model offering a sustainable solution by creating value for all involved players.

2 Experiences and framework

A comprehensive market assessment was performed both on the supply and on the demand side of distribution transformers, with the aim to understand the market opportunities, barriers, key stakeholders, financial instruments and the policy framework. The results of the market assessment are described in a separate document. This chapter summarises examples of relevant international and regional financing mechanisms and programs for energy efficiency and when information is available, focusing specifically on distribution transformers.

As of 2017, most countries in the world did not take yet any action regarding energy efficiency programs for the promotion of higher-efficiency distribution transformers. Countries and regions that had policies that promoted energy-efficient transformers, included the Australia, Canada, China, Europe[15], India, Israel, Japan, Mexico, Republic of Korea, United States, and Vietnam. According to the Guide on Transformers prepared by U4E, until that year, in Africa there were no such actions and programmes that targeted specifically the promotion of investment in energy-efficient distribution transformers.[16]

This chapter focuses on international and regional experiences that give examples of financing mechanisms promoting the investment in energy-efficient distribution transformers, as well as examples of projects that include financial support and methods for supporting a wider range of energy efficiency projects.

[15] Europe includes the 28 members states of EU as well as EFTA and Switzerland.

[16] UNEP U4E (2017), https://united4efficiency.org/wp-content/uploads/2017/11/U4E-TransformersGuide-201711-Final.pdf

It is noted that most of the experiences so far that deal with the reduction of technical losses in the distribution network and improving infrastructure of the power grid, including energy-efficient distribution transformers, are supported by MDBs or development financial institutions (DFIs). MDBs and DFIs can play a key role in mobilising private sector investment and providing investment terms that a commercial lender would struggle to provide. The typical financial source for investing in energy-efficient distribution transformers would be either through traditional public finances, where investments in energy-efficient DTs are part of a larger infrastructure project of the expansion or improvement of the power electrical grid, or through government debt which is financed by MDBs for the same scale of infrastructure investment. In addition, there appears to be the creation of a new market for energy service companies (ESCOs) and innovative business models for the promotion of higher-efficiency distribution transformers.

2.1 Examples of International Experiences

Canada. Powersmiths - an ESCO specialised in EE DT retrofits supplying low-voltage DTs through the ESCO's energy performance contracts model to public and commercial clients. Over the last decade Powersmiths has effectively measured low-voltage DT load profiles and losses for thousands of transformers that have been retrofitted. Higher-efficiency, dry-low-voltage, DTs are optimized to maximize energy savings and provide a quick payback to end-users. The ESCO focused on low-voltage EE DT technologies that are adaptable to many retrofit applications and are shown to have an 80% reduction in energy losses for retrofit projects, after upgrading from older technology, with verified energy savings. The ESCO extensive commercial and technical support includes a preliminary assessment, detailed audits, baseline metering, application-based development, flexible manufacturing, and post-installation performance verification (ISO 17025 Certified Test Lab), as well as a 32-year product warranty, etc. The ESCO offers end-to-end application-based submetering, data collection and building resource data management and reporting solutions to ensure the savings.[17]

India. The Asian Development Bank (ADB) assisted the Indian state of Madhya Pradesh improve the power distribution infrastructure in rural areas. The project improved the quality of power supply in 32 districts. It installed separate power feeders for households and agricultural use, high-voltage distribution systems, including distribution transformers and new power meters, and strengthened the 33-

[17] Powersmiths (2021), website

kilovolt network. This promoted the efficient use of groundwater in agriculture and improve on-farm water conservation practices. The program finished in 2016 and reached a budget of US$ 200 million of loans and technical assistance. Additional measurements such as installation of efficient high voltage distribution system and metering, together with better system management practices, contributed to reduce the technical and commercial losses. [18]

In addition, The UK Department for International Development (DFID) provided technical assistance of £ 14.7 million to the Energy Department, government of Madhya Pradesh and the power utilities in generation, transmission, and distribution. The objective was to support policy and institutional reforms to make the power sector viable in the medium and long-term by ceasing to be a drain on the state finances and to enable the state to spend more on social sectors. DFID support includes: (i) distribution loss reductions; (ii) energy efficiency and Demand Side Management; (iii) private participation in generation; (iv) distribution franchisee Public Private Partnerships (PPPs); and (v) a financial restructuring plan. The project ran from 2005-2012. DFID technical assistance complemented the loans from the Asian Development Bank (AsDB), as well as loans and grants from the Government of India. The latter were provided under the Accelerated Power Development and Reform Program (APDRP) to improve overall power sector infrastructure in generation, transmission and distribution.[19]

KfW Development Bank provided an **energy efficiency credit line** in the amount of EUR 70 million for energy supply companies in India, through a subsidised interest rate to the Rural Electrification Corporation (REC), an Indian public sector finance institution. Under this line of credit, financing was provided for investments to convert rural electricity distribution to a high voltage distribution system (HVDS). A total of 16 individual projects were implemented in the federal state of Andhra Pradesh. The project objective was to raise the energy efficiency of rural electricity distribution by issuing sub-loans to energy supply companies and by institutional strengthening at the REC and the supply companies. The project also aimed to contribute to environmental protection and resource conservation by making more efficient use of the energy generated[20].

[18] ADB (2016), https://www.adb.org/projects/43467-016/main

[19] DFID (2012), https://iati.fcdo.gov.uk/iati_documents/3548244.odt

[20] KFW (2014), https://www.kfw-entwicklungsbank.de/PDF/Evaluierung/Ergebnisse-und-Publikationen/PDF-Dokumente-E-K_EN/Indien_Energieeffizienz_2014_E.pdf

Vietnam. The Improving Energy Efficiency in Rural Areas of Vietnam program included rehabilitating, modernising and expanding the rural electricity grids in northern, central and southern Vietnam. The three regional energy suppliers were responsible for its implementation. As part of the measure, low-voltage grids, medium-voltage grids, substations and transformers were installed in northern, southern and central Vietnam. As a result, the measure played a role in strengthening the Vietnamese distribution network by ensuring that rural areas were better connected to the national electricity grid. The project was finished in 2017 and was supported by KFW Development Bank through **a soft loan** of around EUR 13.6 million[21].

2.2 Overview of experiences in Africa

An overview of experiences on the African continent shows that out of 55 African countries, to date, only 18 countries have some form of financial mechanisms (e.g., credit lines, revolving funds, financial products for energy efficient investments, energy service agreements, partial risk guarantees, vendor credit, 'green' mortgages) that support investment of energy efficient activities in the commercial sector. From the Southern African region, South Africa and Zambia are the only two countries that have credit lines and/or revolving funds with banks, energy services agreements (pay-for-performance contracts), green or energy efficiency bonds, and vendor credit and/or leasing for energy efficiency activities in the commercial sector.

Annex 1 gives a list of financial mechanisms that are available in the commercial sector in Africa as of 2021 and according to the Regulatory indicators for Sustainable Energy (RISE) from the WBG.[22]

There are a few relevant experiences in the African continent regarding programs and projects that include financing mechanisms to promote energy efficiency. For example, in Algeria, there is a dedicated energy efficiency fund which provides soft loans, grants and investments guarantees for energy efficiency and renewable energy investments. A similar fund in Ethiopia that is managed by the Ethiopian Energy Authority, provides support for a range of financial instruments which were expected to be used to deliver efficiency such as **dedicated energy efficiency credit lines**, **partial risk guarantees for energy efficiency** and Energy Service Company (ESCO) financing. In recent years Morocco has developed regulations to encourage the proliferation of **green bonds**. As of early 2020, Morocco had issued five green bonds valued at Dh4bn ($416.7m). In addition to Masen and Casablanca Finance City, green bonds were

[21] KFW (2017), https://www.kfw-entwicklungsbank.de/Evaluierungsbericht/Evaluierungen/Verbesserung-der-Energieeffizienz-in-l%C3%A4ndlichen-Gebieten/index-2.html

[22] RISE (2021), https://rise.esmap.org/countries

issued by two banks for financing and refinancing sustainable energy and energy efficiency projects Moreover, ADFB is providing an almost US$ 1 million grant to Morocco's Société d'Ingénierie Energétique (SIE) to support its transition into the first Super Energy Service Company (Super ESCO) initiative in Africa. As a Super ESCO, SIE should be able to overcome many of the challenges in scaling up energy efficiency investments in the commercial and public sectors. It will also open market opportunities for local ESCOs, offer quality assurance support and build their reputation among end-users and investors. In Nigeria 'Sunref Nigeria' was launched seeking to improve access to energy through improved access to **affordable finance** for renewable energy and energy efficiency technologies in the commercial sector. Hosted by the Manufacturers Association of Nigeria (MAN) and in partnership with local banks, United Bank for Africa (UBA) and Access Bank, Sunref Nigeria offers the private sector **competitive loans** and technical assistance for structuring their green investments so they can seize the opportunities of green finance. **A credit line** of US$ 70 million has been provided to Sunref partner banks that offer attractive terms (**concessional rate loans, long tenors, grace period**). While Rwanda launched in 2012 one of the first national environment and climate change investment funds in Africa (FONERWA), which aimed to facilitate direct access to international climate finance and streamline and rationalize external aid and domestic finance. Financing from the Fund can be accessed by Rwanda's government ministries and agencies, districts, and civil society organizations, including academic institutions and the private sector. The Fund has several investment products, including **grants, innovation investments, and credit lines.**

Apart from country specific initiatives, there are several regional programs that promote EE through a diverse range of financing mechanisms. For example, EDFI ElectriFI is an EU-funded impact investment facility, financing in early-stage private companies and projects, focusing on new/improved electricity connections as well as on generation capacity from sustainable energy sources in emerging markets. By combining technical assistance and risk capital, EDFI ElectriFI can take greater risks than other investors. EDFI ElectriFI's activities de-risk investments and allow private investors and development finance institutions to deploy capital that they could not have invested otherwise. Another example is the **Sustainable Energy Fund for Africa (SEFA)**[23] which was launched in 2012 and is a US$ 95 million **multi-donor facility** managed by the African Development Bank (AfDB). It provides catalytic finance (**grants**, **equity investments**, **loans**, **results-based financing**.) to unlock private sector investments in medium-scale renewable energy and energy efficiency projects.[24] SEFA provides technical assistance and concessional finance instruments to remove market

[23] AfDB (2012), Sustainable Energy Fund Africa (SEFA)

[24] In 2017, SEFA approved a US$ 965,000 grant to Oxygen Energy Private Limited to support the preparation of a bankable business case for the development of a 20MW off-grid solar PV rooftop project on buildings owned and managed by Old Mutual Property Group Zimbabwe countrywide.

barriers, build a more robust pipeline of projects and improve the risk-return profile of individual investments, and support the public sector to improve the enabling environment for private investments in sustainable energy. **Sunref**[25] is an integrative approach of the AfDB to develop **green credit lines** with the local partner banks of the global south for energy efficiency, renewable energy and environment. The initiative provides solutions for the new energy and environmental transition by helping private actors in the South to seize its opportunities and encouraging local financial institutions to finance it.
More detailed information on regional and country specific initiatives across the African continent, can be found in Annex 2.

