Ministry of Energy and Petroleum
Energy and Petroleum Regulatory Authority
Kenya Power and Lighting Company
National Treasury
The Republic of Kenya

Data Collection Survey on Optimal Use of Energy in Kenya

Final Report

March 2025

JAPAN INTERNATIONAL COOPERATION AGENCY

PADECO Co., Ltd.
Oriental Consultants Global Co., Ltd.

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Abbreviations and Acronyms

AAGR	Annual Average Growth Rate
AFD	French Development Agency / Agence Française de Développement
AfDB	African Development Bank
AsDB	Asian Development Bank
AIIB	Asian Infrastructure Investment Bank
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
BESS	Battery Energy Storage System
BETA	Bottom-Up Economic Transformation Agenda
BEZA	Bangladesh Economic Zones Authority
CAPEX	Capital Expenditure
CDM	Clean Development Mechanism
CEEC	Centre for Energy Efficiency and Conservation
C/P	Counterpart
DAC	Development Assistance Committee
DFI	Development Finance Institution
DSM	Demand-Side Management
EAPP	East Africa Power Pool
EBRD	European Bank for Reconstruction and Development
EDFI	European Development Finance Institutions Association
EE&C	Energy Efficiency and Conservation
E-JUST	Egypt-Japan University of Science and Technology
EEP	Ethiopia Electric Power
EER	Energy Efficiency Ratio
EIB	European Investment Bank

EIRR	Economic Internal Rate of Return
EPRA	Energy and Petroleum Regulatory Authority
EPSA	Enhanced Private Sector Assistance
ESCO	Energy Service Company
EV	Electric Vehicle
FEC	Fuel Energy Charge
FERFA	Foreign Exchange Rate Fluctuation Adjustment
GCF	Green Climate Fund
GDC	Geothermal Development Company
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse Gas
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH (German Corporation for International Cooperation)
GMFA	The Green Mobility Facility for Africa
GSL	General Service Lamps
HVDC	High Voltage Direct Current
ICD	Islamic Corporation for the Development of the Private Sector
ICR	Initial Country Report
IDB	Inter American Development Bank
IEA	International Energy Agency
IFC	International Finance Corporation
IMF	International Monetary Fund
IPO	Initial Public Offering
IPP	Independent Power Producer
IRENA	International Renewable Energy Agency

JCM	Joint Crediting Mechanism
JETRO	Japan External Trade Organization
JICA	Japan International Cooperation Agency
JST	JICA Survey Team
KAM	Kenya Association of Manufacturers
KenGen	Kenya Electricity Generating Company
KETRACO	Kenya Electricity Transmission Company
KPLC	Kenya Power and Lighting Company
LCEP	Least Cost Electrification Plan
LCPDP	Least Cost Power Development Plan
LED	Light-Emitting Diode
LIBOR	London Interbank Offered Rate
M&A	Mergers and Acquisitions
MEC	Maximum Energy Consumption
MEPS	Minimum Energy Performance Standards
MoEP	Ministry of Energy and Petroleum
M/P	Master Plan
MTP	Medium Term Plan
MRV	Measurement, Reporting and Verification
NDC	Nationally Determined Contribution
NEECS	National Energy Efficiency and Conservation Strategy
NEP	National Energy Policy
NuPEA	Nuclear Power and Energy Agency
ODA	Official Development Assistance
OECD	Organization for Economic Co-operation and Development

PPA	Power Purchase Agreement
PSIF	Private Sector Investment Finance
PSP	Pumped Storage Plant
RE	Renewable Energy
RERAC	Renewable Energy Resource Advisory Committee
REREC	Rural Electrification and Renewable Energy Corporation
SEZ	Special Economic Zone
S&L	Standards and Labelling
SDG	Sustainable Development Goal
SME	Small and Medium Enterprise
SOFR	Secured Overnight Financing Rate
SRI	Star Rating Index
TCP	Tariff Control Period
TICAD	Tokyo International Conference on African Development
TOU	Time of Use
TPE	Third Party Entity
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial Development Organization
VAT	Value Added Tax
VRE	Variable Renewable Energy
WARMA	Water Resource Management Levy
WB	World Bank

Chapter 1 Survey Outline

1.1 Survey Background

Kenya is rich in renewable energy (RE) resources, with geothermal and hydroelectric power, both base-load power sources, accounting for more than 70% of the power supply mix (Kenya Power and Lighting Company [KPLC], 2023). When variable renewable energy (VRE) resources such as solar and wind power are included, the share of RE in total installed capacity was 86% in 2023 (Kenya Electricity Generating Company [KenGen], 2023). In terms of electricity access, Kenya's electrification rate was 76.5% in 2021 (World Bank), far exceeding the sub-Saharan average of 50.6%. To make further progress in this situation, the Government of Kenya has set targets in its long term development plan, Kenya Vision 2030, calling for 100% use of RE in power generation and 100% electrification by 2030, and is working to ensure a stable supply of clean and affordable energy.

Regarding the transportation sector, at the Africa Climate Summit held in Nairobi in September 2023, the government announced a policy to promote electric vehicles (EVs). Kenya has a growing concentration of e-mobility industries that utilize the country's abundant renewable energy resources, with the Kenya e-Mobility Association having 28 member companies as of March 2024. E-Mobility will not only prevent foreign currency outflows related to fossil fuel imports for transportation and make effective use of RE-derived electricity, but will also be a major force in achieving greenhouse gas reduction targets. Thus, Kenya is in a position to lead green growth in Africa.

Meanwhile, a challenge in achieving 100% use of RE is the peak demand for electricity during specific times of the day. The daily load curve – which shows electricity consumption throughout the day – indicates steep peaks in the morning and night in Kenya, with electricity demand at night in particular exceeding the daily average by almost 40%. This pattern has required the use of diesel power generation to meet electricity demand at night, contributing to the outflow of foreign currency due to the use of fossil fuels. KPLC is aware of this problem but has not been able to identify the cause of the peaks and take appropriate action.

In this survey, the causes of peak electricity demand at night will be identified. The use of pumped-power generation, the introduction of energy-saving equipment, and the design of incentive programs will be studied, with the aim of contributing to reductions in fossil fuel consumption for nighttime electricity supply and appropriate investment in new power sources, thereby contributing to the achievement of the Kenya Vision 2030.

Considering that substantial increases in electricity demand at night compared to the daytime is a common phenomenon not only in Kenya but also in many African countries, the findings of this survey may contribute to solving issues in other African countries.

1.2 Objectives and Outline of Survey

This survey will examine possibilities for cooperation on the demand side (e.g., Demand Side Management, DSM) and other measures in Kenya, which is in a position to lead green growth in Africa.

The difference in electricity demand between day and night in Africa is large due to low industrial demand during the day (compared to Asia, for example), and Kenya currently uses fossil fuels to meet nighttime electricity demand. If this trend continues and the use of EVs accelerates, additional investment in power supply development and fossil fuel use will be required to meet nighttime peak demand. Therefore, it is desirable to examine policy and institutional aspects to

identify measures for peak demand reduction and peak shifting. Against this background, the survey will mainly focus on Kenya, while seeking to formulate an African model for optimal energy use, based on the characteristics of electricity use on the continent. At the same time, the possibility of participation by Japanese companies and mobilization of private-sector funds for the introduction of energy-saving equipment in Africa will also be examined.

Based on these considerations, the objectives of the survey are as follows:

Objectives of the Survey

- Studying the possibility of cooperation on the demand side (e.g., demand side management), in Kenya, which is in a position to lead green growth in Africa.
- Seeking and studying an African model for optimal energy use based on the characteristics of electricity use on the continent, with Kenya as the main focus of the survey.
- Studying the possibility of participation of Japanese companies and mobilization of private funds toward the introduction of energy-saving equipment in Africa.

Table 1-1 presents an overview of the survey.

Table 1-1 Survey Overview

Survey Area	Nairobi Metropolitan Area and Mombasa Metropolitan Area, Kenya (Note: Two cities with significantly different climates are covered.)
Counterparts	Ministry of Energy and Petroleum (MoEP) Energy and Petroleum Regulatory Authority (EPRA) Kenya Power and Lighting Company (KPLC) National Treasury
Implementation Period	June 2024-March 2025

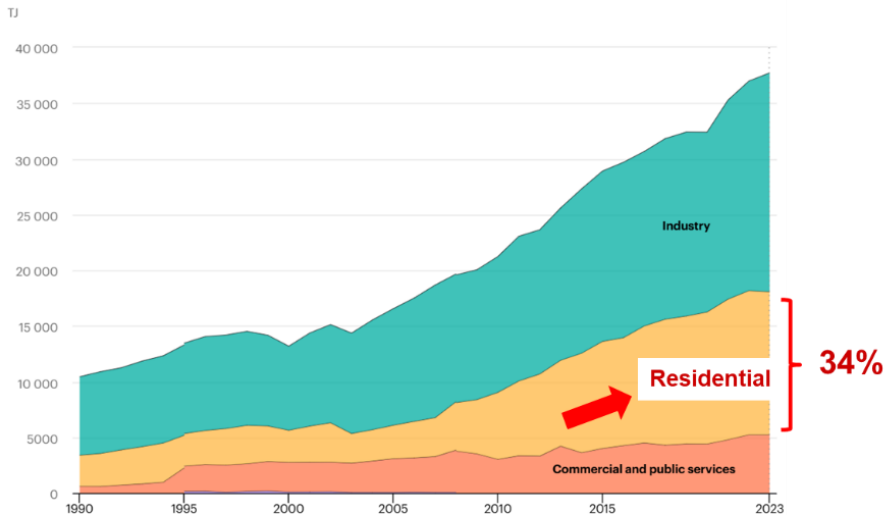
Source: The JST

1.3 Summary of Survey Results

A common trend in electricity demand across African countries is the significant growth in the residential sector and the occurrence of peak electricity demand during nighttime hours.

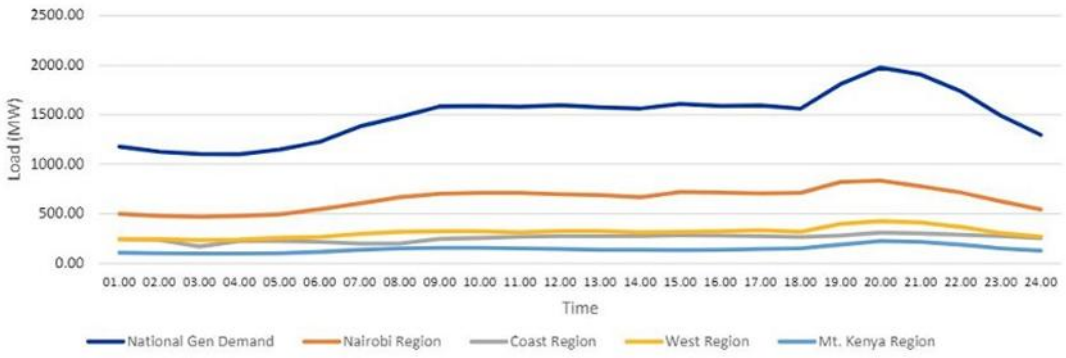
In Kenya, the average annual growth rate (AAGR) of total electricity demand from 2000 to 2023 was 4.7%. In comparison, the residential sector recorded the highest AAGR among all demand categories at 6.7% (industrial: 4.3%, commercial: 3.0%), accounting for 34% of total demand (see Figure 1-1).

Similarly, peak demand follows the trend observed in other African countries, occurring during nighttime hours between 18:00 and 22:00 (see Figure 1-2).



Source: Prepared by JST based on IEA data

Figure 1-1 Trends of Electricity Consumption per Capita (1990-2023)



Source: Prepared by JST based on「ENERGY & PETROLEUM STATISTICS REPORT FOR THE FINANCIAL YEAR ENDED 30th JUNE 2021」(EPRA)

Figure 1-2 Daily Load Curves for Each Region and for All of Kenya (2020)

Kenya's major energy policies on the demand side focus on promoting the adoption of e-cooking in the household cooking sector, which accounts for approximately 47% of total energy consumption (biomass fuels such as firewood), and advancing e-mobility in the transportation sector, which constitutes about 16% of total energy consumption (petroleum).

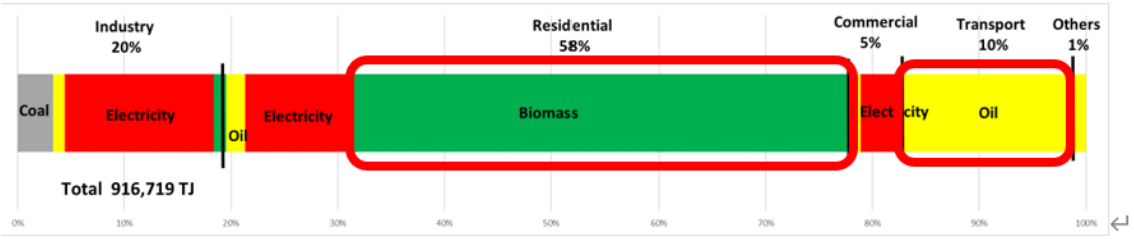
As these electrification initiatives[1] gain traction, peak demand is expected to continue increasing. In the reference scenario of the Least Cost Power Development Plan 2024-2043, peak demand in 2043 is projected to reach approximately 3.5 times the current level. This raises concerns that power supply expansions may not keep pace with demand.

Additionally, a decline in system load factor is indicated, raising concerns over potential financial deterioration for generation, transmission, and distribution operators.

[1] Regarding e-mobility, time-of-use (TOU) tariff has been introduced to help mitigate peak demand, and discussions are ongoing to expand its implementation. Additionally, the introduction of a labeling program for electric cooking appliances is under consideration. However, significant energy savings in this sector are not expected due to technical limitations.

In light of this, a survey was conducted to assess the actual state of household electricity demand, which is the primary driver of nighttime peak demand. Furthermore, key priority areas from the demand side were identified.

The following figure illustrates Kenya's final energy consumption in 2022, with electricity converted to primary energy equivalents.



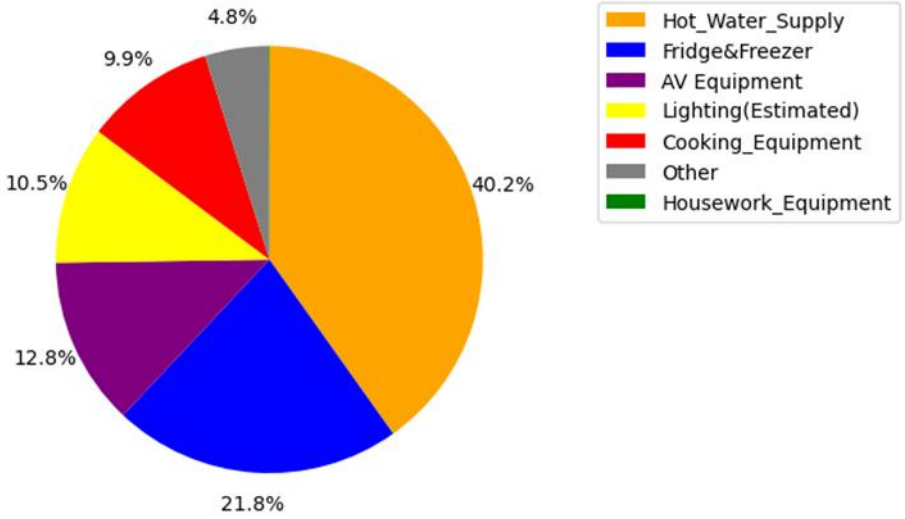
Source: IEA

Figure 1-3 Final Energy Consumption by Sector and Energy Source in 2022

In this survey, in order to grasp the actual situation of household electricity demand, measurements of electricity consumption by home appliance were conducted at five high-consumption households each in Nairobi and Mombasa.

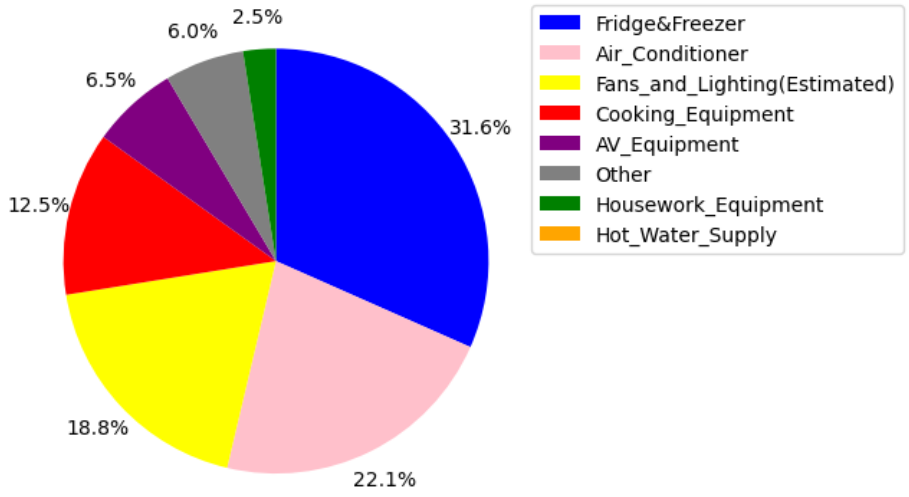
The results indicated that during peak hours (18:00–22:00), the major electricity-consuming appliances were hot water supply systems (approximately 40%) and refrigerators/freezers (approximately 22%) in Nairobi, while in Mombasa, refrigerators/freezers (approximately 32%) and room air conditioners (approximately 22%) accounted for the highest electricity consumption.