Zooming in to the southern African region, the following experiences (or lack thereof) could be listed.

Namibia. In 2020, Nedbank's Namibian subsidiary partnered with Sunref, the green finance label of the French Development Agency (AFD), to set up a facility to finance sustainable energy projects aimed at reducing the carbon footprint of businesses in Namibia. Nedbank and Sunref's new mechanism intends to make available a **green credit line** to local SMEs. It will provide multipurpose **investment cost financing** and tailor support to project developers throughout the entire project life cycle, The Nedbank and Sunref facility will enable the financing of renewable energy projects for businesses including **energy efficiency** in Namibia.[26]

South Africa. In 2015, KfW Development Bank has committed to granting a **promotional loan** for promoting **green electricity** to ESKOM, the state-owned electricity utility in South Africa, totalling just under ZAR 4 billion (EUR 300 million). The financing is to help connect solar and wind power plants and to make a substantial contribution to **modernising and strengthening the infrastructure of the interconnected grid** in South Africa. The network integration of renewable energy sources aimed to allow for annual CO2 savings of up to 5.5 million tonnes.

In 2015, the French Development Agency (AFD) provided an EUR 120 million **discounted credit facility** to two banks - Absa and Nedbank - and also to the SA Government's industrial support agency, the Industrial Development Corporation (IDC). This was for the financing of renewable energy and energy efficiency projects. The loans provided by the banks to their clients could either offer: (i) an **investment grant** to improve the return of the project and/or to finance studies (feasibility, approval, measurement and verification), or (ii) a **lower interest rate** to support the project's development. AFD has also set up a technical assistance facility within the

[25] Sunref (2021), Energy Efficiency
[26] Afrik21, Namibia: Nedbank and Sunref finance green projects for local businesses

South African National Energy Development Institute (SANEDI) to support the banks in their renewable energy and energy efficiency strategy and operations. [27]

In 2020, IFC invested US$ 200 million in the Standard Bank of South Africa Limited's **green bond.** This was Africa's largest green bond which aimed to increase **access to climate finance**. The 10 years green bond was supposed to enable the bank to **on-lend and finance climate smart projects** in the country such as renewable energy, **energy efficiency**, water efficiency and green buildings.[28] According to IFC, commercial banks currently provide only 45% of South Africa's financing for RE and EE projects. IFC estimates that the country's climate smart investment potential between now and 2030 is around US$ 588 billion. The projects funded by this green bond would have the potential to reduce greenhouse gas emissions by **742,000 tons per year.**

In 2021, IFC announced providing Absa Bank Ltd. with a **green loan** of up to US$ 150 million to support the bank's strategy to expand its climate finance business and help South Africa meet its greenhouse gas reduction targets. The green loan is the first certified loan in Africa that complies with the **Green Loan Principles**. This means that lending by Absa for green projects will be disclosed, improving transparency, and encouraging other banks to follow the principles. In addition to the loan, IFC will provide technical advice and knowledge sharing to help the bank develop a green, social, and sustainable bonds and loans framework.[29]

As of 2021, South Africa counts the Development Bank of Southern Africa (DBSA) and the South African National Biodiversity Institute (SANBI) as GCF AEs. DBSA is an NDB, with a mandate to finance both private and public sector activities at national and regional levels in Africa. DBSA provides sustainable infrastructure project preparation, finance and implementation support. Its environment and climate change portfolio for the financial year 2014/2015 was worth approximately US$ 530 million and included renewable energy, **energy efficiency,** biodiversity and sustainable land management projects. DBSA in partnership with the national environmental affairs department has established and manages a **special fund as a national mechanism** that aims to provide catalytic finance to facilitate investment in high-impact and **sustainable green initiatives** in the country. SANBI is a national entity and a research institute that coordinates research, monitors and reports on the state of biodiversity in South Africa. SANBI also provides planning and policy advice and it pilots management models. SANBI intends to mobilize financial resources from various sources, including MDBs. Both DBSA and SANBI were granted basic fiduciary standards and were accredited by GCF for project management and grant award. Only DBSA was accredited for loan, equity, and guarantee from GCF.[30]

[27] PSEE (2015) , Guide to energy efficiency finance in South Africa
[28] IFC (2020), https://pressroom.ifc.org/all/pages/PressDetail.aspx?ID=16888
[29] IFC (2021), Absa green loan
[30] GCF (2021), South Africa national AEs

Tanzania. In 2017, AFD provided its support to Bank of Africa in Tanzania (BOAT) in the context of its Sunref regional program. This support was in two forms a **loan** to BOAT to allow it to allocate loans to finance renewable energy projects or energy efficiency projects in the commercial sector and technical assistance financed by the EU and provided upstream to project promoters, for the preparation of their proposals, and downstream, to bank branches likely to allocate a loan to move on to the implementation stage. This EUR 11 million **green credit line** was AFD's first **concessional credit line** for renewable energy and energy efficiency development in Tanzania.[31]

In 2019, there were over 20 **funding facilities** available in Tanzania for various types of off-grid energy through debt financing offering a **range of capital type and funding instruments** such as grants, debt, equity, guarantees, short- and long-term debt, short-term working capital, US$ and local currency debt, interest free loans, green credit lines, receivables financing, etc.[32]

Zambia. In 2016, the Increased **Access to Electricity and Renewable Energy Production (IAEREP)** project aimed at increasing access to clean energy, promoting renewable energy production and energy efficiency. In the first phase, the Zambian government provided support to public institutions to develop and/or revise the legal and regulatory framework for the deployment of renewable energy and energy efficiency. The second phase of the initiative, launched in August 2019, provided capacity building for public and private organisations involved in renewable energy deployment and energy efficiency solutions in Zambia. In 2021, the European Development Fund (EDFF) provided a EUR 23 million **grant** to support the third phase of the IAEREP programme which intends to stimulate the emergence of **sustainable business models for energy services** to promote the use of renewable energy and energy efficiency at the national level and encourage the private sector to participate in the rural electrification programme.[33]

Zimbabwe. In 2002, the rural electrification programme was initiated following the enactment of the **Rural Electrification Fund Act**[34]. It created a **Rural Electrification Fund (REF)** that had the mandate for the total electrification of all rural areas, funded by electrification levies and government stipends. REF offers 100% capital subsidy to the public institutions. In 2012, the launch of the **National Energy Policy (NEP)** refocused **Rural Electrification Fund (REF)** to have an expanded mandate to promote the provision of electricity and **other modern energy services** to rural areas using **renewable energy service technologies** to the maximum extent possible.

[31] Sunref (2017), Sunref Tanzania
[32] Usaid (2018), Off-grid solar market assessment Tanzania
[33] AEP (2021), IAEREP programme
[34] Rural Electrification Fund Act (2002)

In 2019, Infrastructure Bank of Zimbabwe (IDBZ) was in the process of establishing a **Climate Finance Facility (CFF)**[35] which is essentially a ring-fenced Fund dedicated to financing green projects in Zimbabwe in the priority areas of renewable energy, **energy efficiency**, irrigation schemes, waste management systems, etc. The CFF planned to adopt a **blended finance** approach where concessional finance is provided along with incubation to renewable energy project sponsors and entrepreneurs. The project proposal was supported by UNDP among others. Meanwhile, the **National Climate Fund (NCF)** which will act as a financing mechanism for priority climate change actions and interventions was still at the consultation stage.

3 Financing Mechanism Options

It is imperative to consider financial mechanism options that facilitate end-users in the commercial and public sector, to have access to energy-efficient and climate-friendly distribution transformers and that provide some form of incentives along the demand and supply chain, to overcome financial and technology barriers. On the demand side, financial mechanism options with competitive conditions, or tools that encourage efficient utility purchasing practices such as bulk procurement with Total Cost of Ownership (TCO)[36] and fiscal incentives, would help motivate utilities, and private sector end-users to retrofit or acquire higher-efficiency distribution transformers that can generate important energy savings. On the supply side, the mechanism options aim to engage and motivate providers to supply or install energy-efficient and climate-friendly equipment in the public and commercial sectors.

Therefore, discussions shall lead to the exploration of financing mechanism options including a combination of financial and non-financial components that are tailor-made to the country context to facilitate the access high-efficiency and climate-friendly distribution transformers for end-users.

[35] Catalysing Investments in Climate and Sustainable Energy for Productive Use and The Achievement of the SDGs in Zimbabwe (2019)
[36] UNEP U4E (2017), TCO

Figure 1. Overview of types of financing and supporting mechanisms for DTs[37]

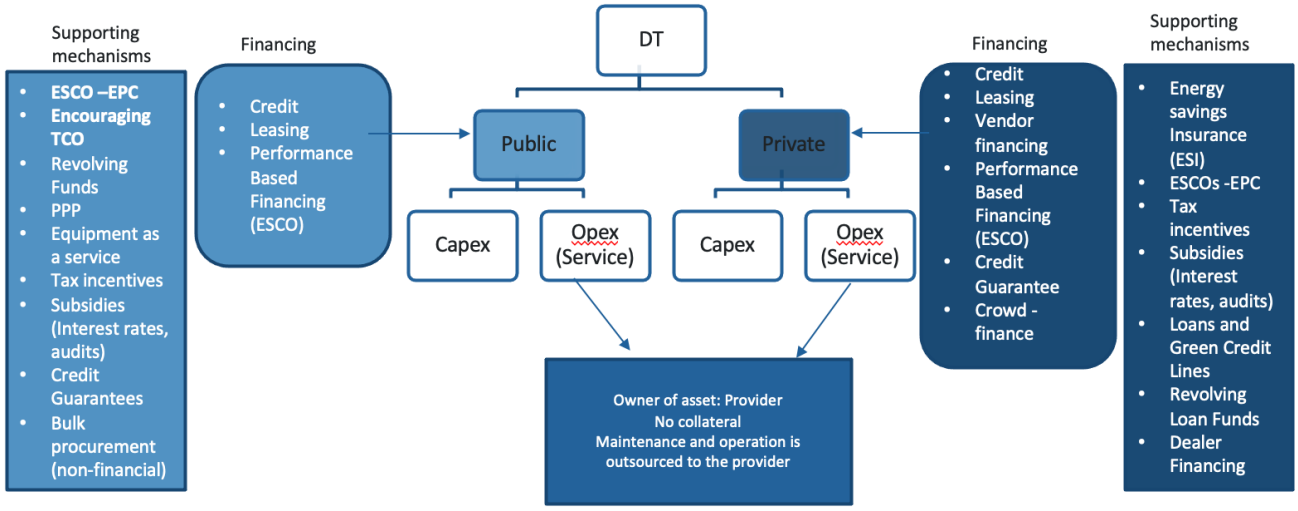


Figure 4 gives a schematic overview of the types of financing and supporting mechanisms that can be applicable to the commercial and public sector and the investments towards energy efficient equipment. In the following subchapters we will focus on two mechanisms: (i) the ESCO model's Energy Performance Contracts (EPCs) and (ii) Bulk procurement with TCO and fiscal incentives. Both options can incentivize the utility and non-utility market players to invest in the retrofits[38] or replacement of high technical loss or end-of-life equipment for higher-efficiency distribution transformers.

3.1 ESCO's Energy Performance Contracts (EPCs)

Model. The ESCO's Energy Performance Contracts (EPCs) enables funding of energy efficiency upgrades from cost reductions. Under an EPC arrangement, the technology provider, typically called an Energy Service Company (ESCO) implements an energy efficiency project and uses the stream of income from the cost savings to repay the project costs. The ESCO can be any of the large distribution transformers providers or manufacturers.

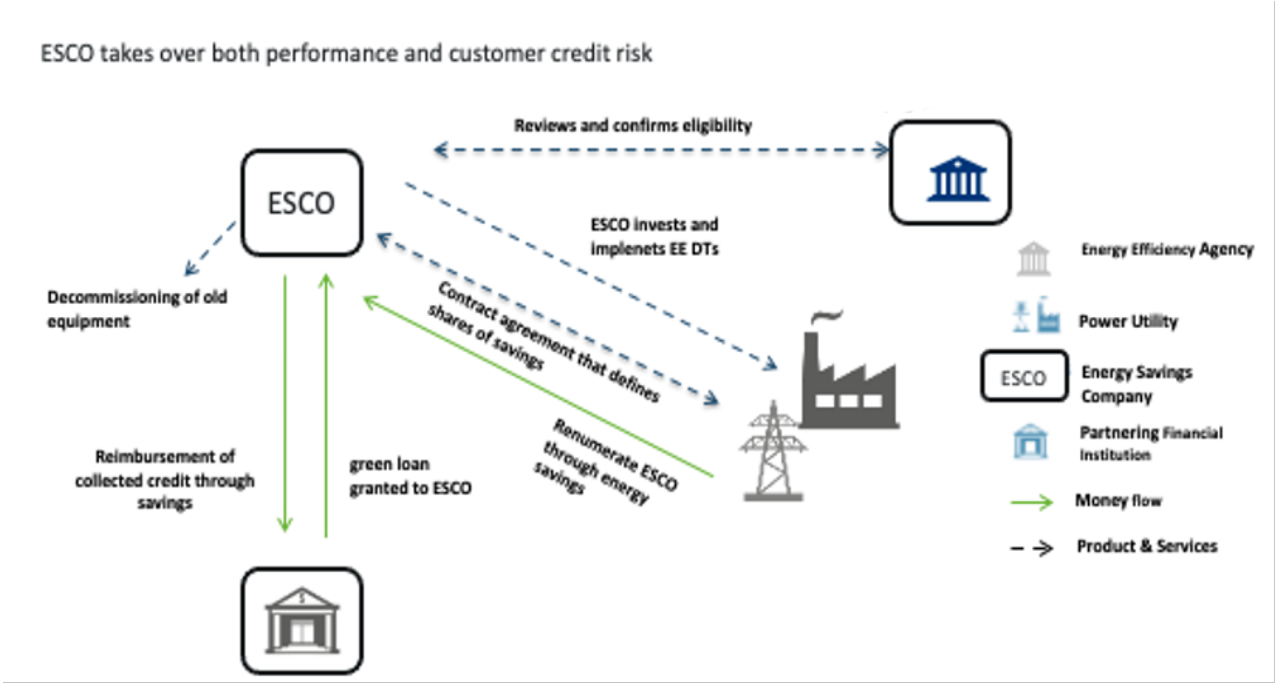
There are two major contracting models defining the relationships and risk allocations among the ESCO, end-users, and lender: (i) the shared savings model, and (ii) the guaranteed savings model.

[37] BASE (2019), Manual of Financing Mechanisms and Business Models for Energy Efficiency

[38] ICA (2021), Distribution Transformers (DT) – Enhancing Energy Efficiency & Reliability through Performance-based Refurbishment Contract

- (i) In the **shared savings model** (figure 5), the ESCO invests and implements the EE DT project. A contract is signed between the ESCO and the client to stipulate the terms, conditions, and obligations. The cost savings resulting from the energy efficiency upgrade are quantified, and for the duration of the contract a pre-determined share of this amount will be used to remunerate the ESCO. The ESCO only receives full payment if the project delivers predicated energy savings. This transfers project technical risks from the client (e.g., Power Utility, mining companies, agricultural companies, etc.) to the ESCO. The ESCO thus takes over both the performance and the customer credit risk, and acquires financing. The financing can come from the ESCO's own equity or from a financial institution (e.g., MDBs, NDBs, GCF, local banking institutions, etc.). If a green loan is granted from a financing institution to the ESCO, conditional financing is applied including strong monitoring and reporting requirements, and the reimbursement of collected credit is done through the energy savings.

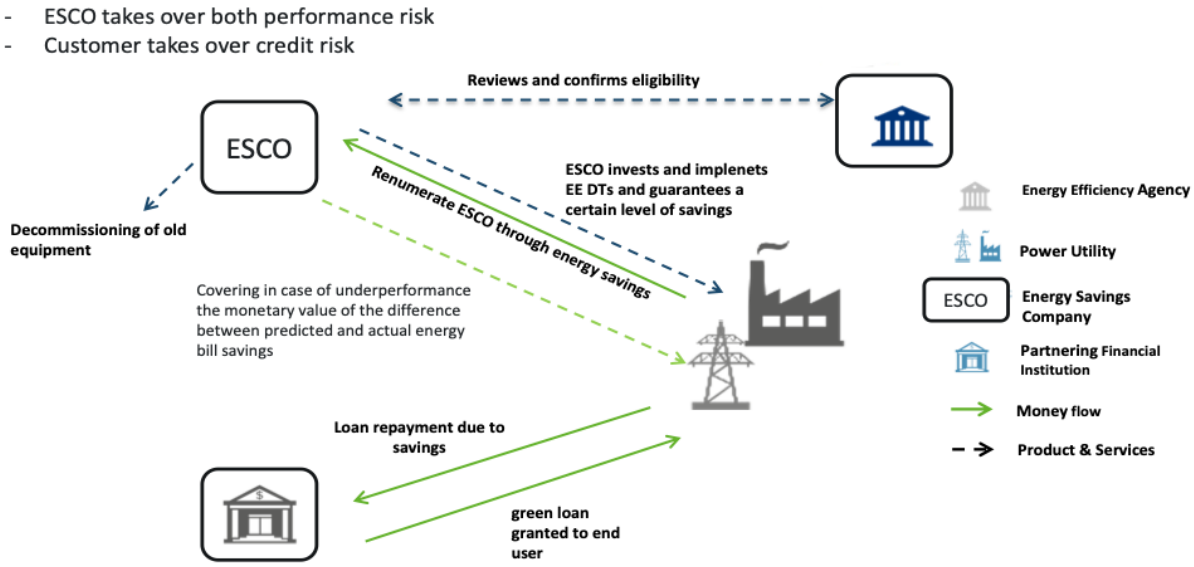
Figure 2. ESCO – Shared savings model



- (ii) In the **guaranteed savings model** (Figure 6), the ESCO receives the full upfront payment (supply, installation) but guarantees a certain level of energy savings by covering, in case of underperformance, the monetary value of the difference between predicated and actual energy bill savings based on a specified utility rate. In case the energy savings are not achieved, the ESCO has to "compensate" the customer for the savings not achieved. This shields the customer (e.g., Power Utility, mining companies, etc.) from any performance

risk. The client uses its own equity (i.e., investment project financing) or is directly financed or supported by a financial institution (e.g., MDBs, NDBs, GCF, banking institutions, etc.), repays the loan and assumes the investment repayment risk.

Figure 3. ESCO – Guaranteed savings model



The feasibility of EPC projects depends on the predictability of energy use, the level in energy efficiency, the price of energy, the size of the investment, the complexity of the project, and the legal, financial and regulatory rules. Public and large commercial sector end-users provide great opportunities for ESCOs to develop EE projects. ESCOs compensation can thus be linked (in part or in full) to the performance of the implemented solutions. In that context, an ESCO can manage projects, mobilise financial resources (not necessarily its own equity), offer turn-key services (either on its own or through collaboration with other market players) and assume performance risks.[39]

Among other things, energy audits need to be carried out by the ESCOs and supervised by the main compliance entity (e.g., Ministry of Energy, MDB, NDBs, GCF, CTCN, etc.) to review and confirm the eligibility of the ESCOs and the EE DT projects, relevant agreements need to be in place among the main stakeholders of the model and these include the agreement between the ESCOs and end-users (e.g., Power Utility, mining

[39] BASE (2019), Manual of Financing Mechanisms and Business Models for Energy Efficiency

companies, industries, etc.). In this agreement, clear clauses need to be inserted on either the quantification of energy savings and agreed share of renumeration between the ESCOs and the end-users, that comes from the savings (the shared savings model), or the guarantee of ESCO of the pre-defined level of energy savings and in turn, the calculation of the loss to be covered in case of underperformance (guaranteed savings model).

Benefits. The main benefits of establishing the ESCO's EPC as a financing mechanism would be:

- Reducing or eliminating the performance risk and need for internal technical expertise from the side of the end-users of distribution transformers.
- Incentivizing the ESCO to provide state-of-the-art products and services and to optimize its operation to achieve high energy savings.
- In the case of the shared savings model, the end-user does not have to invest, and the project is financed off balance sheet.