The measurement results for Nairobi and Mombasa are presented in Figure 1-4 and Figure 1-5, respectively.



Source: JICA Survey Team

Figure 1-4 Electricity Consumption of Each Home Appliance (Nairobi, Peak Hours)



Source: JICA Survey Team

Figure 1-5 Electricity Consumption of Each Home Appliance (Mombasa, Peak Hours)

Based on the above survey results, effective DSM (Demand-Side Management) and energy-saving technologies that contribute to peak shifting and nighttime load creation were analyzed in terms of their potential impact, including market size and their effects on peak reduction and nighttime load creation. Discussions were held with the counterpart to consolidate the necessary measures for promoting the adoption of these technologies (see the Appendices).

Additionally, the benefits of DSM and energy efficiency initiatives for various stakeholders—particularly in reducing supply-side capital investment and fossil fuel imports—were outlined. It was emphasized that, alongside supply-side measures (ensuring power supply capacity), implementing demand-side initiatives would help prevent potential future supply-demand constraints and enhance flexibility in supply-demand management.

The following table shows the compiled recommendations for the dissemination of DSM/EE&C technologies.

Table 1-2 Recommendations for the Dissemination of DSM Technologies (Policies, Incentives, Approaches by Power Companies)

Sector	DSM Technologies	Policy/ Regulation	Incentives (tax exemption, etc.)	Power Company Approaches	Priorities
Residential	**Heat pump water heater**	**Reflection on energy/EE&C policy**	**Application of Green Tax**	• **Rate system (TOU introduction, all-electric discount)** • **Awareness raising activities for residential customers** (E-cooking is under development) • **Cooperation with manufacturers, distributors, etc.**	1
	E-cooking	**Establishment of S&L system** Already reflected in LCPDP	-		
	High efficiency AC	**Periodic update of S&L system**	-	-	3
	High-efficiency refrigerators	**Periodic update of S&L system**	-	-	2

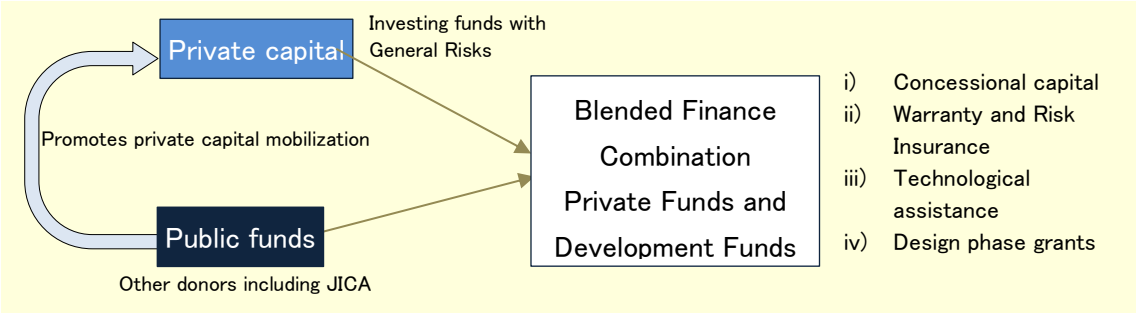
Sector	DSM Technologies	Policy/ Regulation	Incentives (tax exemption, etc.)	Power Company Approaches	Priorities
	Solar water-heater	**Introduction of insulation performance standards for hot water storage tanks**	Already covered by the green tax	-	5
Commercial	**VRF (multi air conditioner for buildings)**	**Reflection on energy/EE&C policy**	-	• **Awareness raising activities for large customers** • **Cooperation with manufacturers, distributors**	9
Industrial	**High efficiency motors (IE1～ IE3)**	**Periodic update of S&L system**	-	• **Awareness raising activities for industrial customers**	8
Cross sector	**RE-utilized power storage system (demand side)**	**Measures to encourage battery installation for large-volume consumers**	-	• **TOUs (individual metering of electric energy, exemption from application of threshold values for existing TOUs)** • **Awareness raising activities for large customers** • **Cooperation with manufacturers, distributors**	6
	LED	**Phase-out of conventional light bulbs**	-	-	7
	E-mobility	Draft National E-Mobility Policy (March 2024, MLIT)	Already covered by the green tax	• TOU • **Promotion and awareness raising activities for customers**	4

Source: The JST

This survey highlighted the importance of taking demand-side interventions from an early stage. Given the rapid increase in household electricity consumption, the widespread adoption of DSM and energy-saving technologies in the residential sector is particularly desirable.

To achieve this, the entry of private-sector companies specializing in the sale and installation of DSM and energy-efficient equipment into the Kenyan market is anticipated. However, barriers to entry exist due to Kenya's low sovereign credit rating and the resulting low bankability.

To mobilize private-sector financing, the introduction of public funding mechanisms—such as blended finance—to mitigate risks for private businesses is considered an effective approach (as illustrated in the following figure).



Source: Convergence, Increasing the Number of SDG and Climate Projects Implemented by Mobilizing Private Investment through Blended Finance, February 28, 2023

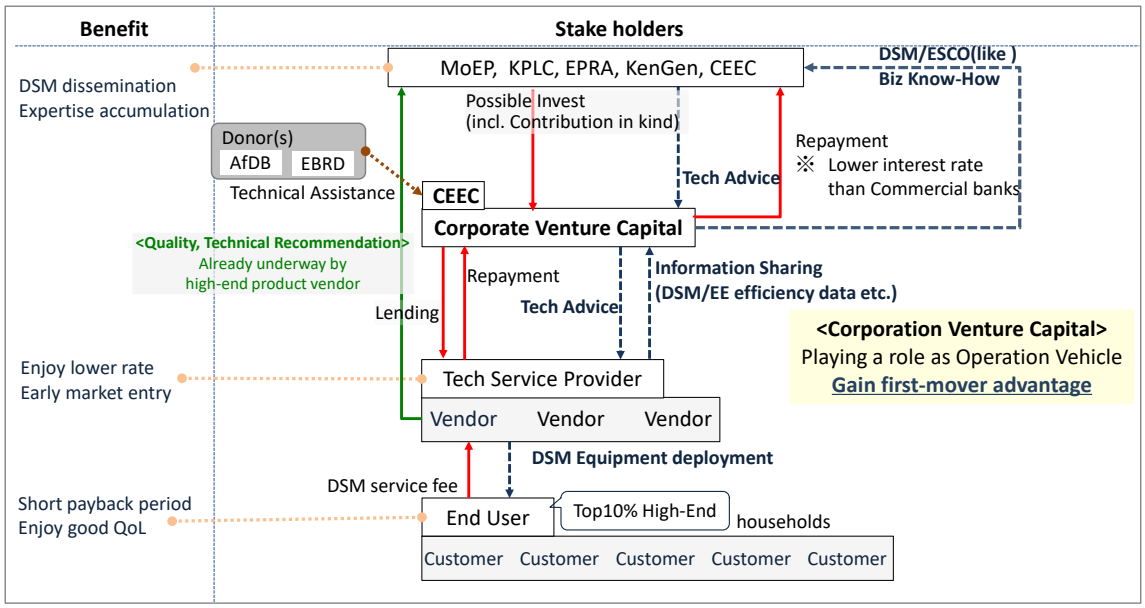
Figure 1-6 Image of the Combination of Private Capital and Public Funds with Development Funds to Encourage Private Capital Mobilization

Through discussions with government agencies in the power sector, donors, and private-sector companies on the promotion of DSM technologies, a phased approach for mobilizing private-sector financing was examined. This approach emphasizes first fostering the market by ensuring tangible benefits from technology adoption, followed by gradual market expansion (as illustrated in the following figure).

Source: The JST

Figure 1-7 Gradual Market Creation for the Introduction of DSM and Energy-saving Equipment

Particularly in the initial implementation phase, donor-supported technical cooperation will be conducted to verify the tangible benefits of DSM technology adoption. This process also aims to facilitate the accumulation of technical expertise among relevant stakeholders (see the next figure).



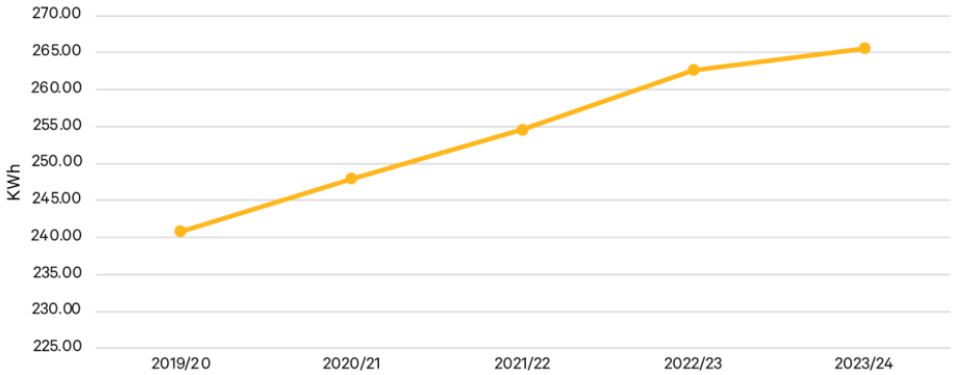
Source: JICA Survey Team

Figure 1-8 Development Phase - Market Formation through Private Business - (Initial Consideration Proposal)

1.4 Basic Energy Information in Kenya

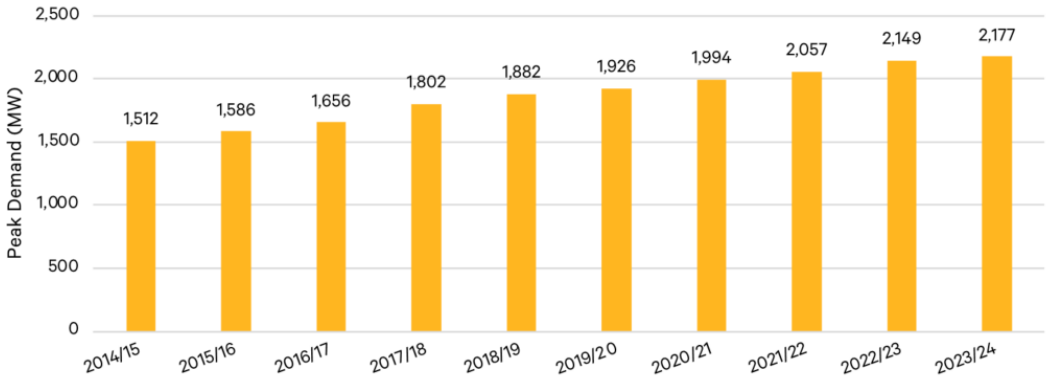
(1) Electricity Consumption Patterns

Electricity consumption per capita in Kenya has been increasing year on year, and in 2023/2024, electricity consumption per capita was approximately 265 kWh (see Figure 1-9). Peak demand has also been increasing year on year, and in 2023/2024, peak demand hit 2,177 MW (see Figure 1-10). In addition, while KPLC's electricity sales volume was 10,516 GWh, peak demand in 2024 (latest figure) was recorded at 2,306 MW (+129 MW).



Source: Energy & Petroleum Statistics Report for the Financial Year Ending 30th June 2024 (EPRA)

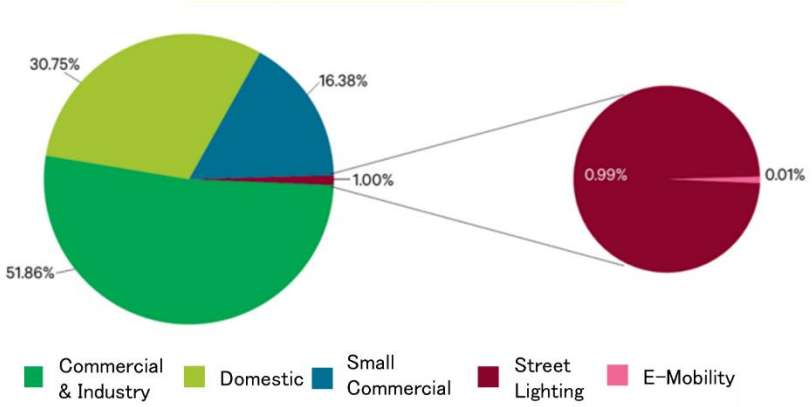
Figure 1-9 Trends of Electricity Consumption per Capita (2019/2020-2023/24)



Source: Energy & Petroleum Statistics Report for the Financial Year Ended 30th June 2024 (EPRA)

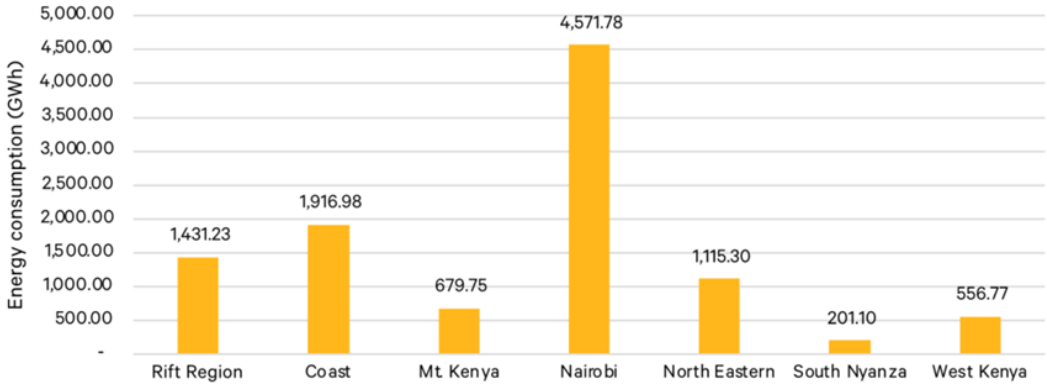
Figure 1-10 Trends of Peak Demand (2014/2015-2023/2024)

By customer category, the commercial and industrial sector accounts for around 68% of electricity consumption, households account for 31% (see Figure 1-11). By region, the Nairobi region, where Nairobi is located, accounts for approximately 44% of electricity consumption, while the Coast region, where Mombasa is located, accounts for approximately 18% (see Figure 1-12).



Source: Energy & Petroleum Statistics Report for the Financial Year Ending 30th June 2024 (EPRA)

Figure 1-11 Electricity Consumption by Customer Category (2023/2024)

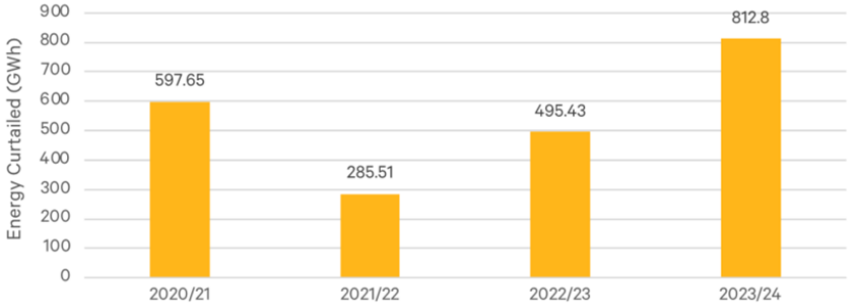


Source: Energy & Petroleum Statistics Report for the Financial Year Ending 30th June 2024 (EPRA)

Figure 1-12 Electricity Consumption by Region (2023/2024)

(2) Energy Curtailment

Demand is lowest between midnight and 5am, and energy curtailment take place to maintain the grid frequency in some occasions. Energy curtailment occurs mainly at geothermal plants operating as baseload, and also for wind power. In 2023/24, energy curtailment was 812.8 GWh, an increase compared to 495.43 GWh in 2022/2023, which is equivalent to 7.7% of KPLC's electricity sales in 2023/2024 (see the next figure). According to the EPRA[2], the main reasons for the increase in energy curtailment in 2023/2024 are the increase in hydropower generation due to heavy rainfall and the increase in electricity imports.



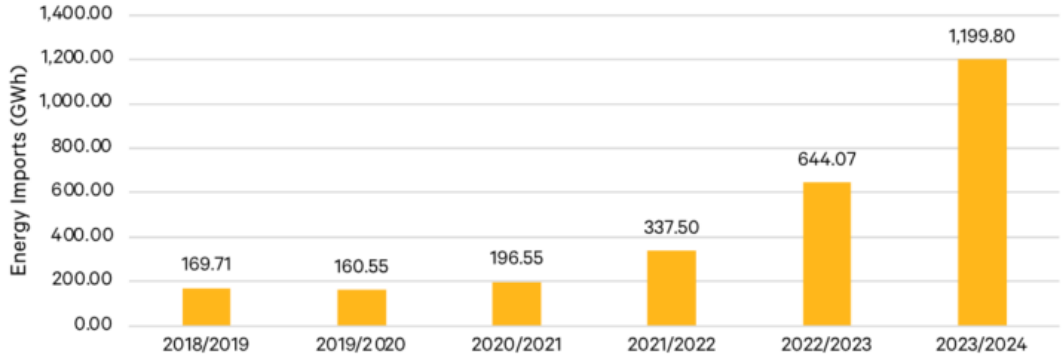
Source: Energy and Petroleum Statistics Report for the Financial Year Ending 30th June 2024 (EPRA)

Figure 1-13 Energy Curtailment (2020/2021-2023/2024)

(3) Electricity Imports

Kenya imports electricity mainly from Ethiopia and Uganda, and electricity imports have increased in recent years. In particular, the increase in 2023/2024 is due to the commencement of electricity receipt under the power purchase agreement (PPA) between KPLC and Ethiopia Electric Power (EEP) from 1 December 2023.[3] Kenya has joined the Eastern Africa Power Pool (EAPP)[4] and is coordinating the interconnection of regional grids between member countries, while promoting security of supply and the spread of VRE. It also envisages power trading with the Southern Africa Power Pool in the future[5].

The following figure shows the annual electricity imports (2018/2019 - 2023/2024).



Source: Energy & Petroleum Statistics Report for the Financial Year Ended 30th June 2024 (EPRA)

Figure 1-14 Annual Electricity Imports (2018/2019-2023/2024, GWh)

[2] Energy & Petroleum Statistics Report for the Financial Year Ending 30th June 2024 (EPRA).
[3] A 1,045 km-long 500 kV HVDC (High Voltage Direct Current) between Ethiopia and Kenya was opened in 2022/2023. HVDC converter substations with a capacity of 2,000 MW have been installed at both ends of the transmission line, with plans to expand import and export volumes in the future.
[4] EAPP consists of 13 member states in East Africa, including Ethiopia, Tanzania and Uganda.
[5] Energy & Petroleum Statistics Report for the Financial Year Ending 30th June 2024 (EPRA).

1.5 Implementation of the Field Surveys

After the commencement of surveys, the JICA survey team (hereinafter referred to as the JST) shared the survey outline, scope and schedule with the counterpart through online meetings, and conducted the first round of the field survey in October 2024.

The main objectives of the first field survey were to collect and confirm information through meetings with the counterpart and to conduct a survey to measure the actual electricity consumption in five households each in Nairobi and Mombasa, and both were implemented as planned.

In the second field survey (December 2024), JST reported on the results of the electricity consumption survey and the work progress, and discussed the direction of future surveys with the counterparts, while also meeting with stakeholders involved in DSM/EE&C to gather basic information.

In the third field survey (January 2025), JST collected information and exchanged opinions with counterparts and stakeholders on measures (policies, systems, incentives, etc.) to promote the dissemination of various technologies that are effective for promoting DSM/EE&C, as well as on financing strategies designed to promote the dissemination of these technologies.

Chapter 2 Survey Findings

2.1 Data Collection on Current Policies and Plans in the Kenyan Electricity Sector

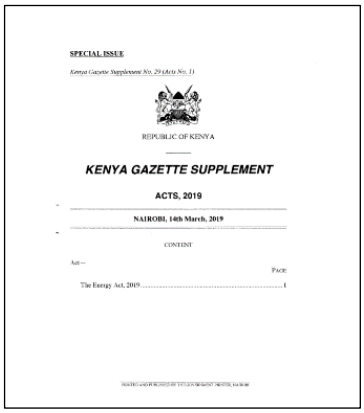
2.1.1 Review of the Implementation Status of Current Policies and Plans in the Power Generation, Transmission, and Distribution Sectors

The following report covers the overall electricity policy in Kenya, as well as various policies and plans related to DSM/EE&C promotion.

(1) Energy Act 2019

The Energy Act 2019 (illustrated in Figure 2-1) came into force in March 2019, amending The Energy Act 2006.

The 2019 Act sets out the establishment, powers, and functions of energy sector entities, while defining the functions of national and county governments in relation to energy. It also sets out the promotion of renewable energy, exploration and utilization of geothermal energy, regulation of the midstream and downstream areas of oil and coal (thermal power generation), and regulations pertaining to the production, supply, and utilization of energy.


SPECIAL ISSUE

REPUBLIC OF KENYA

KENYA GAZETTE SUPPLEMENT

ACTS, 2019

NAIROBI, 14th March, 2019

CONTENT

Figure 2-1 Energy Act

The structure of the Energy Act 2019 is shown in the following table.

Table 2-1 The Structure of Energy Act 2019

Part	Title
Part 1	Preliminary
Part 2	Energy Policy and Integrated Energy Plan
Part 3	National Energy Entities
Part 4	Renewable Energy
Part 5	Downstream Coal
Part 6	Electrical Energy
Part 7	Rights of Way, Wayleaves and Use of Land for Energy Resources and Infrastructure
Part 8	Energy Efficiency and Conservation
Part 9	Miscellaneous Provisions
Part 10	Repeals, Saving and Transitional Provisions

Source: Prepared by the JST based on the Energy Act 2019

Provisions in Part 8 on Energy Efficiency and Conservation Related to EE&C/DSM

Part 8 on Energy Efficiency and Conservation defines the Energy and Petroleum Regulatory Authority (EPRA) as an organization that aims to promote EE&C and DSM and stipulates that EPRA is responsible for measures and policies related to the harnessing, processing, conversion, transportation, storage, cogeneration, heat recovery, and use of energy in all consumer sectors.

Key Points of the Energy Act (Other Than Those in Part 8 on Energy Efficiency and Conservation)

Excluding Part 8: Energy Efficiency and Conservation, the key points of the law are as follows:

- It stipulates the formulation of energy policies and plans, including the development of a National Energy Policy every five years and an Integrated National Energy Plan every three years.
- It provides for the establishment of energy-related institutions, including the Energy and Petroleum Regulatory Authority (EPRA), the Rural Electrification and Renewable Energy Corporation (REREC), the Energy Petroleum Tribunal, the Renewable Energy Resource Advisory Committee (RERAC), and the Nuclear Power and Energy Agency (NuPEA).

(2) National Energy Policy 2018

The National Energy Policy (NEP) 2018 (illustrated in the next figure) sets out the national policy strategy for the energy sector up to 2030. While it reflects the content of the national development plan, Kenya Vision 2030, and the Big 4 Agenda,[6] it does not reflect new or revised energy-related regulations issued since the implementation of the Energy Act 2019 because the policy was issued prior to the 2019 Energy Act amendments.

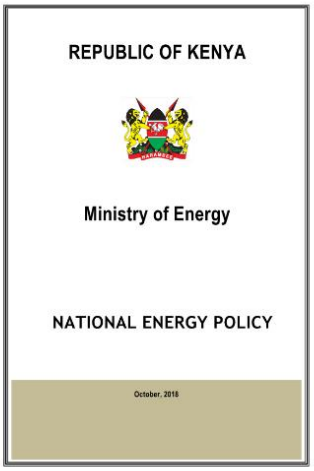


Figure 2-2 National Energy Policy 2018

This policy emphasizes the importance of EE&C and the government states that it will implement the following measures to promote EE&C:

- Develop and implement sustainable awareness-raising programs related to EE&C;
- Implement EE&C measures in all sectors;
- Conduct research and development related to EE&C; and

[6] The development plan was announced by the President in 2017 and focuses on four sectors (food and nutrition, manufacturing, housing, and healthcare).

- Cooperate with the private sector on EE&C.

Furthermore, Chapter 5 on Energy Efficiency and Conservation discusses the background and issues of EE&C promotion as well as policy strategies. The background to EE&C promotion is presented including the increasing cost of energy, the instability of energy supply, the negative impact of fossil fuels on health and the environment, and the depletion of resources. The challenges of EE&C promotion are outlined as follows:

- A lack of awareness and education regarding the benefits of energy efficiency;
- A lack of dissemination of energy-efficiency technologies, equipment, and standards;
- High technical losses in generation, transmission, and distribution systems;
- A lack of technical capacity, training, and expertise in energy management and energy efficiency;
- A lack of comprehensive and reliable energy consumption audit data and information covering all sectors;
- Delays in implementing energy-efficiency measures due to socio-economic factors;
- High initial costs of energy-efficiency projects;
- Insufficient standards for energy-efficiency equipment;
- Lack of tax exemptions and financial incentives for energy-efficiency equipment;
- Low awareness of existing financial and legal incentives for promoting energy efficiency in power plants, equipment, and infrastructure; and
- Low awareness of subsidies and loans for green energy equipment, and credit facilities such as carbon credits through the Clean Development Mechanism (CDM).

In response to these EE&C challenges, key points of policies and strategies outlined in the National Energy Policy 2018 for the period from 2015 to 2030, are shown in the following table.

Table 2-2 Key Points of NEP 2018's EE&C Policies and Strategies

- Implement energy efficiency and conservation initiatives in all sectors.
- Develop and enforce minimum energy performance standards (MEPS) and rating labels for energy efficiency and conservation equipment.
- Provide appropriate fiscal and other incentives to enhance the uptake of energy optimization technologies.
- Enforce building codes to enhance the concept of green design in buildings.
- Develop and enforce standards for fuel economy of motor vehicle operations and maintenance practices.
- Adopt the use of new and efficient technologies in energy efficiency and conservation.
- Develop, disseminate, and implement a National Energy Efficiency and Conservation Plan in consultation with relevant stakeholders.
- Implement international cooperation programs in energy efficiency and conservation.

The NEP 2018 was formulated before the Energy Act 2019 and thus there is an urgent need to revise the NEP to make it consistent with the law; the MoEP plans to publish an updated policy in June 2025.[7]

(3) Least Cost Power Development Plan (LCPDP) 2024-2043

The Least Cost Power Development Plan (LCPDP) 2024-2043 (illustrated in Figure 2-3) was published in June 2024 by MoEP, EPRA, and stakeholders in the power sector including the Geothermal Development Corporation (GDC), KenGen, KPLC, Kenya Transmission Authority

[7] Meeting with MoEP and EPRA in January 2025.

(KETRACO), Rural Electrification and Renewable Energy Corporation (REREC), and NuPEA. This is an update of the version for 2022-2041.

The Energy Act 2019 mandates the development of an Integrated National Energy Plan and Least Cost Power Development Plan responds to the mandate. The Least Cost Power Development Plan 2024-2043 was developed in line with the policy direction of the Bottom-Up Economic Transformation Agenda (BETA)[8] and Kenya's Nationally Determined Contribution (NDC) target for greenhouse gas emissions.[9] The Least Cost Power Development Plan stresses the expansion of renewable energy deployment, with a focus on the introduction of energy storage systems and hybrid projects (i.e., renewable energy and green hydrogen harvesting projects).

The Least Cost Power Development Plan presents projections for peak demand and electricity consumption, power supply development plans, and transmission development plans, while also considering the impact of promoting e-cooking and e-mobility.

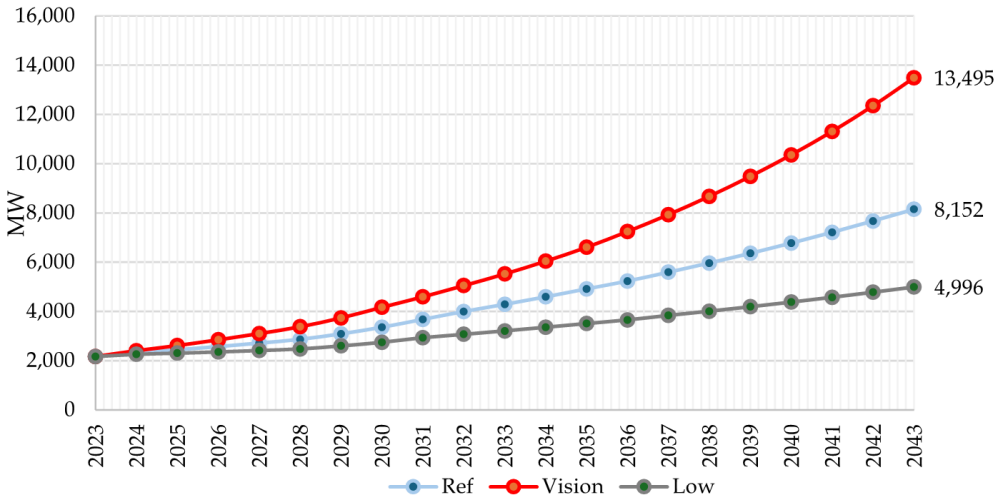
Figure 2-3 Least Cost Power Development 2024-2043

Peak Demand and Electricity Demand Forecasting

The Least Cost Power Development Plan 2024-2043 revised peak demand projections upwards from those in the Plan 2022-2041 (June 2022). The main reasons for this upward revision were the diffusion of electrification technologies such as e-mobility and e-cooking (e.g., induction cooktops, electric cookers, air fryers, electric pressure cookers), the electrification of public transport (which is a flagship project of Kenya Vision 2030), and the development of special economic regions.

[8] Developed and announced by the Government of Kenya in the Fourth Medium Term Plan (MTP IV) 2023-2027 of the Kenya Vision (2008 onwards).
[9] Kenya's NDC target is to reduce carbon emissions by 32% by 2030, aiming for carbon neutrality by 2050.

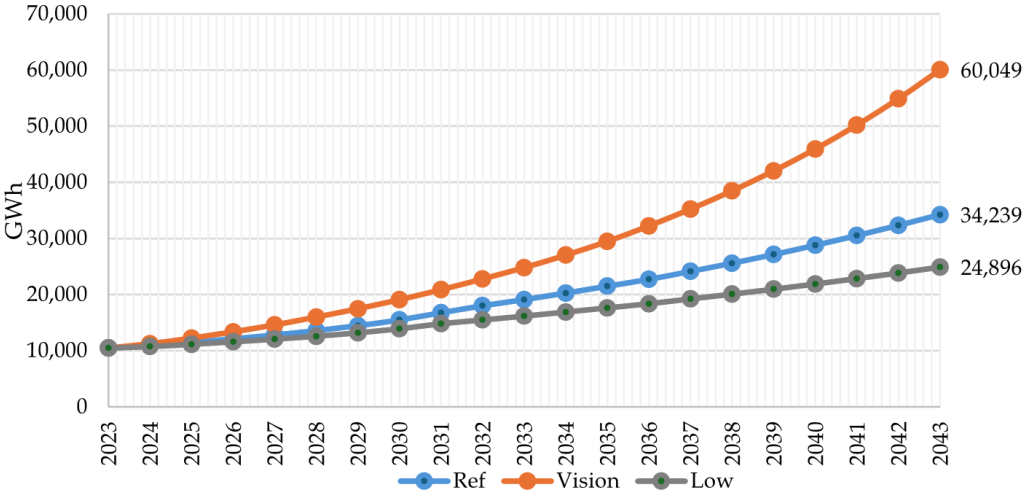
The next figure shows peak demand forecasts in the LCPDP for each scenario up to 2043.



Source: LCPDP 2024-2043

Figure 2-4 Peak Demand Forecast in the LCPDP (2023-2043)

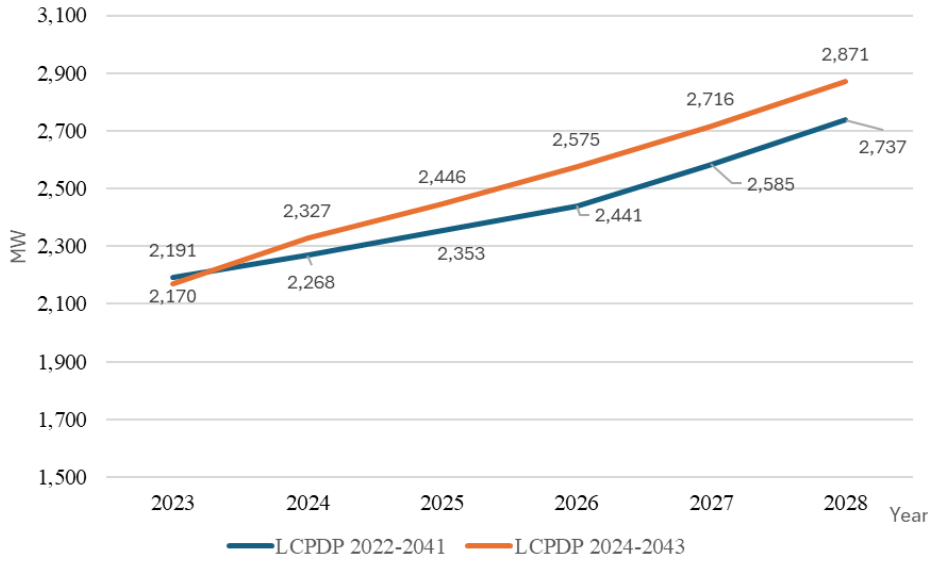
The next figure shows the electricity consumption assumptions in each scenario up to 2043.