Risks and challenges. There are three main challenges with implementing the ESCO model for the promotion of higher-efficiency distribution transformers:

- Ownership of the asset: assessing the risks and benefits of owning the asset and in turn, agreeing on asset ownership between the ESCO and the end-users (i.e., Power Utility, industries, mining companies, etc.) can be quite challenging. Owning an asset requires upfront capital on one side as well as can have an impact on the asset turnover ratio of a company. The asset turnover ratio is a metric that helps investors understand how effectively companies are using their assets to generate revenue. Therefore, a sudden increase in assets can lower this ratio in the short run and in turn, lowers the efficiency of a company in the investment market. On the other side, tax benefits can be associated with asset ownership (such as for depreciation and amortization) which would reduce the tax liability of a company.

  ESCOs can offer alternatives to asset ownership for their client including:

  - Operating leases for equipment, where a lease refers to an agreement under which the end-users pay the ESCO for the use of capital asset for a specified period of time.[40] The lessor retains the asset throughout the

[40] AFDC (2014), Applying the Energy Service Company Model

term of the lease and at the end of the operating lease, the lessee has the option to either return the equipment to the lessor or pay the residual fair market value of the asset. Such contract can be quite lengthy (10-20 years), this means that the asset would be on the books of the ESCO for all this time.

- Capital Lease is a simple way to finance an asset and from the accounting perspective as it is the same as the lessee purchasing the asset
- ESCO model, where the equipment is both, owned and operated by the ESCO throughout the contract term.

- There should be efficient and reliable tools and methods to accurately measure the electrical savings from shifting to EE distribution transformers. In turn, these savings need to be quantified to monetary value in order for the relevant repayments and gains to happen.
- Since distribution transformers have a wide geographical spread along the whole country, the ESCO needs to make sure to have geographical representation or access as often as its needed in the places where distribution transformers are mounted.

Moreover, in the case of shared savings contract:

- There is a possible payment default of the customer after installation. This is especially relevant to the private end-users of the commercial sector where the financial statements and capacities are not robust enough for the investment. This is less possible for the public sector (i.e., Power Utility), however, this can be a bottleneck, where delays of payment and lengthy bureaucratic procedures of transactions can hinder the success of the model.
- Uncertainty of baseline measurement and unexpected increase in installation costs. Through and accurate calculations and measurements should be made prior to installation through an audit, in order to establish the success rate of the investment. This includes a pre analyses of predicted and unpredicted costs for installation. Therefore, necessary capacities and experience needs to be in place for accurate measurements.
- Leverage problems for ESCOs who can become too indebted. A realistic financial assessment needs to be done to the ESCO in charge, in order not to create leverage bottlenecks during the model implementation.
- An adversarial relationship between the ESCO and end-users can be created because higher than expected measured savings translate into higher payments to the ESCO. New approaches attempt to overcome this and elaborated contractual terms that forecast this situation can avoid this challenge.

The guaranteed savings concept is also exposed to uncertainties with the baseline measurement, and can be difficult to implement because it requires end-users to assume investment repayment risk.

Supporting mechanisms. Shared-savings EPC models can be supported by financial tools to recapitalise the ESCOs such as sale and leaseback or the securitisation of cash flows, by risk mitigation mechanisms such as payment guarantees to reduce the risk of default from the end-client and by positive lists.

Guaranteed-savings EPC models can be supported by standardised contracts, independent validation entities, additional insurances[41] to cover the customer in case of non-compliance by the ESCO, credit guarantees to support the client to assume the investment repayment risk and by positive lists.

Both the shared savings and guaranteed savings models can be supported by bulk procurement programs and fiscal measures (see chapter 3.2) to improve commercial and technical cost-efficiencies, and set clear eligibility criteria and technical specification for the procurement between end-users, ESCOs, and manufacturers/ distributors of higher-efficiency DTs under the supervision of the Ministry of Energy in coordination with other government institutions such as the Procurement Regulatory Authority, etc.

Key stakeholders. Both ESCO's EPC models are used largely for energy-efficient investment in the public and commercial sectors. It aims to create a win-win situation for the Government, the Power Utility, ESCOs and technology providers (e.g., local manufacturers, importers, etc.) with financing and potential support from local financial institutions (e.g., NDBs, commercial banks) or others (e.g., MDBs, GCF, CTCN, etc.). To develop the ESCO's energy performance contracts, the following public and private stakeholders are important and are recommended to be closely involved.

- **Government (i.e., Ministry of Energy (MOE), Ministry of Finance (MOF), procurement regulatory authority, customs Authority, etc.).** The support from the Government is essential for the success of this mechanism option. MOE can play a key compliance role in the development and implementation of the mechanism, coordination with public stakeholders, facilitating access to the program to new partners and technologies, promoting certified distribution transformers and partners, and directing the Power Utility, commercial end-users, and ESCOs towards the programme. MOE can be

[41] BASE (2019), Energy Savings Insurance model

central in coordinating and regulating the market and thus offers quality control to different stakeholders involved in the proposed financial mechanism (e.g., review and confirmation of the eligibility of ESCOs and/or technology providers, enforcement of monitoring, reporting and verification (MRV), etc.). Moreover, MOE can support the adoption of both EPC models by lifting institutional barriers as a market creator as well as a rule setter through removing barriers and mobilizing necessary capital needs and supporting procurement and fiscal measures in coordination with MOF, the procurement regulatory authority, the custom authority, etc. The Government can create or simplify local regulations, train public agencies to enter into multi-year performance contracts and offer technical support and facilitation from agencies that develop and administer program regulations. Beyond the promotion of EE DTs in the public and commercial sectors in a pilot phase, MOE could go one step further and set up an energy efficiency agency under the MOE in order to promote the "Super ESCO" model during a scale-up phase. Establishing and capitalizing such a "Super ESCO" would further facilitate large-scale implementation of a diverse portfolio of EE investment projects in public and commercial facilities, and help support capacity building and project development activities with partner ESCOs, and in some cases provide these partner ESCOs or their customers with financing.

- **Power Utility or private end-user (i.e., mining companies, industries, farmers, etc.).** The principal beneficiaries of the proposed mechanism, on the demand side, are the Power Utility in need for a large amount of distribution transformers or the private end-users such as the mining industry and farmers. Credit (guaranteed savings model) and participation conditions to the proposed financial mechanism must be easily accessible, and transparent, while the application and procurement process must be as simple and efficient as possible. Advantages of the programme should be explained through target communications and awareness campaigns and key components of the mechanism should be clear and well defined. The Power Utility or commercial end-users will reimburse on a regular basis the ESCO or partner financial institutions with whom they have entered into an agreement be it through the predefined and quantified share of savings for the ESCO, or through the negotiated loan agreement with the financial institution. The Power Utility or commercial end-users thus have a secure repayment scheme, which make it easier for them or the ESCO to obtain a commercial loan at preferential conditions and reduce the need to provide additional collaterals or loan guarantees for the investment. Through the model, the Power Utility or commercial end-users avoid the performance risk of investing in distribution

transformers, while the credit risk is on their side only in the case of the guaranteed savings model.

- **Partner financial institutions (MDBs, NDBs, GCF, banking institutions, CTCN, etc.).** Local financial institutions or other large banking institutions can play a key role in implementing, financing and promoting the mechanism. Partners adapt their offering of commercial credits to propose green credits based on a set of eligibility criteria and requirements for the promotion of eligible EE DT investment (e.g., positive list of eligible EE DT technologies, agreed minimum % energy savings, etc.) to ESCOs (shared savings model) or end-users (guaranteed savings model). MDBs, NDBs, or GCF might eventually support either ESCOs and end-users directly or partner financial institutions indirectly with green credit lines, revolving loans funds, or credit guarantees to help mitigate any credit risk and improve concessional lending terms offered to ESCOs or end-users through the EPCs. Institutional players such as MDBs, NDBs, GCF, or CTCN can also provide technical assistance to promote, develop, and implement key components of the mechanism through grants, as well as help streamline and digitalise the system integration and processes. They can advise partner financial institutions and provide grants to help structure the financial and non-financial components of the mechanism (e.g., standardized contracts, finance modelling and structuring, validation process, M&E, MRV, etc.), support the promotion and marketing, as well as the operationalisation and digitisation of the mechanism.

- **ESCOs (e.g., technology providers, etc.).** As the key stakeholder in the model, energy savings companies (ESCOs) are third-party organizations that can develop the engineering, supply, install and maintain the energy-efficient distribution transformers for the end-beneficiary. If they offer shared savings contracts, they provide the investment and will use the stream of income from the cost savings of the energy-efficient equipment to repay the project costs.

  In the shared savings contract, the ESCO only receives full payment if the investment on energy-efficient distribution transformer delivers the predicated energy savings. Therefore, the technical risks of the investment fall under the ESCO. In the case of the shared savings model, the ESCO might request financial support from a financial institution to receive a green loan. The cashflows of the energy efficiency projects, which come from the energy savings, are used to pay back the green loan from the ESCO to the bank. In this case, the ESCO takes over the credit risk of the investment as well. The mechanism will address the risks associated with the usual end-users' lack of trust in reliability of different DT technologies, by encouraging the partner ESCO to procure or supply only the most reliable higher-efficiency equipment

at lower costs because of the energy performance contracts and support mechanisms in place. A new premium market for higher-efficiency equipment is opened up for technology providers through the mechanism.

In case the ESCO offers guaranteed savings contracts, the customer is the one who invests in the supply and installation of the EE DT and the ESCO must be able to provide guarantees to the customer on the promised energy savings for a certain period of time. Guarantees can be non-financial (written) or financial guarantees or a combination of both. Financial guarantees can be in the form of insurance or bank guarantees. Reliance on the guarantee will depend on the customer's confidence in the ESCO to respond to the guarantee of the promised savings.

3.2 Bulk procurement with Total Cost of Ownership (TCO) and fiscal incentives

Model. Bulk procurement is a no-subsidy, demand-driven mechanism that provides economies of scale, enabling manufacturers or distributors to bring down their process and costs through successive rounds of efficient and transparent bidding to create a large and sustainable market for EE DT technologies.

Through the bulk procurement, the Power Utility would issue tenders for all end-users (e.g., mining companies, large farmers, etc.) with a set of qualifying criteria including technical specifications and energy efficiency standards to buy large numbers of similar energy-efficient DT equipment, while manufacturers or distributors compete on price bids. The technical specification should cover the design, manufacturing, testing, supply, delivery and performance requirements of the selected EE DT technology. Among other things, the Power Utility will include a criterion expressing maximum no-load and load losses. In each round, multiple bidders are selected and all of them are asked to match the price of the lowest bidder. The volume of the bid is then allocated to all the manufacturers who agree to match the lowest price in the bid. Aggressive bidding by manufacturers and the exclusion of regular dealers and distributors tend to drive down the price of procured energy-efficient equipment. Improved manufacturing and competition lower retail market prices for the targeted energy-efficient equipment as well.