Source: LCPDP 2024-2043

Figure 2-5 Electricity Sales Forecast in the LCPDP (2023-2043)

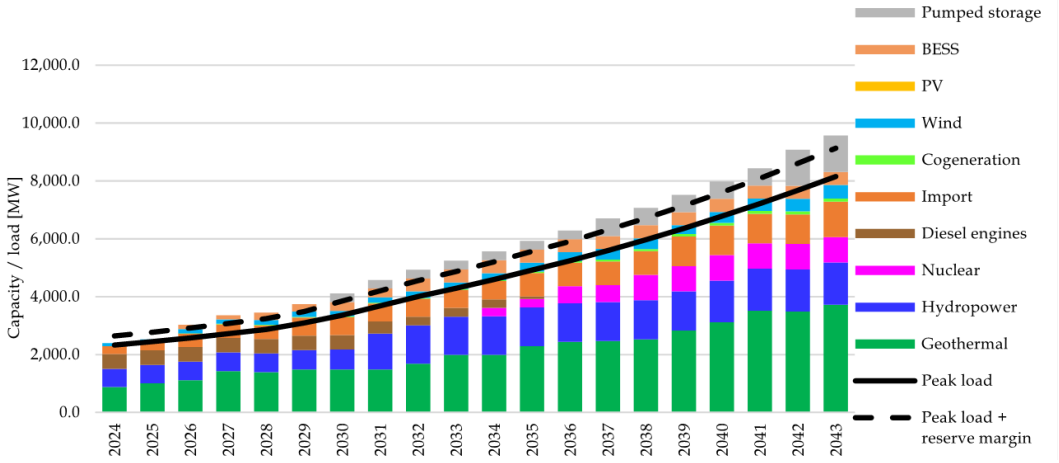
The Least Cost Power Development Plan 2022-2041 and the Least Cost Power Development Plan 2024-2043 show peak demand trends up to 2028, with the latest plan assuming an increase in peak demand of about 130 MW in 2028 (compared to the previous plan) (see the following figure).



Source: Prepared by the JST based on LCPDP 2022-2041 and 2024-2043

Figure 2-6 Comparison of Demand Forecasts for 2023-2028

The firm capacity (the generation capacity that can be counted on as power supply capacity) and peak demand under the reference demand scenario is presented in the next figure. From 2036 onwards, thermal power generation (diesel, gas, and oil) is expected to be phased out, while the expansion of nuclear power generation is projected to progress from 2034 onwards.



Source: LCPDP 2024-2043

Figure 2-7 Firm Capacity vs Peak Load in Reference Demand Scenario

Load Leveling / DSM Measures

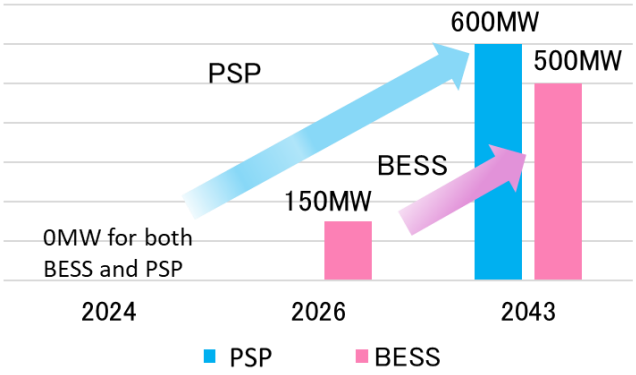
In the Least Cost Power Development Plan (LCPDP) 2024-2043, the areas related to load-leveling / DSM measures are reflected in the long-term demand forecast, with particular emphasis on the immediate development of battery energy storage systems (BESS) and pumped storage power generation. The following table summarizes the electricity load-leveling / DSM measures set out in LCPDP 2024-2043.

Table 2-3 Summary of Load Leveling / DSM Measures Discussed in LCPDP 2024-2043

Load Leveling / DSM Measures		Content
Energy Storage	Pumped Storage Power Generation	○ Assumes the introduction of 600 MW of pumped storage power plants by 2043 in order to reduce medium- and long-term peak-capacity shortages in the power supply plan and output curtailment (venting) of geothermal power during off-peak hours. ○ Recommends early approval of pumped storage power plants for stable supply.
	Battery Energy Storage System (BESS)	○ The power plan envisages the introduction of 500 MW of BESS by 2043. The main objectives of the BESS are to: ・ Reserve power for frequency adjustment of variable renewable energy (VRE). ・ Stabilize the voltage of the grid. ・ Reduce venting at geothermal power plants. ・ Increase the rate of VRE installations. ・ Provide power supply in the event of supply shortages and ensure system security. ・ Contribute to load shedding on the grid, thereby extending the life of transmission and distribution facilities. ○ It is recommended the development of 150 MW of BESS should be implemented by 2026. 100 MW of BESS are assumed to be commissioned from KenGen and 50 MW are assumed to be commissioned from IPPs respectively by 2026.
Tariff Structure	Time of Use (TOU)	Proposes setting conditions for application to industrial and commercial use to achieve 24-hour economy and to increase the monthly electricity consumption limit for the e-mobility quota (currently 15,000 kWh/month or less).
Transport	e-Mobility	Promotes of e-mobility

Source: Prepared by the JST based on LCPDP 2024-2043

In the Least Cost Power Development Plan (LCPDP) 2024-43, 100 MW of BESS are assumed to be commissioned from KenGen and 50 MW are assumed to be commissioned from IPPs respectively by 2026. In addition, 600 MW (two 300 MW×2 power plants) of pumped storage plants are envisaged to be in operation by 2043 (see the next figure).



Abbreviations: BESS = battery energy storage system, PSP = pumped storage plant
Source: Prepared by the JST based on the LCPDP 2024-2043

Figure 2-8 Development of the Storage System as Modeled in the LCPDP 2024-2043

The Least Cost Power Development Plan (LCPDP) 2024-43 also shows a recommended 20-year generation expansion plan, and the recommended plans for pumped storage and nuclear power generation are shown in Tables 2-4 and 2-5, respectively. This recommended plan indicates a more ambitious power development plan than the plan shown in the main text of "LCPDP 2024-2043".

Table 2-4 Recommended 20-Year Generation Expansion Plan for Pumped Storage Power Generation (2024-2043)

Year Considered for System Integration	Plant Name	Capacity (MW)	Connection Point (Substation)	Progress Status
2030	Pumped Hydro Storage- Unit 1	300	Ortum 220kV/32kV	Pre-Feasibility Study Complete
2037	Pumped Hydro Storage- Unit 2	300	Baringo 400kV	Finance Sourcing
2042	Pumped Hydro Storage- Unit 3	650	-	Concept

Source: Least Cost Power Development Plan 2024-2043

Table 2-5 Recommended 20-Year Generation Expansion Plan for Nuclear Power Generation (2024-2043)

Year Considered for System Integration	Plant Name	Capacity (MW)	Connection Point (Substation)	Progress Status
2034	Nuclear- Unit 1	291	Kilifi 400kV	Feasibility Study
2036	Nuclear- Unit 2	291.3	Kilifi 400kV	Feasibility Study
2038	Nuclear- Unit 3	291.3	Kilifi 400kV	Feasibility Study

Source: Least Cost Power Development Plan 2024-2043

(4) Kenya Energy Efficiency and Conservation Strategy (NEECS) 2020

The National Energy Efficiency and Conservation Strategy (NEECS, illustrated in the following figure) 2020 is an energy efficiency and conservation roadmap for the period 2020-2025, setting sectoral energy efficiency and conservation targets. It was developed by MoEP with technical support from the United Nations Environment Programme (UNEP) Copenhagen Centre, with the participation of energy sector stakeholders and the Kenya Centre for Energy Efficiency and Conservation (CEEC) in the development of the strategy.

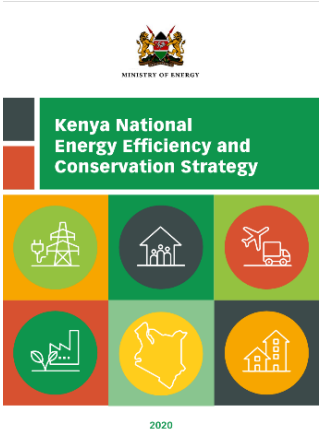


Figure 2-9 NEECS 2020

While the Energy Act 2019, the Energy Management Regulations 2012, and The Energy (Appliances' Energy Performance and Labeling) Regulations, 2016 have led the way in EE&C in Kenya and various initiatives have been undertaken, these legal and regulatory instruments are decentralized and a comprehensive EE&C strategy/policy was needed. Therefore, the National Energy Efficiency and Conservation Strategy (NEECS) 2020, which sets EE&C targets for key sectors in the country, was developed to systematically cover efforts to achieve the national

agenda, including the Kenya Vision 2030 and the Big 4 Agenda (food and nutrition, manufacturing, housing and healthcare), 2017.

The next table summarizes the EE&C targets for each sector in the National Energy Efficiency and Conservation Strategy 2020.

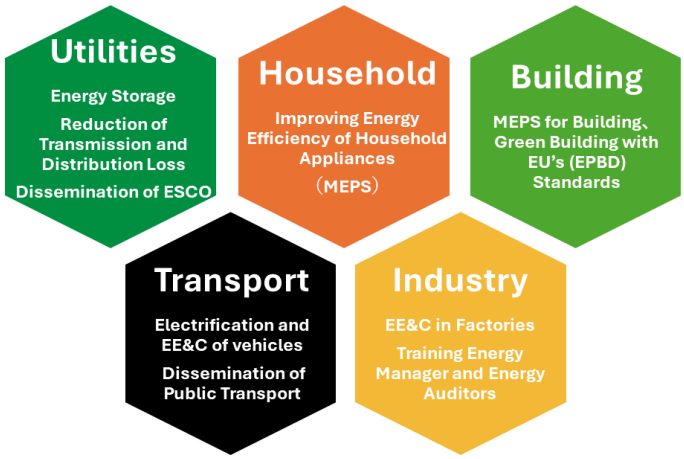
Table 2-6 EE&C Targets by Sector for 2025 Set by NEECS 2020

Sector	2025 Target
Household	・ Improve the energy efficiency of household appliances by 3% per annum from the 2020 baseline. ・ Increase the number of appliances covered by MEPS from six (Ballasts for Fluorescent Lamps, Double Capped Fluorescent Lamps, Self-Ballasted Lamps、Non-Ducted Air Conditioners, Refrigerating Appliances, Three-Phase Case Induction Motors) to ten (appliances to be added are televisions, PCs, cookers, and LEDs). ・ 50% of households utilise clean energy.
Building	・ Increase the percentage of new floor area that complies with energy efficiency requirements from the current 0% to 10% of all buildings. ・ Adopt American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) buildings energy conservation standards or equivalent for public and commercial buildings. ・ Reduce the energy load from lighting in public buildings by 50%. ・ Design and construct energy-efficient/green public buildings and 25% of standard-priced housing planned by the Government to be green buildings. ・ Develop and publish MEPS for buildings.
Industry/Agriculture	・ Increase the number of energy audits carried out annually from the current 1,800 to 4,000. ・ Increase the number of licensed EE&C professionals from the baseline of 70 (2019) to 120. ・ Increase the number of registered Energy Service Companies (ESCOs) from a baseline of 0 to 5.
Transport	・ Improve fuel efficiency ⇒ Reduce fuel consumption from 7.5 ℓ/100 km (2019) to 6.5 ℓ /100 km. ・ Of all vehicles imported annually, achieve a target of 5% as electric or hybrid vehicles. ・ Increase the number of commuter train passengers from 116,000 to 150,000 per day. ・ Launch a standards and labelling (S&L) program for vehicle fuel consumption.
Utilities	・ Reduce transmission and distribution losses from 23% (2019) to 15%. ・ Install 1-MW energy storage systems. ・ Invest KES 5 billion (equivalent to US$38.5 million[10]) in the implementation of energy efficiency and conservation measures to implement the Super ESCO model. ・ Prepare a study report on ancillary services, energy storage, energy generation, and transmission.

Abbreviation: MEPS = Minimum Energy Performance Standards
Source: Prepared by the JST based on NEECS 2020

The following figure presents an overview of the key energy efficiency and conservation approaches for each sector (households, buildings, industry, transport, and utilities) proposed by the National Energy Efficiency and Conservation Strategy 2020.

[10] 1 Kenyan shilling = 0.0077 USD (as of November 2024)



Source: Prepared by the JST based on NEECS 2020

Figure 2-10 EE&C Approaches for the Five Sectors as Proposed in NEECS 2020

(5) Kenya National Energy Efficiency and Conservation Strategy (NEECS) Implementation Plan 2022

The Kenya National Energy Efficiency and Conservation Strategy Implementation Plan 2022 (illustrated in the next figure) presents a concrete implementation plan for the energy conservation targets set out in the National Energy Efficiency and Conservation Strategy 2020. This implementation plan was formulated with the cooperation of the MoEP, the World Bank, and the UNEP Copenhagen Centre.

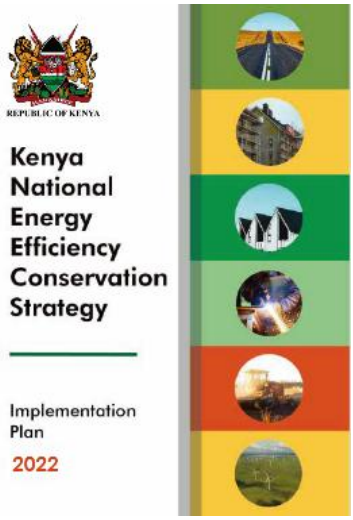


Figure 2-11 NEECS Implementation Plan 2022

This implementation plan includes a matrix that clearly shows the specific activities, timelines, institutions in charge of implementation, and budget required to achieve the targets. It was published about two years after the announcement of the National Energy Efficiency and Conservation Strategy 2020, and in light of legal revisions that took place in the intervening period, some of the measures for achieving the targets were updated from 2020.

The EE&C measures for each sector are set out in the next table.

Table 2-7 NEECS Implementation Plan and Status of EE&C Measures by Sector

Sector	NEECS Implementation Plan 2022	Status as of October 2024
Household	○ MEPS-related ・ six items added/changed (biomass/electricity/LPG cookers, computer monitors, general lighting lamps, televisions).	○ 2016 (initial): six items subject to the labelling system (Ballasts for Fluorescent Lamps, Double Capped Fluorescent Lamps, Self-Ballasted Lamps、Non-Ducted Air Conditioners, Refrigerating Appliances, Three-Phase Case Induction Motors). ○ Although not yet regulated, standards for computers and computer monitors have already been established, and standards for televisions are in the draft stage.
Building	○ Priority given to energy conservation in new buildings and existing public buildings ・ Establish MEPS for buildings. ・ Implement a project to improve the lighting efficiency of existing public buildings. ・ Implement a subsidy/rebate system to encourage public buildings to become green buildings. ○ Although this provision was not included in the NEECS 2020 aiming to achieve the SDG targets, by 2030, new buildings are to be carbon net zero and by 2050 existing buildings are to be carbon net zero.	○ In July 2024, the Building Code 2024 was enacted, which forms the basis for the formulation of MEPS for buildings. ○ The Green Fiscal Incentives Policy Framework (Draft) 2023 (National Treasury) clearly states the incentive system for green buildings.
Industry/ Agriculture	○ Promotion of energy audits and management ・ Project for Energy Audit implementation ・ Curriculum development for energy audits and management ・ Approval of facilities for training energy auditors and managers ○ Energy Management Regulations (Draft) 2021 ・ Establishment of energy performance targets ・ Establishment of an energy credit market	○ UNEP is collaborating to create a curriculum for energy auditing and management. ○ In addition to the Energy Management Regulations 2021 (Draft), Energy Management Regulations 2024 (Draft) [11]have been prepared, although they have not yet been institutionalized.
Transport	○ Implementation of a vehicle labelling program ○ Promotion of electric vehicles ・ Reduction of tariffs and vehicle road taxes for EVs ・ Conversion of internal combustion engine vehicles and small cars to EVs ○ Improvement of vehicle fuel efficiency ・ Installation of intelligent traffic lights ・ Promotion of carpooling ・ Restriction on imports of used cars ○ Promotion of public transport, walking, and bicycling	○ The tariff on EVs was reduced from 20% to 10% in the Financial Act 2019. ○ According to the e-Mobility Market Assessment Report (University of Nairobi, 2024), there are 3,753 EVs in operation. Motorcycles and tricycles account for about 90% of registered vehicles[12].
Utilities	○ ESCO	○ The establishment of a Super ESCO is being supported by AfDB. In April 2024,

[11] The "Energy Management Regulations 2024 (Draft)" states that the government will designate energy management designated factories (heat and electricity consumption of 180,000 kWh or more), energy auditors, energy auditing companies, energy managers, and energy service companies (ESCOs). Its notion is common with Japan's Energy Conservation Law and ISO 50001.

[12] Source: LCPDP 2024-2043.

Sector	NEECS Implementation Plan 2022	Status as of October 2024
	・ Creation of a DSM concept paper for off-takers ・ Establishment of a super ESCO ○ Other Measures ・ Reduction of transmission and distribution losses ・ Development of a framework for ancillary services ・ Test operation of BESS	KPLC published an Expression of Interest and it is expected that a Super ESCO will be established in the future. ○ The revision of the transmission and distribution master plan is being carried out with the support of the AFD. ○ In early 2024, KenGen announced that it would implement a 100-MW BESS project funded by the World Bank and the Green Climate Fund (GCF).

Abbreviations: AFD = French Development Agency / Agence Française de Développement, AfDB = African Development Bank, BESS = battery energy storage system, ESCO = energy service company, EV = electric vehicle, KenGen = Kenya Electricity Generating Company, KPLC = Kenya Power and Lighting Company, LCPDP = Least Cost Power Development Plan, MEPS = minimum energy performance standards, UNEP = United Nations Environment Programme

Source: Prepared by the JST based on the NEECS Implementation Plan 2022

(6) National E-Mobility Policy (Draft)

Kenya's first National e-Mobility Policy (Draft, illustrated in the next figure) was formulated by the Ministry of Road and Transport and announced in March 2024.[13] In addition to the policy's vision and mission, the draft policy clearly states its goals, key issues, policy principles, and policy measures, and provides a comprehensive message for the promotion of e-mobility.

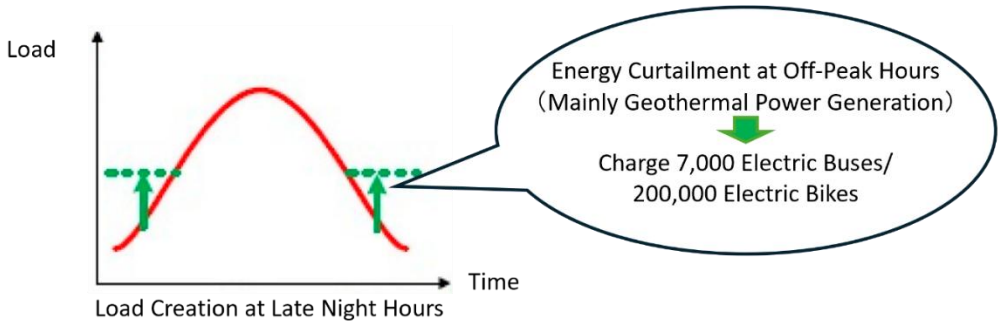
Figure 2-12 Draft National E-Mobility Policy

The draft policy states that 495,437 MWh (July 2022-June 2023) of electricity has been curtailed[14] (about 4.7% of annual consumption),[15] and if the curtailed power during off-peak hours is used, it would be possible to charge about 7,000 electric buses or about 200,000 electric motorcycles per day. Given that Kenya's power grid has sufficient capacity to support e-mobility, the spread of e-mobility is considered an effective measure to cope with the power curtailment during off-peak hours.

The TOU for e-mobility was introduced with a new electricity pricing system in March 2023,[16] and the National E-Mobility Policy (Draft) proposes a preferential electricity rate for EVs as an

[13] The development of the policy proposal was supported by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH (German Corporation for International Cooperation).
[14] Referred to EPRA statistic data.
[15] The amount of electricity consumed in 2024 was 10,488 GWh.
[16] Approval of the Schedule of Tariffs Set by the Energy Regulatory Authority for Supply of Electrical Energy by the Kenya Power and Lighting Company Ltd., 2023.

incentive to promote the adoption of EVs. The following figure presents an image of load creation during late night hours through e-mobility.



Source: Prepared by the JST based on the Draft National E-Mobility Policy, Ministry of Road and Transport 2024

Figure 2-13 Load Creation during Late Night Hours through E-Mobility (Image)

(7) Standards and Labeling Program (S&L) / Minimum Energy Performance Standards (MEPS)

In 2016, the Energy (Appliances' Energy Performance and Labeling) Regulations (MoEP Cabinet Secretary Regulations) introduced labeling program (Standards and Labeling, S&L).[17] The system covers six types of equipment: Ballasts for Fluorescent Lamps, Double Capped Fluorescent Lamps, Self-Ballasted Lamps, Non-Ducted Air Conditioners, Refrigerating Appliances, Three-Phase Case Induction Motors. The equipment is classified as shown in the next table, with reference to Minimum Energy Performance Standards (MEPS), and it is labelled using a star rating system (see the following figure for an example of this rating system).

Table 2-8 Energy Efficiency Rating for Home Appliances

Equipment/Home Appliances Covered	Evaluation Stages
Energy efficiency of air conditioners and refrigerators	1 (Lowest)-5 (Highest)
Energy efficiency of motors	1 (Lowest)-3 (Highest)
Energy efficiency of lighting equipment	A (Lowest)-G (Highest)

Source: Prepared by the JST based on Regulatory Impact Assessment on the Energy (Appliances' Standards and Labelling) Regulations, Draft Report

Figure 2-14 Label Showing an Example of the Star Rating System

[17] There were supports from UNEP and the Global Environment Facility (GEF).

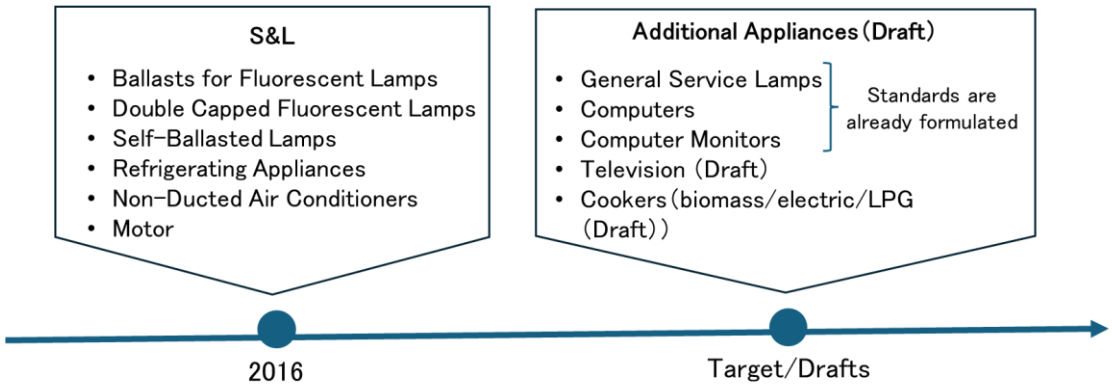
In 2020, standards for Ballasts for fluorescent lamps, double-capped fluorescent lamps, and self-ballasted lamps defined in the Energy (Appliances' Energy Performance and Labeling) Regulations were replaced by new standards (General Service Lamps, GSL). Also, star evaluation standards for computers and computer monitors were added, with star evaluation standards for televisions also being drafted. While these standards have been formulated and drafted, the labelling regulations need to be revised for the institutionalization of MEPS for the additional items, the regulations for which have not been revised since 2016. The next table presents relevant standards of appliances.

Table 2-9 Standards of Appliances

Item No.	Standard	Title	Description
1	KS 2449: 2013	Rotating Electrical Machines	An energy efficiency standard for three-phase induction cage motors with ratings range of 0.75 kW to 75 kW using a three-star label system that relates to efficiency classes IE1, IE2, and IE3.
2	KS 2463: 2019	Non-Ducted Air Conditioners	An energy efficiency standard for non-ducted air conditioners that uses a five-star rating system that relates to specified energy efficiency ratios (EER) in watts.
3	KS 2464: 2020	Refrigerating Appliances	An energy efficiency standard for domestic refrigerators that uses a five-star rating that relates to the star rating index (SRI) and respective annual energy consumption
4	KS 2914: 2020	General Service Lamps	An energy efficiency standard for general service lamps for general illumination that uses a seven-class rating based on lighting efficacy in lumens per watt (lm/W).
5	KS 2880: 2020	Computers	Energy efficiency standards for computers based on maximum energy consumption (MEC).
6	KS 2879: 2020	Computer Monitors	An energy efficiency standard that uses a five-star rating system based on an SRI.
7	KS 62087 .1	Televisions (Draft)	An energy efficiency standard that uses a five-star rating system based on an SRI.

Source: Prepared by the JST based on the Regulatory Impact Assessment on the Energy Appliances' Standards and Labelling Regulations Draft Report, EPRA

The timeline since the introduction of the labeling program is shown in the next figure.



Source: Prepared by the JST based on Regulatory Impact Assessment on The Energy (Appliances' Standards And Labelling) Regulations Draft Report, Energy and Petroleum Regulatory Authority

Figure 2-15 Timeline of Draft Targets since the S&L Program was Established

(8) Time of Use

In order to achieve a 24-hour economy in the industrial and commercial sectors, and to encourage electricity consumption during off-peak hours, a time of use (TOU) electricity rate system for industrial and commercial customers was introduced in December 2017. In addition, TOU for e-mobility was introduced in March 2023. The current TOU system is available for small commercial use (SC 3), commercial and industrial use (C&I 1 to C&I 7), and e-mobility.

The next table shows the TOU time periods and the customers/categories that are eligible to receive discounts.

Table 2-10 Off-Peak Hours and Target Customer Categories in TOU

Off-Peak Hours	TOU Customer Category
・Weekdays: 22:00-06:00 ・Saturdays：14:00-08:00 ・Sunday/Holiday: All day	・SC 3: Small Commercial ・C&I 1-7: Commercial and Industry ・EM: E-mobility

Source: Prepared by the JST based on Approval of the Schedule of Tariffs Set by the Energy Regulatory Authority for Supply of Electrical Energy by the Kenya Power and Lighting Company Limited, 2023

For small-scale commercial and industrial/commercial customers, the system offers a 50% discount on electricity prices during off-peak hours, provided that monthly electricity consumption exceeds the threshold. The following table shows the criteria for TOU and tariff discounts.

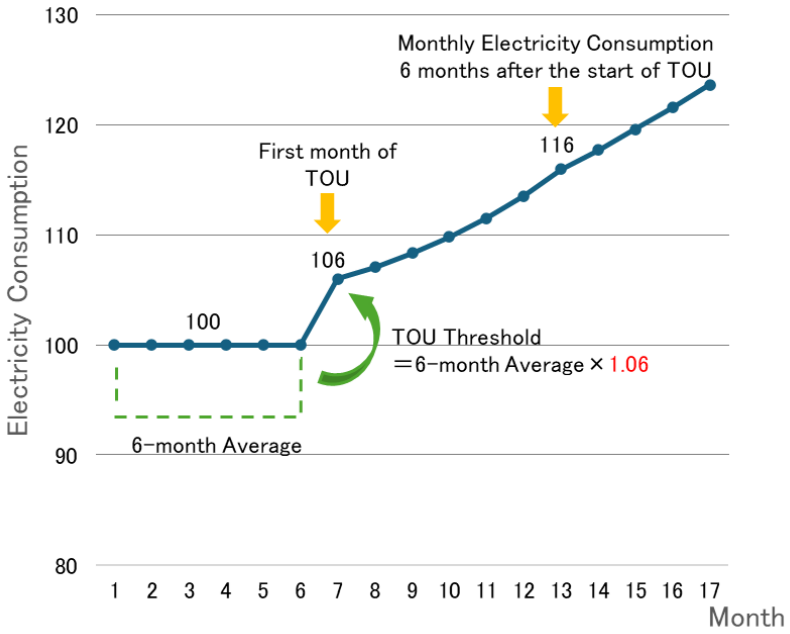
Table 2-11 Criteria for TOU and Tariff Discounts

TOU Customer	TOU Threshold	Additional Discounts
Small Commercial and Commercial & Industry	The Energy Consumption Threshold is the existing average monthly consumption for the last six consecutive months adjusted with a growth factor of 6%.	Upon satisfactory confirmation by KPLC of the operation at 100% production capacity during peak and off-peak periods, an additional 5% discount is applied to off-peak consumption from the fee after the TOU is applied.
New Customers: Small Commercial and Commercial & Industry	The Energy Consumption Threshold is the average monthly consumption for the first three consecutive months adjusted with a growth factor of 6%.	

Abbreviations: KPLC = Kenya Power and Lighting Company, TOU = time of use

Source: Prepared by the JST based on Approval of the Schedule of Tariffs Set by the Energy Regulatory Authority for Supply of Electrical Energy by The Kenya Power and Lighting Company Limited, 2023

The next figure illustrates moving thresholds by month under the TOU program.



Source: Prepared by the JST based on Approval of the Schedule of Tariffs Set by the Energy Regulatory Authority for Supply of Electrical Energy by the Kenya Power and Lighting Company Limited, 2023

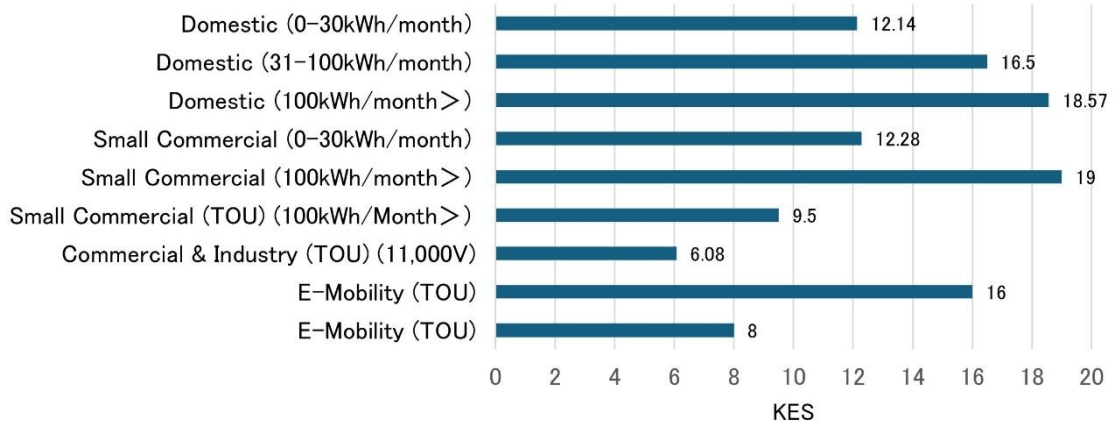
Figure 2-16 Moving Thresholds under the TOU Program (Image)

A TOU tariff system for e-mobility has also been introduced with the most recent electricity price revision in April 2023, and as of 2023/24, 30 customers had signed contracts with KPLC.[18] Although the number of customers benefiting from the TOU system is still limited, the demand for electric buses in particular has been higher than expected, and the number of customers exceeding the upper limit of 15,000 kWh/month is increasing. EPRA is already considering revisions to the upper limit of electricity consumption.[19]

However, a TOU system for households has not yet been introduced, and any consideration/progress in this regard could not be confirmed from a review of various related documents.[20]

The following figure compares electricity tariffs by major category in 2025/26.[21]

[18] Energy & Petroleum Statistics Report for the Financial Year Ending 30th June 2024, EPRA.
[19] Energy & Petroleum Statistics Report for the Financial Year Ending 30th June 2024, EPRA.
[20] There are about 6.3 million households with monthly electricity consumption of 30kWh or less (lifeline category), which is 71.3% of the total number of KPLC customers. Source: Press Release Retail Electricity Tariff Review for the 2022/23-2025/26 4th Tariff Control Period Effective 1st April, EPRA.
[21] The monthly bill paid by customers includes the regulated prices and the following tariff adjustment charges:
- Fuel energy charge (FEC);
- Water Resource Management Levy (WARMA);
- Inflation adjustments; and
- foreign exchange rate fluctuation adjustments (FERFA).



Source: Prepared by the JST based on Approval of the Schedule of Tariffs Set by the Energy Regulatory Authority for Supply of Electrical Energy by the Kenya Power and Lighting Company Limited, 2023

Figure 2-17 Comparison of Electricity Tariff by Category (2025/26)

The next table shows the electricity tariff for 2022/23-2025/26 by customer category.