Decision based on TCO. When procuring distribution transformers, end-users (i.e., the Power Utility and non-utility market players) can use a purchasing practice referred to the Total Cost of Ownership (TCO) or whole life costing, which involves the

capitalisation of losses to select the best bid. This approach to specifying and purchasing transformers is used to minimise the total investment over the lifetime of a transformer, enabling the Power Utility and other end-users to maximise energy savings at the lowest cost. Loss capitalisation takes time to determine the correct factors to apply but helps provide answers to the following questions:

- At what cost should the lost energy be evaluated?
- What is the load factor that should be applied?
- What is the internal rate of return that needs to be applied to any discounting?
- What interest rates should be applied to the capital purchase?

The biggest issue with loss capitalisation is that it seeks to quantify the typical life of a transformer – which spans several decades, and which represents the length of time that end-users could use for discounting asset values in their accounts.
This whole life costing approach is intended to assign a present value to the value of future losses that will occur over the life of the transformer in a given installation. To achieve this, the loss factors typically developed for an annualised cost method can be used as inputs to a discounted present value calculation method looking into the future to develop the whole life costing model. However, each purchaser may prefer different approaches based on historical methodologies.

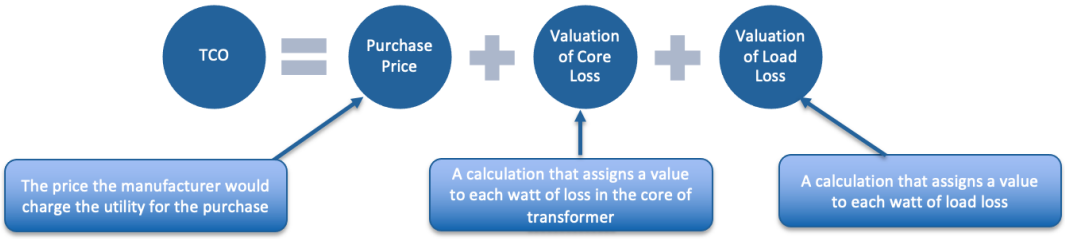
By using the whole life costing approach, future changes such as load growth or reductions can be factored into the calculation. In this method the discounted present value of the cost of energy consumed in transformation throughout the life of the transformer is added to the purchase price by the end-users. The lowest total cost would be the preferred option and thus the selected bid. In a procurement program informed by TCO, the lowest first cost design from the technology providers is usually not the selected one.

When purchasing EE DTs through bulk procurement, the Power Utility will include a statement expressing the valuation of no-load and load losses. These two valuations are expressed on a cost per Watt basis, where the cost is in the same currency as the purchase order. For instance, the Power Utility could specify its no-load and load-loss valuation in dollars per Watt of losses ($/W). The transformer manufacturers or distributors then uses this information in their design process to prepare a design that trades off higher first cost against lower lifetime operating cost. The higher the valuation of the transformer's losses, the more efficient a manufacturer will make the transformer design – this is the core principle of how the TCO approach works.

Thus, when assessing the various bids received in response to a request for tenders, the transformer specifier (i.e., the Power Utility) will apply the following equation and select the option which has the lowest TCO for the transformer designs specified

(note: the design options with the lowest TCO are not necessarily the ones with the lowest purchase price):

Figure 4. TCO Equation



In this equation, the purchase price represents what the manufacturer would charge the utility or non-utility market players for the purchase. This price is a reflection of the materials and construction techniques, and thus more efficient distribution transformers will tend to have higher purchase prices.

The valuation of core loss is a calculation that assigns a value to each watt of loss in the core of the transformer. In other words, if core losses are valued at for example $5 per watt and a transformer design has 100 watts of core loss, then the valuation of core loss entered into the total cost of ownership calculation will be $500. Adding valuation of losses allows the overall design assessment result in the most cost-optimised purchase decision for the Power Utility. It serves to offset the higher first cost of an energy-efficient design due to the fact that lower losses associated with the more efficient design will result in a lower operating cost added to the TCO calculation.

The valuation of load loss is very similar to that of valuing core loss. Each watt of load loss is multiplied by the value of the load losses to arrive at a total cost associated with the load loss that should be incorporated into the purchasing decision. In other words,

Valuation of core loss = A x core loss (W)
Valuation of load loss = B x load loss (W)

The total cost of ownership equation is therefore written as follows:

$$TCO = Purchase\ Price + (A \times Watts_{No-Load\ Losses}) + (B \times Watts_{Load\ Losses})$$

Where:

A-factor is the capitalisation of no-load losses, taking into account lifetime, the discount rate and the cost of electricity; the units are defined as the national currency per watt or kilowatt; and

B-factor is the capitalisation of load losses, taking into account lifetime, the discount rate, the cost of electricity and the loading on the transformer; the units are defined as the national currency per watt or kilowatt.

Benefits. With bulk procurement with TCO, large-scale energy-efficient DT technology deployment with similar specifications would be feasible without government subsidies. There are many examples in the literature of effective bulk programmes carried out in developed and developing economies for standardised energy-efficient appliances and equipment.

- One benefit is that repeated tenders of bulk procurement increase and improve domestic manufacturing capacity or fosters competition among distributors.
- Buying directly on a mass scale reduces risk for manufacturers or distributors.
- Bulk demand is also a strong economic incentive for manufacturers and distributors to invest more in local assembly lines or lower their costs. As the model allows manufacturers or distributors to deal with one procurement entity (e.g., the Power Utility), they can bypass commercial intermediaries and save transportation costs. The Power Utility could procure on behalf of other non-utility market players.
- By aggregating the demand for similar EE DT technologies and specifications on a national scale, bulk procurement with TCO has the potential to transform the market towards higher-efficiency DTs. Most importantly, bulk procurement supports the implementation of efficiency standards with TCO, and helps create sustainability in a market, passing on resulting savings to end-users.
- With TCO, the end-user of distribution transformers (i.e., Power Utility, non-utility market players) obtains a practical real balance between investment and reward.
- Using TCO lowers the perception of the high upfront costs of purchasing a distribution transformer: With lower loss and high-efficiency DT, this upfront cost will be compensated by reduced running costs through the lifecycle of the DT.
- It promotes the model thinking in the purchase of other EE equipment and appliances.
- It lowers other indirect costs such as maintenance and repairing costs.

Challenges. Some of the challenges associated with bulk procurement for DTs can be

- The potential for product cost reduction through bulk procurement depends on the volume of tenders and the number of suppliers in an energy-efficient product market. If both are small, the potential will be limited.
- Bulk procurement is more adapted to the procurement of a large number of standardized EE DTs (with similar technical specifications) than to a small number of tailor-made EE DT equipment. This would thus be more aligned to

supporting standardized off-the-shelves EE DTs of lower kVA capacity than tailor-made EE DT of larger kVA capacity.

- The retail market disturbances could be challenging for DT of kVA capacity if withdrawal plans from bulk procurement are not well-prepared.
- With procurement decision based on TCO, estimating the net present value (NPV) of future electricity losses involves a degree of uncertainty (since it's a predictive calculation) for the end-users. For this reason, the estimation requires professional judgment and relevant expertise with specialist knowledge of the issues that should be involved. If not there yet, relevant capacity needs to be built in the country for proper estimation.
- The capitalization of loss in DTs seeks to quantify the typical life of the equipment, which can span to several decades. Loss evaluation factors can be fluctuating due to regional variation and variation due to time (price of electricity, cost of capital, etc.). This can be particularly challenging for economies where these factors have a high fluctuation rate. Therefore, accurate trends need to be taken into consideration (to the extent possible).

Fiscal incentives.

In addition to both ESCO's energy performance contracts options or bulk procurement based on TCO decision, targeted fiscal incentives could help drive costs down and further support investment in higher-efficiency DTs.
For instance, VAT exemption when purchasing EE DTs or EE DT components or duty exemptions when importing the equipment or components could nudge the local market towards purchasing energy-efficient equipment. Though, one must be aware of the competition between the local manufacturers and distributors of distribution transformers and the international technology providers when considering exemption of import duties as this mechanism would favor the international market to the local one.

4 Initial assessment and next steps

The proposed financial mechanism options shall be assessed through robust selection criteria, and discussed with the key stakeholders and adapted properly to ensure buy-in and commitment of the stakeholders. Once an option is selected, economic analysis of the selected option will be conducted to analyse the suitable cost, rebates, economic benefits and credit conditions. Detailed implementation plan for the selected option shall then be refined accordingly.

4.1 Selection criteria and assessment

The proposed pathway to overcome barriers for the promotion of higher-efficiency DTs largely depends on addressing high up-front cost for utilities and non-utility market players by considering energy savings as positive future cash flows and driving cost efficiency through new procurement practices, building trust in EE DT technologies, and to some extent facilitating access to finance. Key selection criteria are considered to evaluate recommended financial mechanism options (into dedicated programs) for the promotion of EE DTs (see below Table 3). Each mechanism is being assessed as low, middle, or high for each criterion.

Table 1. Comparative assessment of financing mechanism options (into dedicated programs) based on key selection criteria

Selection criteria	**Shared energy savings**	**Guaranteed energy savings**	**Bulk procurement with TCO**
Difficulty to develop and implement (policy and legal framework)	High – Public procurement regulations would need to be largely complemented with these types of contracts.	Middle - Public procurement regulations would need to be amended to include the guaranteed energy savings.	Low - Public procurement regulations would need to be slightly amended to accommodate this option
Cost-intensity of development and implementation through technical assistance project	High – Among other things, technical assistance would be needed to hire lawyers to develop public procurement contracts and support political dialogue and reforms	Middle	Low
Sustainability in the market beyond implementation	High		
Familiarity from the market	Low – There is no operational ESCOs in the country and end-users are not used to delegate financing of DT equipment to other entities.	Middle – The Power Utility is already used to procure and finance DT equipment itself.	Middle – Some non-utility market players are not used to delegate procurement of DT equipment to other entities and not familiar with TCO.