Table 2-12 Electricity Tariff by Customer Category (2022/23-2025/26)

Code	Customer	Metered Voltage	Energy Limit kWh/month	Charge Method	Unit	2022/23	2023/24	2024/25	2025/26
DC	Domestic Lifeline	240 or 415	0-30	Energy	KShs/kWh	12.22	12.24	12.23	12.14
	Domestic Ordinary 1	240 or 415	31-100	Energy	KShs/kWh	16.30	16.58	16.54	16.50
	Domestic Ordinary 2	240 or 415	>100	Energy	KShs/kWh	20.97	20.58	19.08	18.57
	Small Commercial 1	240 or 415	0- 30	Energy	KShs/kWh	12.22	12.24	12.23	12.28
	Small Commercial 2	240 or 415	31-100	Energy	KShs/kWh	16.40	16.36	16.34	16.30
	Small Commercial 3	240 or 415	>100	Energy	KShs/kWh	20.18	20.00	19.40	19.00
	TOU	240 or 415	>100	Energy	KShs/kWh	10.09	10.00	9.70	9.50
	Bulk Tariff	240 or 415	1,000-15,000	Energy	KShs/kWh	19.30	19.12	18.30	18.00
EM	E-mobility	240 or 415	200-15,000	Energy	KShs/kWh	16.00	16.00	16.00	16.00
	TOU	240 or 415	200-15,000	Energy	KShs/kWh	8.00	8.00	8.00	8.00
C&I 1	Commercial & Industrial	415	>15,000	Energy	KShs/kWh	14.70	14.50	13.74	13.44
	TOU	415	>15,000	Energy	KShs/kWh	7.35	7.25	6.87	6.72
	Bulk Tariff	415	>15,000	Energy	KShs/kWh	14.70	14.50	13.74	13.44
				Demand	KShs/kVA	1,100.00	1,100.00	1,100.00	1,100.00
C&I 2	Commercial & Industrial	11,000	No Limit	Energy	KShs/kWh	13.24	13.08	12.44	12.16
	TOU	11,000	No Limit	Energy	KShs/kWh	6.62	6.54	6.22	6.08
	Bulk Tariff	11,000	No Limit	Energy	KShs/kWh	13.24	13.08	12.44	12.16
				Demand	KShs/kVA	700.00	700.00	700.00	700.00
C&I 3	Commercial & Industrial	33,000	No Limit	Energy	KShs/kWh	12.66	12.52	11.92	11.68
	TOU	33,000	No Limit	Energy	KShs/kWh	6.33	6.26	5.96	5.84
	Bulk Tariff	33,000	No Limit	Energy	KShs/kWh	12.66	12.52	11.92	11.68
				Demand	KShs/kVA	370.00	370.00	370.00	370.00

Code	Customer	Metered Voltage	Energy Limit kWh/month	Charge Method	Unit	2022/23	2023/24	2024/25	2025/26
C&I 4	Commercial & Industrial	66,000	No Limit	Energy	KShs/kWh	12.40	12.26	11.68	11.42
	TOU	66,000	No Limit	Energy	KShs/kWh	6.20	6.13	5.84	5.71
	Bulk Tariff	66,000	No Limit	Energy	KShs/kWh	12.40	12.26	11.68	11.42
				Demand	KShs/kVA	300.00	300.00	300.00	300.00
C&I 5	Commercial & Industrial	132,000	No Limit	Energy	KShs/kWh	12.12	11.98	11.40	11.16
	TOU	132,000	No Limit	Energy	KShs/kWh	6.06	5.99	5.70	5.58
	Bulk Tariff	132,000	No Limit	Energy	KShs/kWh	12.12	11.98	11.40	11.16
				Demand	KShs/kVA	300.00	300.00	300.00	300.00
C&I 6	Commercial & Industrial	220,000	No Limit	Energy	KShs/kWh	10.00	10.00	10.00	10.00
	TOU	220,000	No Limit	Energy	KShs/kWh	7.42	7.42	7.42	7.42
			Demand	Energy	KShs/kWh	200.00	200.00	200.00	200.00
C&I 7	Special Economic Zone	-	No Limit	Energy	KShs/kWh	10.00	10.00	10.00	10.00
	TOU	-	No Limit	Energy	KShs/kWh	7.42	7.42	7.42	7.42
				Demand	KShs/kVA	200.00	200.00	200.00	200.00
SL	Street Lighting	240 or 415	No Limit	Energy	KShs/kWh	9.22	9.24	9.23	9.15

Source: Prepared by the JST based on EPRA Press Release Retail Electricity Tariff Review for the 2022/23-2025/26 4th Tariff Control Period (TCP) Effective 1st April 2023 and Approval of the Schedule of Tariffs Set by the Energy Regulatory Authority for Supply of Electrical Energy by the Kenya Power and Lighting Company Limited 2023

(9) Electricity Access Rate

As shown in the next table, there is a large gap in electricity access between rural and urban areas where most households are electrified. The Least Cost Electrification Plan (LCEP) presents initiatives/scenarios aimed at achieving 100% electrification.

Table 2-13 Latest Data on Electricity Access (Urban and Rural areas)

No. of Urban Houses (in 1000s)	No. of Connected (Urban Areas] (in 1,000s)	Urban Connect-ion rate	No. of Rural Houses (in 1,000s)	No. Connected (Rural areas] (in 1,000s)	Rural Connect-ion Rate	Total No. of Houses (in 1,000s)	No. Connected (Total) (in 1,000s)	Total Connect-ion Rate
5,604	5,492	98%	78,629	5,093	65%	13,466	10,585	79%

Sources: Prepared by the JST based on various documents including the Least Cost Electrification Plan (MoEP, October 2024)

2.1.2 Confirmation of the Updates of the Master Plan for Power Generation and Transmission Supported by the French Development Agency (AFD)

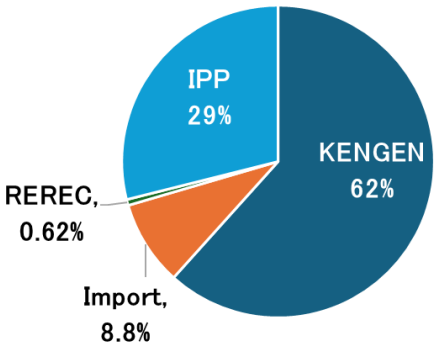
The Initial Country Report (ICR) for the project updating the master plan for power generation and transmission was prepared in October 2024, with the aim of updating the Generation and Transmission Master Plans, Medium-Term (2015-2020) and Long-Term (2015-2035), October 2016, which was formulated with the support of the French Development Agency (Agence Française de Développement, AFD). This revision will focus on the expansion plans for the power transmission and distribution network and the study of solar power generation systems, with the study of storage capacity covered by the Lowest Cost Power Development Plan (LCPDP) 2024-43[22].

Regarding the update of these master plans, in August 2023, MoEP issued a Request for Expressions of Interest to invite consultants. At a meeting with ethe counterparts in January 2025, it has been confirmed that the selection of consultants had already been carried out, but any significant progress has not confirmed.

2.2 Verification of the Electricity Sector Structure in Kenya

Kenya's electricity sector is vertically unbundled. Private companies have entered the power generation market, and while KenGen, which is 70% government-owned, accounts for 62% of the market, independent power producers (IPPs) account for about 29%, as shown in the following figure. Despite the increasing involvement of private companies in power generation, transmission and distribution are still undertaken by KPLC and KETRACO, which are over 50% government-owned, with a single trading model by which power is bought and sold through long-term power purchase agreements (PPAs) .

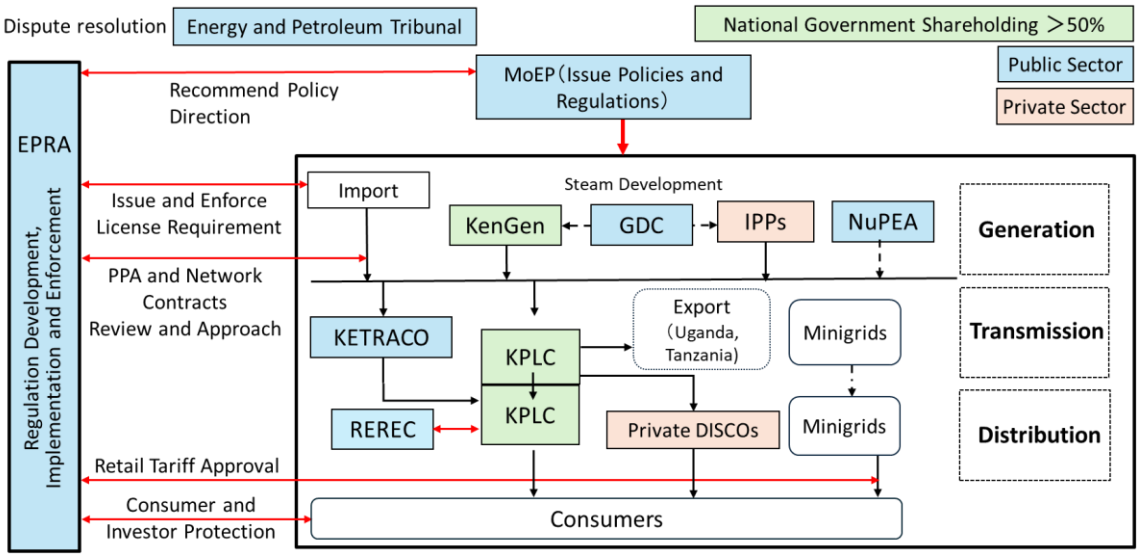
[22] The scope of work for the consultants in formulating the M/P indicated consideration of storage capacity.



Source: Prepared by the JST based on the Energy & Petroleum Statistics Report for the Financial Year Ending 30th June 2024, EPRA

Figure 2-18 Electricity Market Share (2023/2024)

The next figure illustrates current overall structure of the energy sector in Kenya and it should be noted that the Nuclear Power and Energy Agency (NuPEA) has been absorbed by the Ministry of Energy in January 2025.



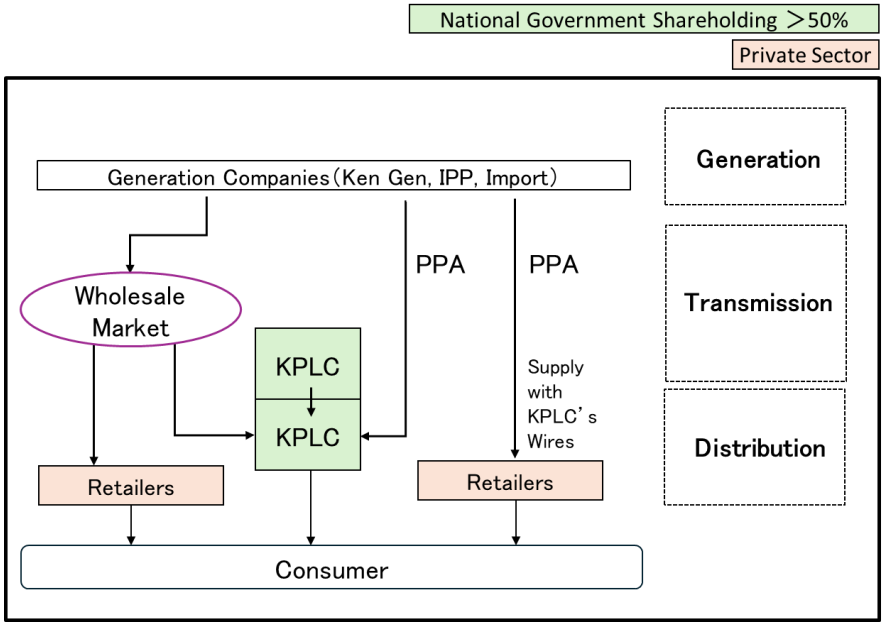
Abbreviations: DISCO = Distribution Company, EPRA = Energy and Petroleum Regulatory Authority, GDC = Geothermal Development Company, IPPs = Independent Power Producers, KenGEN = Kenya Electricity Generating Company, KETRACO = Kenya Electricity Transmission Company, KPLC = Kenya Power and Lighting Company, MoEP = Ministry of Energy and Petroleum, PPA = Power Purchase Agreement, REREC = Rural Electrification, and Renewable Energy Corporation

Source: Prepared by the JST based on the Least Cost Power Development Plan, 2021-2030 (EPRA et al., 2021)

Figure 2-19 Overall Structure of the Energy Sector in Kenya

The Energy Act 2019 calls for commencing operation of a wholesale electricity market, and promotes reform and liberalization of the electricity sector structure. To promote the liberalization of the distribution and retail functions, The Energy (Electricity Market, Bulk Supply and Open Access) Regulations were promulgated in the official gazette in February 2024, and National Energy Policy is scheduled to be implemented updated by the end of June 2025. These regulations will form the basis for retailers to form PPAs directly with IPPs and foreign power generation companies.

From discussions with MoEP and EPRA, it is apparent that MoEP and EPRA are cautious about the start of operation of the wholesale power market, and although no specific start date has been announced[23], it is expected that power will be sold through long-term PPAs and traded on the wholesale power market in parallel (see Figure 2-20).



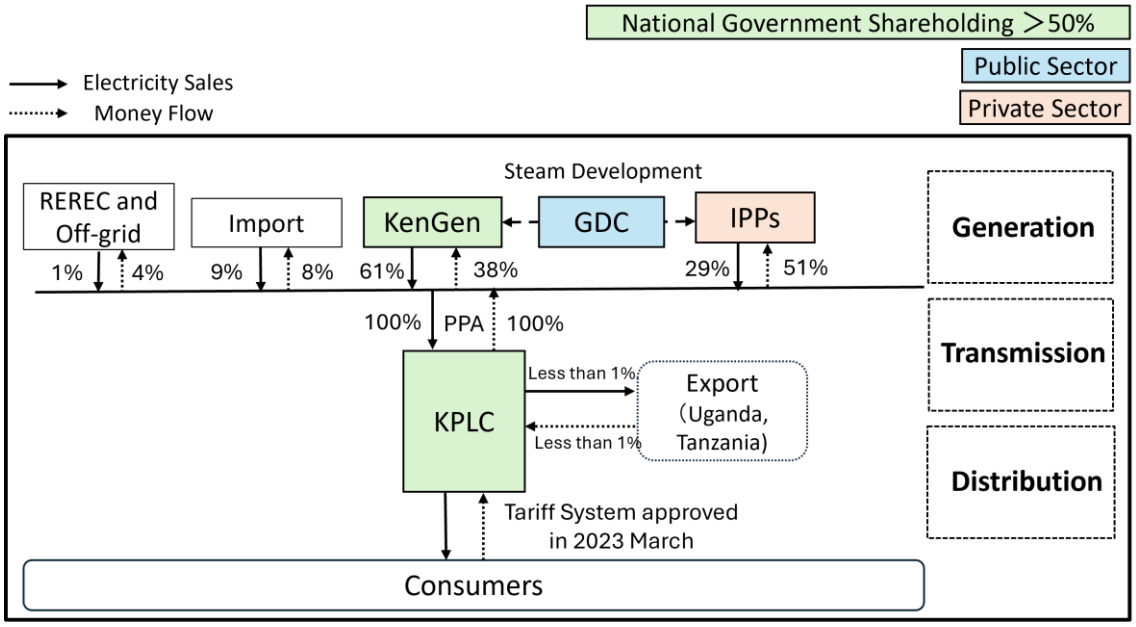
Source: Prepared by the JST based on discussion with project counterparts

Figure 2-20 Energy Contract Structure after Introduction of the Wholesale Market (Image)

2.2.1 Comparison of Electricity Sales and Purchase Costs by Power Generation Type

The proportion of the total amount of electricity purchased (GWh) and purchase cost (KES basis) by power generation company is shown in the following figure, with the amount of electricity purchased from KenGen accounting for the largest proportion at around 61%. In contrast, the IPPs account for the largest proportion of the purchase cost at around 51%.

[23] Information from C/Ps in October 2024.



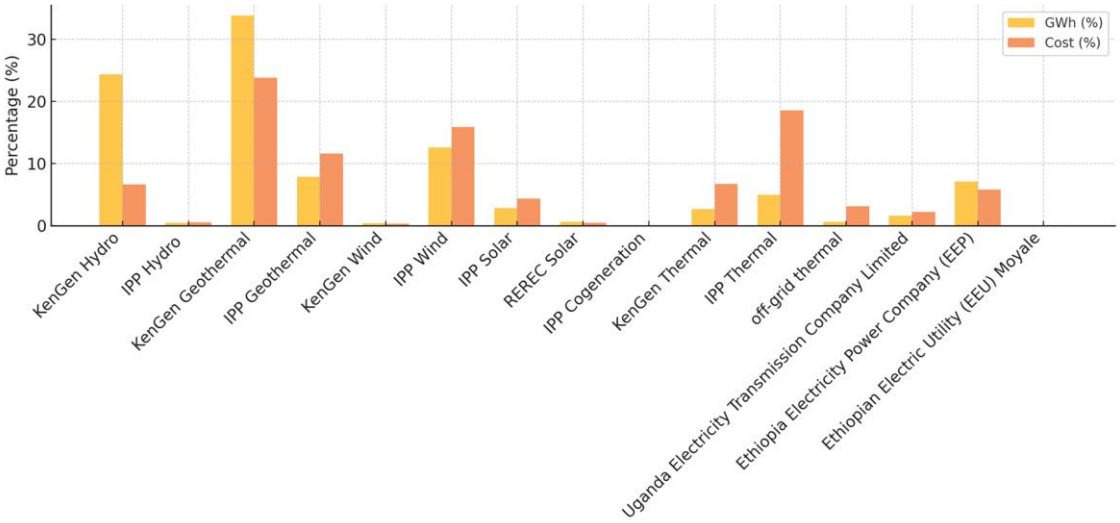
Abbreviations: GDC=Geothermal Development Company, IPPs= Independent Power Producers, KenGEN=Kenya Electricity Generating Company, KPLC=Kenya Power and Lighting Company, PPA=Power Purchase Agreement, REREC=Rural Electrification and Renewable Energy Corporation

Source: Prepared by the JST based on "Least Cost Power Development Plan, 2024-2043, EPRA etc. 2024" and "Annual Report and Financial Statements for the Year Ended 30th June 2024, KPLC"

Figure 2-21 Electricity Sales and Purchase Cost per Power Generation Category

The next figure provides a more detailed breakdown of the proportion of electricity purchased (GWh) and purchase cost (KES) by power generation type, based on KPLC's financial statement (2023/2024). It can be observed that electricity generated by KenGen's hydropower is relatively inexpensive, whereas the electricity unit price for IPP thermal power generation is relatively expensive.

The power supply commands to each generator are operated in the order of the cheapest power sources (merit order) as load increases, while taking into account the holistic stability of the power system.