Potential to leverage financing from private sector (for public DT)	High – Additional financing can be leveraged from financial institutions to support the investment from ESCOs	Low – Same financing channels (own equity or commercial loans) used by the end-users, no addition	Low – Same financing channels used by the end-users, no addition
Alignment with country strategy and government priorities	High – All options are fully aligned.		
Alignment with target technology market	Middle – Lack of labelling scheme and standardization for DT technologies.		
Inclusiveness	High – All target market segments could participate in the program (both utility and non-utility market players)	High – All target market segments could participate in the program (both utility and non-utility market players)	Low – Only the utility will directly participate in the program, while non-utility market players might eventually benefit through bulk procurement led by the utility on their behalf.
Scalability	High		
Endorsement from key stakeholders (strong engagement and expression of support)	Feedback from stakeholder consultations needed		

4.2 Consultations of Policy Working Group (PWG) and national stakeholders

Each of these mechanisms have different advantages and use a different path to overcome specific barriers. The selected option needs to be tailored to local conditions and combined with the right source of financing and eventually risk mitigation instruments and support mechanisms. Its success heavily depends on a thorough understanding of the market, a large consultation and strong engagement of the key stakeholders, the successful creation of an environment of trust and a well-designed model offering a sustainable solution by creating value for all involved players. Therefore, the selected financing mechanism option combining a set of high potential financial and non-financial components that was proposed, informed by the

key findings of the project market assessment will be further detailed based on consultation of the Policy Working Group (PWG) members and national stakeholders. Selected option must be endorsed and supported by key stakeholders through expressions of support during the consultations.

4.3 Development of detailed implementation plan for selected option

A detailed implementation plan will be developed for the selected option based on feedback and inputs from PWG members and national stakeholders following consultations in Q1 2022. This section describes the expected involvement of key stakeholders, as well as the engagement and coordination with partners for the development and implementation of both options. The responsibilities and activities related with the development and operationalisation of the selected option with partners may include, but are not necessarily limited to:

Lead compliance entity (e.g., Ministry of Energy, MDBs, NDBs, GCF, CTCN if providing financing and technical assistance, etc.)

- Source, identify, and analyse ESCOs and technology providers of certified energy-efficient and climate-friendly distribution transformers.
- Source and engage interested local financial institutions to participate in the selected mechanism.
- Sign Memorandum of Understandings (MOUs) to officialise partnership and initiate technical assistance with interested ESCOs and/or technology providers of EE DTs, financial institutions (e.g., commercial banks, MDBs, NDBs, GCF) if providing financing, major end-users (e.g., Power Utility, non-utility market players), and partner government institutions (e.g., MOF, procurement regulatory authority, custom authority, etc.) during the development and implementation phase of the selected mechanism.
- Review the details of interested ESCOs and/or technology providers supplying eligible DT technologies.
- Review the details of interested banking institutions' relevant current financing product schemes.
- Review the details of the procurement regulatory authority and the Power Utility and major non-utility market players' procurement policies, regulations, framework and processes.
- Support the assessment of full integration of procurement and financing support, tendering and payments, and flow of funding for the selected financing mechanism.
- Support the preparation and implementation of commercial and technical

eligibility criteria for financing (e.g., positive list) and review and amendment of technical specifications and procurement regulations through the selected financial mechanism.

- Certify eligible DT technologies (in alignment with the U4E Model Regulations) based on the product eligibility criteria and agree on the monitoring requirements, and verification protocols for certified products supplied and/or procured through the selected mechanism.
- Verify conformity assessment report sent by partner ESCOs, technology providers to approve certified energy-efficient and climate-friendly equipment through the selected financing mechanism option.
- Support policy and legal framework reforms to support the selected financing mechanism option (e.g., procurement, finance, customs, etc.)
- Refine cost-benefit analysis of eligible EE DT technologies and internal financial structure, which can help partners to define appropriate financial conditions based on available de-risking or concessional financing support from MDBs, NDBs, or GCF to structure financing products to potential clients.
- Prepare and implement guidelines to support partner financial institutions green relevant current financing product scheme to deliver of the new financing products to target clients including financing product details, lending terms, conditions, eligibility, and simplified requirements, procedures for reviewing applications.
- Prepare and implement guidelines and provide framework for monitoring and evaluation (M&E), monitoring, reporting and evaluation (MRV) for a data management system as part of the mechanism to track financing of approved products to clients, energy savings, and climate benefits attributed to the selected financial mechanism option (specify the features it should include, recommended protocol for integration into the financial mechanism processes, advising on existing software that may be a good fit for the digitisation of the M&E and/or MRV, agreement, processes, pricing, etc).
- Certify and oversee the programme and guide ESCOs, technology providers, financial institutions, and end-users wishing to apply for the programme through partners.
- Define, review, and enforce program processes and draft standardized agreements and contracts to clarify terms and conditions of participation and responsibilities of different actors (e.g., ESCOs, Power Utility, non-utility market players, participating technology providers, partner financial institutions, etc.) in the selected financing mechanism option.
- Review draft standardized agreements among lead compliance entity, ESCOs,

technology providers, end-users, and partner financial institutions including energy savings agreements, procurement specifications, credit terms and conditions for end-users in the selected financial mechanism option, etc.

- Provide an advisory role to partners for the development and operationalisation of the selected mechanism.
- Capacity building, training, development and implementation meetings with ESCOs, participating technology providers, financial institutions, the Power Utility, MDBs, NDBs, CTCN, other partners, to support the operationalisation of the selected mechanism.
- Develop and implement a marketing and promotion strategy that aims to raise awareness of the selected mechanism option during the development and implementation including a "communication toolkit" which includes programme branding, as well as support on marketing and promotion to integrate the financing product into partner communication channels.
- Promote certified EE DTs, partner ESCOs, participating technology providers, partner financial institutions, pilot projects, and other partners.
- Consider extending the mechanism to supply other types of climate solutions into the market beyond the program implementation through the Super ESCO model led by energy efficiency agency.

Partner ESCOs and/or participating technology providers (e.g., manufacturers and distributors of EE distribution transformers)

- Express interest with lead compliance entity to develop and implement the selected financing mechanism.
- Sign Memorandum of Understandings (MOUs) to officialise partnership and receive technical assistance from lead compliance entity to structure financing mechanism with interested end-users (e.g., the Power Utility, non-utility market players), financial institutions (e.g., MDBs, NDBs, GCF, commercial banks, etc.) during the development and implementation phase of the selected mechanism.
- Provide supporting documents including financial statements, technical standards of equipment, procurement specifications, etc.
- Support the assessment of full integration of financing and procurement support, tendering and payments, and flow of funding for the selected financing mechanism.
- Support the preparation and implementation of commercial and technical eligibility criteria for financing (e.g., positive list) and/or procurement technical specifications through the selected financial mechanism.

- Comply with product eligibility criteria, additional or revised procurement regulations and agree on the monitoring requirements, and verification protocols for certified products supplied and/or procured through the selected mechanism.
- Support cost-benefit analysis of eligible EE DT technologies and internal financial structure, which can help partners to define appropriate financial and procurement conditions based on available de-risking or concessional financing support.
- Develop and implement the monitoring and evaluation (M&E), and monitoring, reporting, and verification (MRV) guidelines to track the energy savings and climate benefits of the selected financing mechanism option.
- Proceed with signing of terms and conditions, and agreements with lead compliance entity, end-users (Power Utility, non-utility market players), and other partners for the development and implementation of the selected financing mechanism.
- Exchange information with partners to track the energy savings and progress of the development and implementation of the selected financing mechanism.
- Support the development and implementation of a marketing and promotion strategy that aims to raise awareness of the selected mechanism option.
- Consider extending the mechanism to supply other types of climate solutions into the market beyond the program implementation.

Power Utility:

- Express interest with lead compliance entity to develop and implement the selected financing mechanism.
- Sign Memorandum of Understandings (MOUs) to officialise partnership and receive technical assistance from lead compliance entity to structure financing mechanism with partner ESCOs and/or participating technology providers, non-utility market players, financial institutions (e.g., commercial banks, NDBs, MDBs, GCF), other government institutions, during the development and implementation phase of the selected mechanism.
- Provide supporting documents including financial statements, technical standards of equipment, procurement documents including technical specifications and processes, etc.
- Support the assessment of full integration of financing and procurement support, tendering and payments, and flow of funding for the selected financing mechanism.
- Support the preparation and implementation of commercial and technical eligibility criteria for financing (e.g., positive list) and/or additional or revised

procurement through the selected financial mechanism.

- Comply with product eligibility criteria, additional or revised procurement regulations, and agree on the monitoring requirements, and verification protocols for certified products supplied and/or procured through the selected mechanism.
- Support cost-benefit analysis of eligible EE DT technologies and internal financial structure, which can help partners to define appropriate financial and procurement conditions based on available de-risking or concessional financing support.
- Develop and implement the monitoring and evaluation (M&E), and monitoring, reporting, and verification (MRV) guidelines to track the energy savings and climate benefits of the selected financing mechanism option.
- Proceed with signing of terms and conditions, and agreements with lead compliance entity, ESCOs and/or participating technology providers, other partners, and non-utility market players for the development and implementation of the selected financing mechanism.
- Exchange information with partners to track the energy savings and progress of the development and implementation of the selected financing mechanism.
- Support the development and implementation of a marketing and promotion strategy that aims to raise awareness of the selected mechanism option.
- Consider extending the mechanism to supply other types of climate solutions into the market beyond the program implementation.

Partner financial institutions (e.g., MDBs, NDBs, banking institutions) and key institutional partners (e.g., GCF, CTCN, etc.)

- Set up green credits lines or credit guarantees with ESCOs and/or end-users (Power Utility, private users), structure and provide green loans and develop quick relevant application procedures.
- Define standard credit process and sign standardized contract to clarify terms and conditions of participation and responsibilities of different actors
- Draft standardized agreements between ESCOs and end-users where the shared savings model or the guaranteed savings model terms are accurately stipulated.
- Exchange information to help monitor the programme.
- Monitor, verify and evaluate the results of programme and exchange information on the extent of green loans granted to ESCOs and/or end-users
- Analysis of the possibility of extending green loans and credit lines with partners to promote investment in other climate technologies through the selected

financing mechanism.

- Support the development and implementation of a marketing and promotion strategy that aims to raise awareness of the selected mechanism option.