Source: Prepared by JST based on Annual report and Financial Statements for the Year Ended 30th June 2024, KPLC

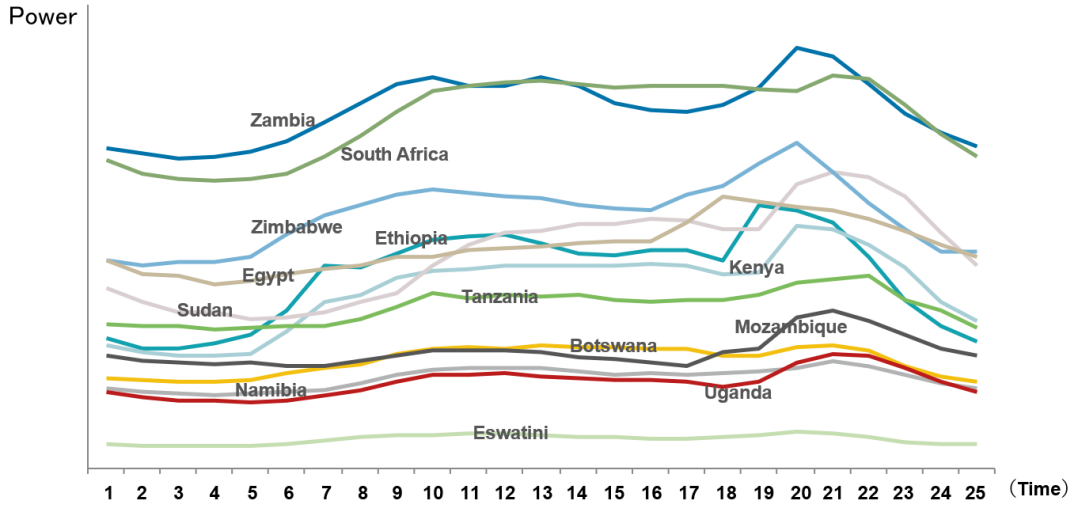
Figure 2-22 Comparison of GWh Purchased and Cost Percentages by Source

2.3 Feasibility Study of Application to Other African Countries

In Kenya, while electrification policies such as e-cooking and e-mobility are being promoted, nighttime peak electricity demand is expected to increase. This survey examined both technical and regulatory measures for the optimal utilization of energy on the demand side—focusing on nighttime peak demand reduction and energy efficiency—alongside the advancement of these policies (see Appendices).

Furthermore, based on relevant data from 11 selected African countries, an assessment was conducted to determine the priority of expanding the DSM and EE&C promotion measures, using Kenya as a model.

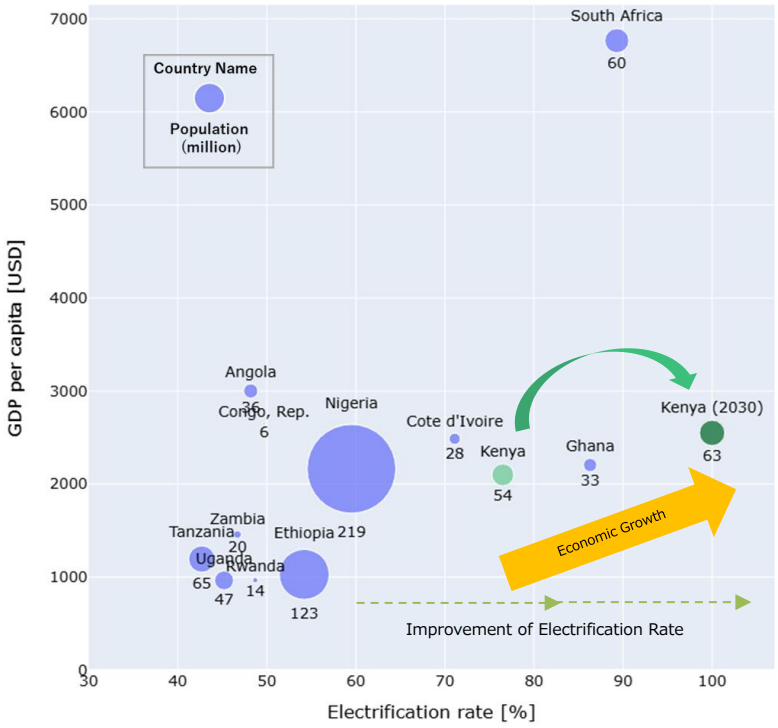
As shown in the following figure, the daily load curves of various African countries indicate a similar trend to Kenya, where peak electricity demand occurs during nighttime hours.



Source: Compiled by JST from Planning and Prospects for Renewable Power: Eastern and Southern Africa, International Renewable Energy Agency (IRENA)

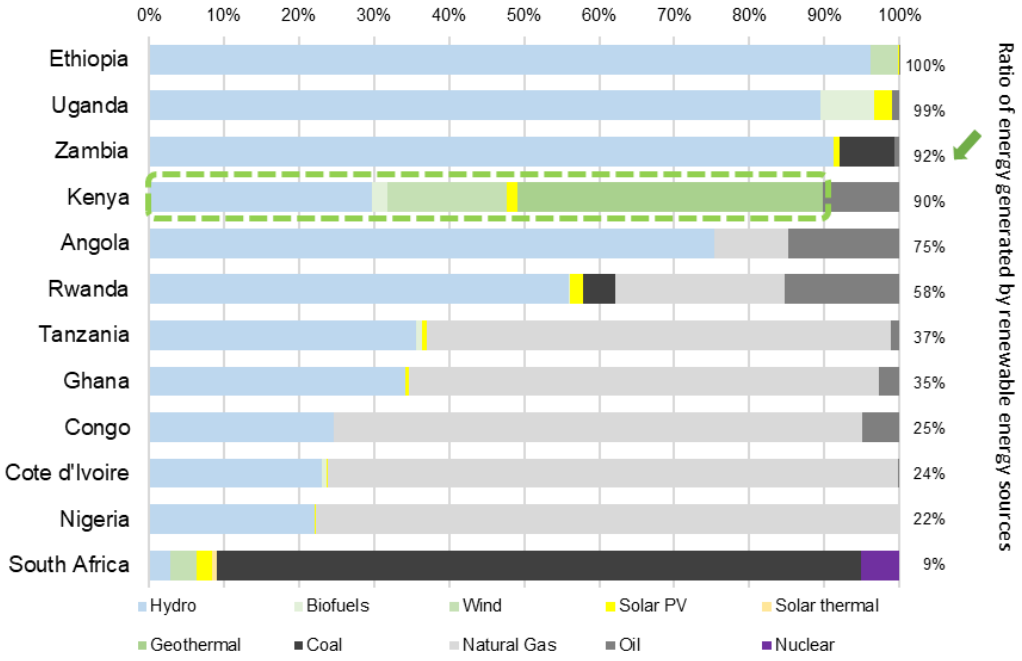
Figure 2-23 Daily Load Curves for Selected African Countries (average for January except in South Africa, for which the May-August average is shown)

Figure 2-24 illustrate the electrification rate, population size, per capita GDP, and Figure 2-25 provides the power generation mix by energy source for the African countries under consideration for potential expansion. Kenya has a high share of renewable energy in its power generation mix, with a well-balanced composition of geothermal, hydro, and wind power. Given this structure, Kenya serves as a promising model for green growth in other African countries.



Source: Prepared by the JST based on published data from the World Bank, IMF, and United Nations.

Figure 2-24 Electrification Rate, Population Size and GDP per Capita of Each Country



Source: Prepared by the JST based on IEA published data

Figure 2-25 Electrification Rate, Population Size and GDP per Capita of Each Country

Furthermore, as findings from this survey, it has been considered the following characteristics of each country in Sub-Saharan Africa (11 countries) as target countries that can effectively tackle green growth from the perspectives of DSM/EE&C.

2.3.1 Electricity Prices in Each Country

The next table shows the household electricity prices in the 11 countries surveyed. By positioning the countries with the high electricity prices as the priority target countries for promoting DSM, the following seven countries are applied.

South Africa, Zambia, Uganda, **Mozambique**, **Ghana**, Ivory Coast, **Tanzania**

Table 2-14 Household Electricity Prices in 11 Countries (USD/kWh) (2023)

Country	Household electricity price (USD/kWh)
Ethiopia	0.01
Angola	0.02
Democratic Republic of the Congo	0.03
Nigeria	0.05
Tanzania	0.10
Ivory Coast	0.12
Ghana	0.13
Mozambique	0.13
Uganda	0.17
Zambia	0.20
(Kenya)	(0.22)
South Africa	0.23

Source: Statista

2.3.2 Progress of DSM/EE&C Policies in Each Country

The next table shows the status of initiatives to promote DSM/EE&C in 11 countries. By positioning the countries, where it has been confirmed the formulation of DSM/EE&C policies/strategies, as priority countries for promoting DSM, the following seven countries are applied.

South Africa, Zambia, **Mozambique, Ghana, Tanzania,** Nigeria, Ethiopia

Table 2-15 Status of Implementation of DSM/EE&C Policies in 11 Countries

Country	EE&C Policies/Strategies	S&L Program	TOU	TOU for Household	E-mobility Policy/Incentives
South Africa	✓	✓	✓	✓	✓
Ghana	✓	✓	N/A	N/A	✓
Nigeria	✓	✓	N/A	N/A	✓
Ethiopia	✓	✓	N/A	N/A	✓
Zambia	✓	△	✓	N/A	✓
Tanzania	✓	△	N/A	N/A	△
Mozambique	✓	△	N/A	N/A	△
Uganda	N/A	△	✓	N/A	N/A
Ivory Coast	N/A	N/A	✓	N/A	△
Angola	N/A	N/A	N/A	N/A	✓
Democratic Republic of the Congo	N/A	N/A	N/A	N/A	N/A

Note: ✓ indicates that an EE&C policy/strategy has been formulated separately from the national energy policy.
△ indicates that EE&C policy/strategy is still in the draft stage.

Source: Prepared by the JST based on each country's energy policy, etc.

2.3.3 Fossil Fuel Imports/Exports and its Use in Thermal Power Generation

It can be considered one of the triggers for accelerating DSM/EE&C promotion activities is whether a country is rich in fossil fuels or not as a domestic resource (i.e. in countries with abundant renewable energies, enough acceleration of the activities may experience difficulties). In the former case, the cost of importing/purchasing fossil fuels can lead to pressure on the domestic economy, and in the latter case, it can be realized to generate revenue by using the fossil fuel consumed in thermal power generation for exports.

In this survey, with reference to the energy balance (2022) for 11 countries published by IEA and the Africa Energy Commission, the amount of fossil fuel exports and the amount of fossil fuel used in thermal power generation have been confirmed. The extracted countries that import/export fossil fuels and use a certain amount of fossil fuels in thermal power generation are the following seven countries.

South Africa, Mozambique, Nigeria, **Ghana,** Angola, **Tanzania,** Ivory Coast

Based on the field surveys results in Kenya and Tanzania, the survey results of the three items above, and the situation regarding the Japanese companies market entries, the following table summarizes the issues and priorities that should be considered with regards to the feasibility of promoting DSM/EE&C to contribute to green growth in each country in Sub-Saharan Africa.

Table 2-16 Consideration Items for Possibility Examination in Marketing African Countries and Priorities

Power Sector Structure	Country (City Name)	RE-derived power generation rate	Affinity with energy storage technology	Electrification rate	Economic strength	Room for diffusion of efficient technologies (lighting, water heaters, refrigerators, etc.)	Room for diffusion of efficient ACs	Residential Electricity Rates	Status of Japanese Companies Market Entry	EE Policy Progress	Fossil fuel import/ export	Input to thermal power generation	**Overall priority**
Unbundled (Nairobi climate)	Ethiopia (Addis Ababa)	100	High	High	Middle	High	Middle	Low	High	High	Importing country	N/A	⑨
	Uganda (Kampala)	99	High	Middle	Middle	High	Middle	High	Middle	Middle	Importing country	N/A	⑧
Vertically integrated (Nairobi climate)	**South Africa (Johannesburg)**	9	Low	High	High	High	Middle	High	High	High	Importing country	Domestic coal + gas-fired power	②
	Democratic Republic of the Congo (Kinshasa)	25	Middle	Low	Middle	High	Middle	Low	High	Low	Importing country	Limited	⑩
	Zambia (Lusaka)	92	High	Middle	Middle	High	Middle	High	Low	High	Importing country	Limited	⑪
Branch type (Mombasa climate)	**Nigeria (Lagos)**	22	Middle	High	High	High	High	Low	High	High	Gas domestic production	Gas-fired power	④
	Ghana (Accra)	35	Middle	High	High	High	High	High	High	High	Gas domestic production	Gas-fired power	③
	Angola (Luanda)	75	High	Middle	High	High	High	Low	Low	Middle	Oil imports + domestic gas	Oil consumption is high	⑥
Vertically integrated (Mombasa climate)	**Tanzania (Dar es Salaam)**	37	Middle	Middle	Middle	High	High	High	High	High	Oil imports + domestic gas	Domestic natural gas	①
	Cote d'Ivoire (Abidjan)	24	Middle	High	High	High	High	High	High	Middle	Gas domestic production	Gas-fired power	⑤
	Mozambique (Maputo)	83	High	Low	Low	High	High	High	Middle	Low	Gas domestic production	Gas-fired power	⑦

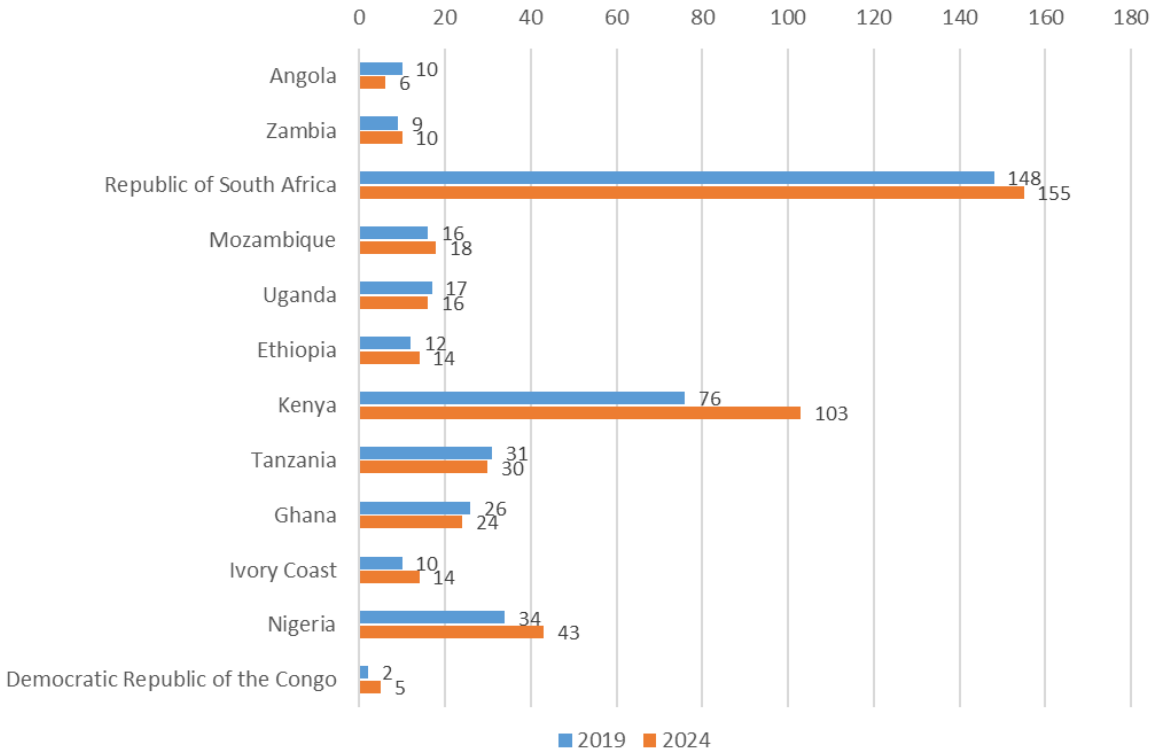
Source: Prepared by the JST

2.4 Feasibility Study of Introduction of Energy-Saving Equipment in Africa by Japanese Companies

2.4.1 Overview and Trends of Japanese Company's Expansion (including All Sectors in addition to Energy-saving Equipment)

In the 11 target countries identified by the survey team, as well as in Kenya, Japanese companies have established a presence in all countries, as illustrated in the following figure. However, there is a notable concentration in South Africa, Kenya, and Nigeria.

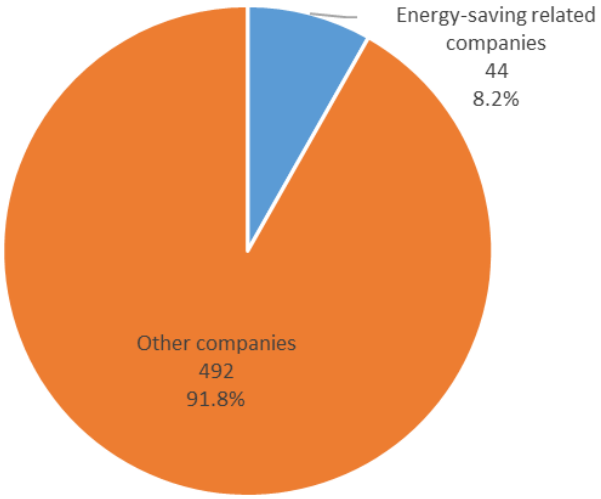
Furthermore, over the five-year period from 2019 to 2024, the number of business locations has increased in most of these countries, with Kenya experiencing the highest growth in the number of established offices.