5 Annexes

Annex 1

Table 2. Summary of financing mechanisms in the commercial sector and status of local GCF accreditation by country, 2021

Country	Commercial/ Industrial Sector	National direct GCF Accredited Entity
Algeria	Yes - Credit lines and/or revolving funds with banks, other mechanisms, for energy efficiency activities in the commercial sector. Financial and/or non-financial institutions offer financial products for energy efficiency investments	No
Angola	No	No
Benin	Yes - Credit lines and/or revolving funds with banks for energy efficiency activities. Financial and/or non-financial institutions offer financial products for energy efficiency investments	Yes – National Fund for Environment and Climate (FNEC)
Botswana*	NA	No
Burkina Faso	No	No
Burundi	No	No
Cabo Verde*	NA	No
Cameroon	Yes - Credit lines and/or revolving funds with banks for energy efficiency activities, Energy services agreements (pay-for-performance contracts), vendor credit and/or leasing, partial risk guarantees, for energy efficiency activities. Financial and/or non-financial institutions offer financial products for energy efficiency investments.	Yes - Attijariwafa Bankdirect (AWB)
Central African Republic	No	No
Chad	No	No

Comoros*	NA	No
Congo, Dem.Rep.	No	No
Congo, Rep.	No	No
Côte d'Ivoire	Yes - Credit lines and/or revolving funds with banks for energy efficiency activities. Financial and/or non-financial institutions offer financial products for energy efficiency investments.	Yes - Attijariwafa Bankdirect (AWB)
Djibouti*	NA	No
Egypt	Yes- Energy services agreements (pay-for-performance contracts). Financial and/or non-financial institutions offer financial products for energy efficiency investments.	Yes - Attijariwafa Bankdirect (AWB)
Equatorial Guinea *	NA	No
Eritrea	No	No
Eswatini*	NA	No
Ethiopia	Yes - Credit lines and/or revolving funds with banks for energy efficiency activities. Financial and/or non-financial institutions offer financial products for energy efficiency investments.	Yes-Ministry of Finance and Economic Cooperation (MOFEC)
Gabon*	NA	Yes - Attijariwafa Bankdirect (AWB)
Gambia*	NA	No
Ghana	No	Yes-Ecobank Ghana Limited
Guinea	No	No
Guinea – Bissau*	NA	No
Kenya	Yes – Discounted "green" mortgages, Credit lines and/or revolving funds with banks, vendor credit and/or leasing for energy efficiency activities. Financial and/or non-financial institutions offer financial products for energy efficiency investments.	Yes- Acumen Fund, Inc. (Acumen), KCB Bank Kenya Limited (KCB), National Environment Management Authority of Kenya (NEMA)
Lesotho*	NA	No
Liberia	No	No
Libya*	NA	No
Madagascar	No	No

Malawi	No	No
Mali	Yes – Credit lines and/or revolving funds with banks for energy efficiency activities. Financial and/or non-financial institutions offer financial products for energy efficiency investments	No
Mauritania	Yes - Financial and/or non-financial institutions offer financial products for energy efficiency investments in the industrial sector. Moreover, credit lines and/or revolving funds with banks for energy efficiency activities are available in both, the commercial services sector and industrial sector.	No
Mauritius*	NA	No
Morocco	Yes - Credit lines and/or revolving funds with banks, energy services agreements (pay-for-performance contract), vendor credit and/or leasing for energy efficiency activities. Financial and/or non-financial institutions offer financial products for energy efficiency investments	Yes – Agency for Agricultural Development for Morocco (ADA), Attijariwafa Bank (AWB), CDG Capital S.A. (CDG Capital), Moroccan Agency for Sustainable Energy S.A (MASEN)
Mozambique	No	No
Namibia*	NA	Yes – Environmental Investment Fund of Namibia (EIF)
Niger	Yes - Credit lines and/or revolving funds with banks, partial risk guarantees. Financial and/or non-financial institutions offer financial products for energy efficiency investments	No
Nigeria	Yes - Credit lines and/or revolving funds with banks, energy services agreements (pay-for-performance contract), green energy efficiency bonds, partial risk guarantees for energy efficiency activities. Financial and/or non-financial institutions offer financial products for energy efficiency investments	No
Rwanda	Yes - Financial and/or non-financial institutions offer financial products for energy efficiency investments	Yes – Ministry of National Resources of Rwanda (MINIRENA)
Sao Tome and Principe*	NA	No
Senegal	No	No

Seychelles*	NA	No
Sierra Leone	No	No
Somalia	Yes - Financial and/or non-financial institutions offer financial products for energy efficiency investments	No
South Africa	Yes- Credit lines and/or revolving funds with banks, energy services agreements (pay-for-performance contracts), green or energy efficiency bonds, and vendor credit and/or leasing for energy efficiency activities. Financial and/or non-financial institutions offer financial products for energy efficiency investments.	Yes - Development Bank of Southern Africa (DBSA), South African National Biodiversity Institute (SANBI)
South Sudan	No	No
Sudan	No	No
Tanzania	No	Yes - CRDB Bank PLC (CRDB)
Togo	No	No
Tunisia	Yes - Credit lines and/or revolving funds with banks for energy efficiency activities. Financial and/or non-financial institutions offer financial products for energy efficiency investments.	Yes - AWB and the Sahara and Sahel Observatory (OSS)
Uganda	Yes - Credit lines and/or revolving funds with banks for energy efficiency activities. Financial and/or non-financial institutions offer financial products for energy efficiency investments.	Yes - Ministry of Water and Environment of Uganda (MWE)
Zambia	Yes - financial and/or non-financial institutions offer financial products for energy efficiency investments	Yes – Development Bank of Zambia (DBZ)
Zimbabwe	No	Yes – Infrastructure Development Bank of Zimbabwe (IDBZ)

*These countries are not included in the Regulatory indicators for Sustainable Energy (RISE) from the WBG as of 2021 which looks into financing mechanisms for Energy Efficiency activities. Therefore, the relevant information is stated as NA – Non-Applicable.

Annex 2: Experiences in financing mechanisms programs that support Energy Efficiency in the African Continent.

Algeria. A dedicated energy efficiency fund exists in Algeria - the National Fund for Energy Management (FNME) providing **soft loans, grants and investment guarantees** for energy efficiency and small-scale renewable energy investments. Its funding is

provided from either **energy consumption taxation** or other sources such as **special state subsidies and grants**.

Also, Algeria has adopted **fiscal tools** such as the **reduction of custom duties and Value Added Taxes (VAT)** on imported energy efficient appliances, equipment and material

Ethiopia. The Energy Efficiency Program from the Ethiopian Energy Authority (2014)[42] provided for the establishment of an **Energy Efficiency and Conservation Fund** to provide **loans** and financial support to energy efficiency activities. This fund intended to include **budget allocation** from the government, **loans and grants** from financial institutions, grants from non-governmental organizations, **charges** on inefficient buildings, industry and appliances, or other sources. There was a range of financial instruments which were expected to be used to deliver efficiency through the fund such as **dedicated energy efficiency credit lines**, **partial risk guarantees for energy efficiency**, Energy Service Company (ESCO) financing, and **consumer financing for energy efficiency** and renewable energy products.

Morocco. In recent years Morocco has developed regulations to encourage the proliferation of **green bonds**. As of early 2020 Morocco had issued five green bonds valued at Dh4bn (US$ 416.7 million). In addition to Masen and Casablanca Finance City, green bonds were issued by two banks for financing and refinancing sustainable energy and energy efficiency projects.[43]

Launched in 2015, Morocco Sustainable Energy Financing Facility (MorSEFF) is a **credit line facility** of up to EUR 110 million to participating financing institutions in Morocco to on-lend to businesses and **Energy Service Companies (ESCOs)** investing in energy efficiency and renewable energy projects by the European Bank for Reconstruction and Development (EBRD), in cooperation with the European Investment Bank (EIB), the Agence Française de Développement (AFD), and the Kreditanstalt für Wiederaufbau (KfW). It also includes grants and technical assistance with support from the UE.[44]

Launched in 2007 at the initiative of the "Agence Nationale pour le Développement des Énergies Renouvelables, et de l'Efficacité Énergétique" (ADEREE), the "Fonds de Garantie des Efficacités et Énergies Renouvelables" or Guarantee Fund for Renewable Energy and Energy Efficiency (FOGEER) is a **credit guarantee fund** intended to de-risk

[42] Ethiopian Energy Authority (2014), The Energy Efficiency Program
[43] Oxford Business Group (2020), Green financing attracts investors to Morocco's banking sector
[44] Morocco Sustainable Energy Financing Facility (MorSEFF)

sustainable energy loans (covering up to 70%) granted by banking institutions to Moroccan technology

In February 2021, The African Development Bank's Sustainable Energy Fund for Africa (SEFA) is providing a US$ 965,000 grant to Morocco's Société d'Ingénierie Energétique (SIE), to support its transition into the first Super Energy Service Company (ESCO) initiative in Africa. Amid growing demand, Morocco aims to meet its energy needs by combining large-scale energy efficiency strategies and renewable energy investments. Super ESCOs are vehicles for channelling funds into public sector energy efficiency investments such as hospitals, schools, and street lighting, laying the foundation for private investment later in the commercial and industrial sectors. As a Super ESCO, the SIE should be able to overcome many of the challenges in scaling up energy efficiency investments. It will also open market opportunities for local ESCOs, offer quality assurance support and build their reputation among end-users and investors.[45]

Nigeria. In 2014, AfDB and the Clean Technology Fund (CTF) developed a **credit line** to Nigerian Bank for RE and EE projects. AfDB intended to extend a 7-year line of credit to Nigerian Bank to facilitate the provision of financing to projects on terms and conditions relevant for RE/EE. More specifically, the credit line was supposed to allow Nigerian Bank to offer **loans** with maturities of up to 7 years, which was far beyond what was currently offered in the market and more affordable interest rates, compared to the 20 - 40% interest rates charged by Nigerian banks.[46]

In 2018, Sunref Nigeria was launched seeking to improve access to energy through improved access to **affordable finance** for renewable energy and energy efficiency technologies in the commercial sector. Hosted by the Manufacturers Association of Nigeria (MAN) and in partnership with local banks, United Bank for Africa (UBA) and Access Bank, Sunref Nigeria offers the private sector **competitive loans** and technical assistance for structuring their green investments so they can seize the opportunities of green finance. **A credit line** of US$ 70 million has been provided to Sunref partner banks that offer attractive terms (**concessional rate loans, long tenors, grace period**). A EUR 9.5 million investment grant is available to make green investments even more attractive. Project sponsors can benefit from a **grant of 10% of the loan amount** upon completion of their project.[47]

Regional.

[45] AfDB (2021), https://www.afdb.org/en/news-and-events/press-releases/africas-first-super-energy-service-company-morocco-gets-965000-grant-boost-african-development-banks-sustainable-energy-fund-africa-sefa-42217

[46] CIF (2021), Line of Credit for Renewable Energy and Energy Efficiency Projects

[47] Sunref Nigeria (2021), website

EDFI ElectriFI is an EU-funded impact investment facility, financing in early-stage private companies and projects, focusing on new/improved electricity connections as well as on generation capacity from sustainable energy sources in emerging markets. It aims to accelerate the development of businesses providing access to clean energy to hundreds of millions of people by 2030. ElectriFI's unique business model relies on EU funding so that it can invest in local markets in poorer economies and fragile situations. By combining technical assistance and risk capital, EDFI ElectriFI can take greater risks than other investors. EDFI ElectriFI's activities de-risk investments and allow private investors and development finance institutions to deploy capital that they could not have invested otherwise[48].

Sustainable Energy Fund for Africa (SEFA)[49] which was launched in 2012 is a US$ 95 million **multi-donor facility** managed by the African Development Bank (AfDB) and funded by the governments of Denmark, the United Kingdom, the United States and Italy. It provides catalytic finance (**grants**, **equity investments**, **loans**, **results-based financing**.) to unlock private sector investments in medium-scale renewable energy[50] and energy efficiency projects. SEFA provides technical assistance and concessional finance instruments to remove market barriers, build a more robust pipeline of projects and improve the risk-return profile of individual investments, and support the public sector to improve the enabling environment for private investments in sustainable energy. The Fund, founded in 2011, transformed into a Special Fund on 31 October 2019. SEFA focuses on green baseload, green mini-grid, and energy efficiency investments. SEFA approved seven high-impact projects worth US$ 54 million in 2020.[51]

Sunref[52] is an integrative approach of the AfDB to develop **green credit lines** with the local partner banks of the global south for **Energy Efficiency,** Renewable Energy and Environment. The initiative provides solutions for the new energy and environmental transition by helping private actors in the South to seize its opportunities and encouraging local financial institutions to finance it. So far, they have partnered with 70 banks in over 30 countries of the South. The total project volume is over EUR 2.5 billion of loans, out of which EUR 1.2 billion is already disbursed.

Power for All is a global network of 250 organizations campaigning to end energy poverty faster by accelerating the deployment of **decentralized renewable energy (DRE)** solutions such as solar for home and business, mini-grids and **income-generating appliances**. Working with the public and private sector, Power for All and

[48] Electrifi (2021), https://www.electrifi.eu/portfolio/
[49] AfDB (2012), Sustainable Energy Fund Africa (SEFA)
[50] In 2017, SEFA approved a US$ 965,000 grant to Oxygen Energy Private Limited to support the preparation of a bankable business case for the development of a 20MW off-grid solar PV rooftop project on buildings owned and managed by Old Mutual Property Group Zimbabwe countrywide.
[51] AfDB (2021), SEFA
[52] Sunref (2021), Energy Efficiency

its partners enable market transformation to deliver universal energy access faster, cleaner and more cost-effectively, while laying the foundation for economic and social impact for rural communities. Power for All is committed to delivering access to energy for the 85% of the 1.1 billion people without reliable power that live in rural areas within 10 years. Power for All's mission is to accelerate this market transformation by working with public and private sectors to include Decentralized Renewables in Energy Policy (e.g. such as reducing **tariff barriers, duties and value-added taxes**), mobilize capital for the entire value chain and accelerating the market by earmarking funds specifically for decentralized renewables, including financing for pay-as-you-go and distribution, and expanding the range of efficient devices and making energy access more affordable.

Africa Energy Efficiency Program[53] aims at transforming Africa towards a harmonised regional market for **energy efficient** lighting, refrigerators, room air conditioners, motors and power **distribution transformers**. It is implemented by AFREC (The African Energy Commission) and supported by UNEP and U4E. The project lasts for 5.5 years (ending in 2026) and has a budget of US$ 1.1 million per year. The project aims to develop on a regional level for 55 African states the saving assessments by quantifying electricity, climate and financial benefits from the switch towards energy efficient lighting, appliances and equipment. Moreover, its objectives include development of strategic policies and frameworks, supporting testing laboratories for the enforcement of MEPS and Labelling, developing Capacity Building and **developing specific tools/resources for its implementation**.

GCF-EBRD Sustainable Energy Financing Facilities (SEFF) Co-financing Programme: Approved in 2016, this programme intends to deliver climate finance at scale via partner financial Institutions in developing countries (including Egypt, Morocco, and Tunisia in the region), which will fund over 20,000 scalable and replicable projects across industrial, commercial, residential, transport and agricultural sectors. SEFF is an **on-lending programme** that will provide **credit lines** to partner financial institutions with the aim to create self-sustaining markets in the areas of **energy efficiency**, renewable energy and climate resilience. Financing activities will be complemented by the provision of technical assistance (TA), both to the local partner financial institutions and to the borrowers. The project has an estimated lifespan of 15 years. GCF injected US$ 378 million financing in **loan and grant,** while the AE (i.e., European Bank for Reconstruction and Development (EBRD)) injected US$ 1007 million co-financing in loan and grant.[54]

Universal Green Energy Access Programme (UGEAP): Approved in 2016, this programme is an **investment fund** that will reduce GHG emissions by increasing access

[53] U4E (2019), AFRICAN ENERGY EFFICIENCY PROGRAM
[54] GCF (2021), FP025

to **clean electrical energy** for mainly rural populations in Sub-Saharan Africa (i.e., Benin, Ethiopia, Kenya, Namibia, Nigeria, Tanzania, and Uganda.) It aims to provide **financing for decentralized energy service companies** for off-grid and mini-grid systems for rural households and communities and renewable energy for industrial players. At a later stage, the programme intends to work with local financial institutions to enable banks to provide **long-term loans** to businesses that provide clean electricity solutions. GCF injected US$ 80 million financing in equity and grant, while the AE (i.e., Deutsche Bank) injected US$ 222 million co-financing in equity.[55]

DBSA Climate Finance Facility: Approved in 2018, the Development Bank of Southern Africa (DBSA) programme intended to be the **first private sector climate finance facility in Africa** using a pioneering **green bank model**. It will **de-risk and increase the bankability of climate projects** in order to **crowd in private sector investment**. Its successful implementation intended to prove that similar financial models can be replicated in other developing countries. The programme has an estimated lifespan of 20 years. GCF injected US$ 55.5 million financing in **loan and grant,** while the AE (i.e., DBSA) injected US$ 115 million co-financing in loan and grant.[56]

Transforming Financial Systems for Climate, Global Subnational Climate Fund (SnCF Global) – Equity: Approved in 2020, the Fund is designed to overcome project-level barriers and limitations in attracting private investment that leads to chronic underfunding of **bankable mitigation** and adaptation projects at the sub-national level, specifically at the deal size of US$ 5 million to 75 million. Thousands of high merit sub-national projects are bypassed by **commercial financing** because investors prefer perceived safer and larger investments. The Fund firmly believes that GCF **anchor funding** and **first-loss coverage** will unlock both public investors and more importantly, private institutional investors. With GCF support, these investors have expressed willingness to co-invest. This is the first time an **impact equity fund** mobilizes public (20 %) and private sector (80%) funding at scale to **de-risk sub-national middle scale infrastructure projects**. The Fund covers globally 42 countries including Burkina Faso, Cameroon, Congo Dem. Rep., Côte d'Ivoire, Gabon, Guinea, Kenya, Mali, Mauritania, Morocco, Mozambique, Nigeria, Rwanda, Senegal, South Africa, Togo, Tunisia, and Uganda. GCF injected US$ 150 million **financing in equity,** while the AE (i.e., Pegasus Capital Advisors (PCA)) injected US$ 600 million co-financing in equity.[57]

High Impact Programme for the Corporate Sector: Approved in 2020, this programme is GCF's first at-scale investment to promote the **uptake of low-carbon technologies** in the industrial sector. It has been designed to facilitate a transformational shift within energy-intensive industries, agribusinesses, and the mining sector. The

[55] GCF (2021), FP027
[56] GCF (2021), FP098
[57] GCF (2021), FP152

programme covers only two African countries that are Morocco and Tunisia. GCF injected US$ 258 million financing in **loan and grant**, while the AE (i.e., EBRD) injected US$ 759 million co-financing in loan and grant.[58]

Leveraging Energy Access Finance (LEAF) Framework: Approved in 2021, the LEAF framework intends to address financial and investment barriers by deploying **credit enhancement instruments** and **new financial products** to **crowd in local currency debt and commercial capital** in **decentralised renewable energy solutions in the region (i.e., Ethiopia, Ghana, Guinea, Kenya, Nigeria, and Tunisia)**. GCF injected US$ 171 million financing in **loan, grant, and guarantee,** while the AE (i.e., AfDB) injected US$ 789 million co-financing in loan, grant, guarantee, and equity.[59]

Sustainable Renewables Risk Mitigation Initiative (SRMI): Approved in 2021, this programme is designed to help **unlock the large amounts of private finance** needed to complement the limited public funding available. It will help six target countries in the region (i.e., Botswana, Central African Republic, Congo Dem Rep, Kenya, Mali, Namibia) shift to low-emission sustainable development pathways and increase **access to affordable, reliable, sustainable and modern energy**. To do this, the programme will support the use of technical assistance, public investments and **risk mitigation instruments**. GCF injected US$ 280 million financing in **loan, grant, and guarantee,** while the AE (i.e., WBG) injected US$ 1283.5 million co-financing in loan and grant.[60]

Rwanda. In 2012, the **Rwanda Green Fund (FONERWA)** was established to invest in public and private projects that drive transformative change. It was one of the first national environment and climate change investment funds in Africa. FONERWA facilitates direct access to international climate finance and streamlines and rationalizes external aid and domestic finance. Financing from the Fund can be accessed by Rwanda's government ministries and agencies, districts, and civil society organizations, including academic institutions and the private sector. The Fund has several investment products, including **grants, innovation investments, and credit lines.** Innovation investments are **performance-based investments** for research and development, proof-of-concept and demonstration. Private sector companies can apply for up to US$ 300,000 and must provide 25% match funding. The Fund provides Rwanda's cheapest money with a **credit line** that provides financing at 11.45%, well below market rates of approximately 18%. Private sector companies must provide 30% match funding. The minimum loan amount is US$ 70,000. FONERWA has mobilised investment US$

[58] GCF (2021), FP140
[59] GCF (2021), FP168
[60] GCF (2021), FP163

216 million and supported 44 projects for strategic climate resilience investments in Rwanda.[6162]

[61] UNFCCC (2021), FONERWA
[62] FONERWA (2021), website