Source: Prepared by the JST from "List of Japanese companies involved in African business, 2019 edition" and "List of Japanese companies involved in African business, 2024 edition" (Africa Business Partners)

Figure 2-26 Changes in the Number of Bases in 2019 and 2024 in the JST's Proposed Countries and Kenya

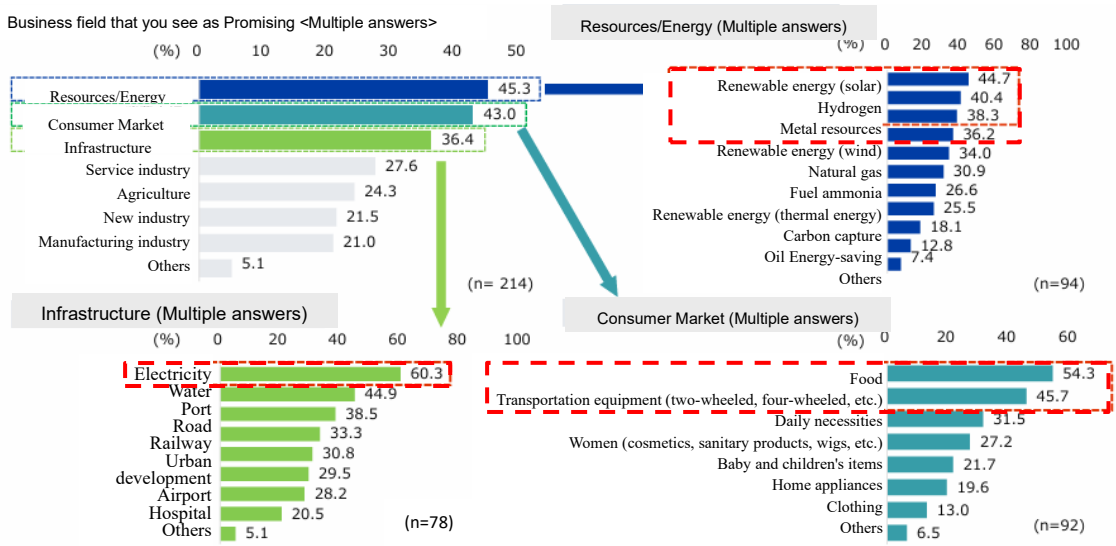
As shown in the next figure, of the 536 companies operating in Africa as of 2024, 44 companies are engaged in business related to energy-saving equipment such as air conditioners and refrigerators, accounting for 8.2%.



Source: Prepared by the JST from "List of Japanese companies involved in African business 2024 edition" (Africa Business Partners)

Figure 2-27 Percentage of Companies Engaged in Energy-saving Related Business

Furthermore, according to JETRO, there have been many cases of Japanese startups and companies entering carbon-free and green-related fields, such as renewable energy, as a recent trend in expanding into Africa[24], and the resource and energy field is a promising business field in Africa. A survey conducted by JETRO in fiscal 2024 revealed that energy-saving devices are being viewed as such (see the next figure), and as the number of companies in this field expands into Africa, we can expect an increase in the number of companies dealing in energy-saving equipment.



Source: "2024 Survey of Japanese Companies Expanding Overseas | Africa Edition" (JETRO)

Figure 2-28 Promising Business Fields for the Future[25]

[24] Source: Trends in Japanese Companies Expanding into Africa: Increasing Number of Business Locations (JETRO) (https://www.jetro.go.jp/biz/areareports/special/2024/1202/f5184ec08d46cbf2.html), accessed January 31, 2025.

[25] Survey results targeting Japanese companies in Africa, local subsidiaries with a Japanese investment ratio of 10% or more, and Japanese branches and representative offices.

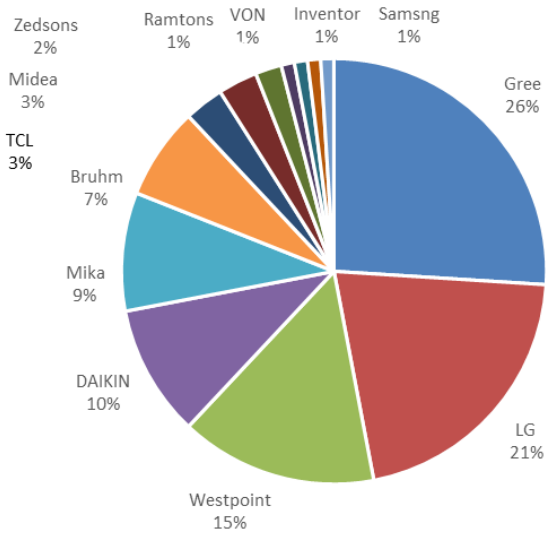
Based on the above, the overall trend indicates an increasing number of Japanese companies expanding into Africa. This suggests that market entry in the energy efficiency sector is also expected to grow. Consequently, opportunities and a more favorable business environment for Japanese companies dealing in energy-saving equipment to enter the African market are expected to develop.

2.4.2 Market Share of Japanese Companies for Energy-saving Equipment in Kenya and Tanzania

Regarding room air conditioners, refrigerators, and heat pumps, which were subject to effective peak load reduction and peak shift measures in this study, market surveys of the equipment have been conducted in Kenya and Tanzania.

(1) Room Air Conditioner Market in Kenya

The next figure shows the share of room air conditioners by brand. Gree, a brand owned by a Chinese company, has the largest share with 26%, followed by LG, a brand owned by a Korean company, with 21%, and Westpoint, a French company, with 15%. The market share of Japanese company Daikin is 10%. In addition, MIKA, a local company brand (products are OEM-manufactured by Chinese companies), has a 9% share.

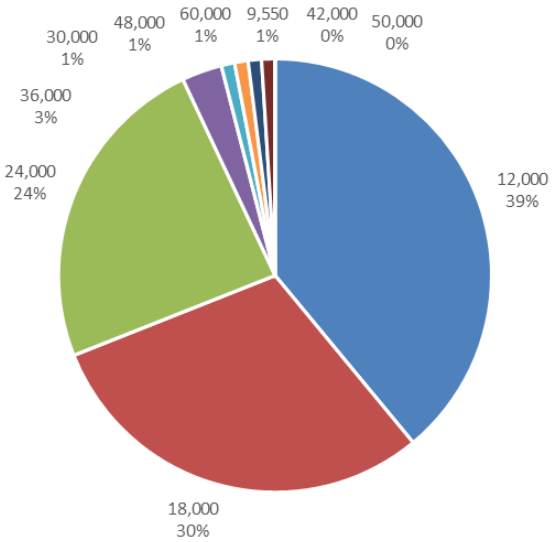


Source: Prepared by the JST from REGULATORY IMPACT ASSESSMENT ON THE ENERGY, EPRA

Figure 2-29 Share of Room Air Conditioners by Brand in Kenya [%]

Next, the composition of air conditioner capacity ratios is shown in the next figure. 12,000[Btu/hr] is the largest, accounting for 39%, followed by 18,000[Btu/hr] and 24,000[Btu/hr] at 30% and 24%, respectively.

(https://www.jetro.go.jp/ext_images/_Reports/01/94936ab3c7475252/20240030.pdf, JETRO, accessed on January 31, 2025)



Source: Prepared by the JST from REGULATORY IMPACT ASSESSMENT ON THE ENERGY, EPRA

Figure 2-30 Composition Ratio of Room Air Conditioners by Capacity [Btu/hr, %]

As a result of a market survey conducted at home electronics retailers in shopping malls in Mombasa, products made by SAMSUNG, LG, and MIKA, a local company brand, were being sold. Additionally, although Japanese company brands were not found in the stores where JST conducted the market research, Daikin room air conditioners were installed in the homes where JST conducted power measurements.

Source: Prepared by the JST

Figure 2-31 Examples of Air Conditioner Brands Sold at Home Electronics Stores in Mombasa (Left: MIKA, Right: LG)

(2) Refrigerator Market in Kenya

As a result of a market survey conducted at home electronics stores in large shopping malls in Nairobi, products made by SAMSUNG, LG, Haier, and local company brands MIKA, VON, and Ramtons were being sold. On the other hand, in the stores where this market research was conducted, products from Japanese company brands were not found.

Source: Prepared by the JST

Figure 2-32 Examples of Refrigerator Brands Sold at Home Appliance Stores in Nairobi (Left: VON, Center: MIKA, Right: LG)

2.4.3 Conducting a Questionnaire Survey of Japanese Companies

A questionnaire survey was conducted targeting companies that handle energy-saving equipment regarding the status of expansion into African countries, plans for expansion, challenges faced in expanding into African countries, and necessary support systems. The survey method was to create a survey format and obtain responses either via email or in person.

The list of companies that participated in this survey is shown in the next table.

Table 2-17 List of Companies that Participated in Questionnaire Surveys

No.	Company Name	Industry	Main Business Contents
1	AGC Co., Ltd.	Manufacturing industry	Architectural glass, automotive glass, electronic glass, chemicals
2	Fujita Co., Ltd.	Construction industry	General construction company
3	NGK Insulators Co., Ltd.	Manufacturing industry	Manufacture and sale of ceramic products, NAS batteries, etc.
4	Daikin Industries, Ltd.	Manufacturing industry	Manufacture (including construction) and sales of air conditioners
5	TMEIC Co., Ltd.	Manufacturing industry	Sales, engineering, construction, and services of industrial systems and electrical equipment mainly for manufacturing plants, as well as the development and manufacture of monitoring and control systems, power electronics equipment, and rotating machines (large-capacity motors, etc.) for the manufacturing industry.
6	Japan Itomic Co., Ltd.	Manufacturing industry	Manufacture and sale of electric water heaters and EcoCute
7	Kaneka Co., Ltd.	Manufacturing industry	Production and sales of solar cells/production and sales of chemicals
8	Shinko Industries Co., Ltd.	Manufacturing industry	Manufacture and sale of air conditioners and fan coil units (FCU)
9	Shimizu Construction Co., Ltd.	Construction industry	General construction company

Source: JST

Regarding the status of expansion into African countries

All of the companies surveyed this time have past and current business experience in African countries, either in the form of establishing local bases, selling products, or receiving orders for local operations.

Challenges in entering the market in African countries

The following are the main issues that respondents answered about when entering the market.

- The market is small and it is unclear whether there will be demand. They are weak in terms of cost competitiveness compared to products made in other countries such as Chinese companies.
- With yen loans, it is unclear how much the recipient organization will request, and there is a risk associated with uncertainty.
- Brand recognition among general consumers is low, and there are challenges in improving market presence.
- There is little understanding of the need for energy-saving and low-environmental impact products, and it is necessary to carry out educational activities and stimulate demand regarding energy saving.

Desired support system for business development in African countries

The following is a list of the main points that respondents expressed their desire for as support systems for business development.

- We would like Japan to provide equal support to countries other than Kenya. The financial situation of each country is not good, and we would like them to consider, for example, financing with an eye to the use of carbon credits.
- As part of our approach to governments around the world regarding the spread of energy-saving equipment, we would like to see support such as making energy-saving regulations mandatory.
- It would be good to have information on various schemes regarding the possibility of business development other than yen loans.

Strategies for Japanese Companies Entering African Markets Identified Through the Survey

This survey targeted companies that have already expanded into Africa. The survey revealed that multiple companies face challenges in developing their businesses in the African market and require support programs to facilitate business expansion.

While Japanese companies have some potential to participate in infrastructure-related ODA projects in various African countries, challenges remain. Specifically, projects such as yen-loan-funded initiatives require extensive communication with local government agencies and the utilization of local networks, making new market entry difficult.

In the private sector, competition is particularly intense, especially with Chinese companies, both in terms of cost and brand recognition, making it difficult for Japanese companies to expand their market share after entry.

Given that many Japanese products have superior performance in terms of energy efficiency, implementing technical cooperation projects to properly assess and demonstrate energy-saving effects could not only facilitate the entry of Japanese companies into African markets but also provide long-term benefits to the respective countries.

Furthermore, the economic benefits derived from energy savings (such as cost recovery through reduced electricity consumption) are not yet widely recognized in the African market, which puts Japanese companies at a disadvantage despite their technical superiority. Therefore, fostering a market where the investment recovery from energy-saving equipment can be clearly demonstrated would be an effective strategy.

The following section, 2.5 Initial Considerations on Private Sector Financing Mobilization, outlines a phased approach for fostering the market for energy-saving technologies, developed through discussions with local stakeholders.

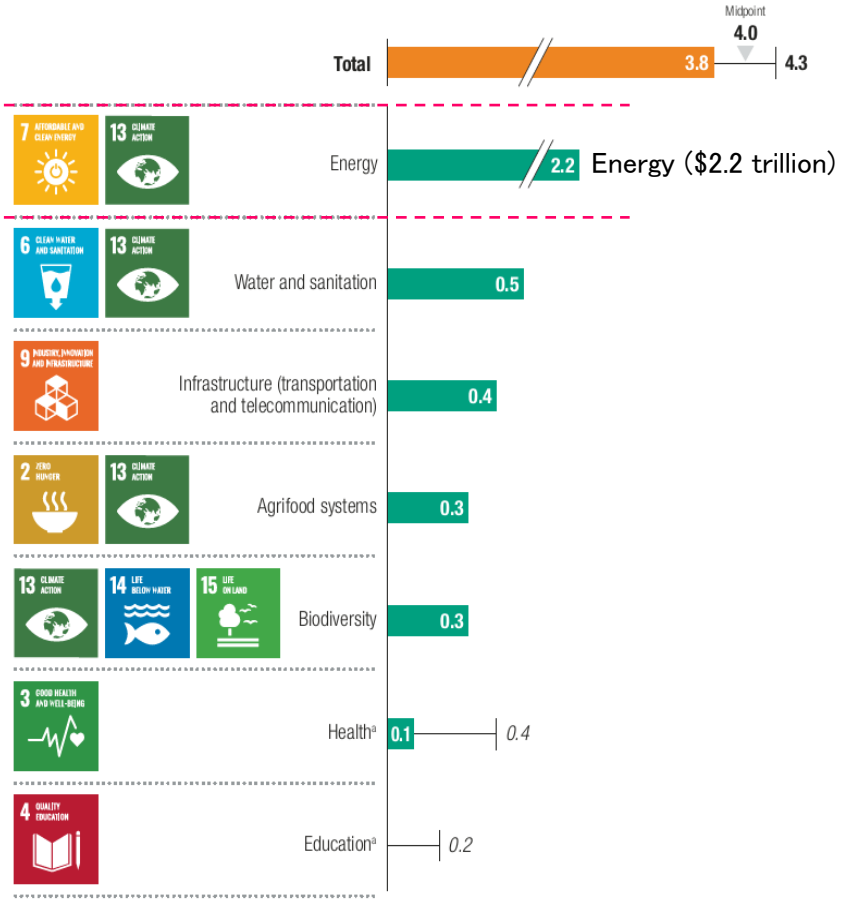
2.5 Initial Study of Private Capital Mobilization

2.5.1 Initial Study of Private Fund Mobilization

(1) Importance of Mobilizing Private Funds

Financing has been identified as a challenge to achieving sustainable development worldwide. According to the 2024 Sustainable Financing for Development Report of the United Nations Joint Agency Task Force on Financing for Development, the funds needed to close the development financing gap are estimated at US$4.3 trillion per year, as shown in the next figure. The report shows that the Organization for Economic Cooperation and Development (OECD) countries' Official Development Assistance (ODA) increased from US$185.9 billion in 2012 to US$211 billion in 2022, but most of this increase was allocated to supporting the rapidly growing refugee population, and remains insufficient to achieve sustainable development.

To fill this development financing gap, mobilization of private funds is essential. The funding gap is particularly large in the energy sector, where about half of all energy-related funds are inadequate. To optimize the use of energy, it is important to promote the mobilization of private-sector funds to fill the development financing gap.



Source: United Nations Conference on Trade and Development, World Investment Report, 2023

Figure 2-33 Annual Development Finance Gap by SDG Sector (in trillions of US$)

The Government of Japan's Basic Policies for Economic and Fiscal Management and Reforms for 2024 call for the mobilization of private-sector funds for ODA in support of developing countries, and a meeting was convened by an expert group on Mobilizing New Financing for Development. The expert group put forward a proposal toward the Creation of a Virtuous Circle of Growth and Contribution to a Sustainable Future. The proposal noted the importance of mobilizing private-sector funds, including funds from private companies and investors, as well as the cooperation of the public and private sectors. The main contents of this proposal are shown in the following box.

Proposal of the Expert Group on Mobilizing New Financing for Development

(1) It is important to create an "ecosystem" that leads to the development of developing countries by collaborating with various actors and by making investments based on economic rationality by private companies and investors themselves using ODA as a catalyst.
(2) Serious consideration within the government is expected towards introduction of concrete new initiatives such as utilizing grant funds and expanding risk-taking functions.
(3) In implementation, the public and private sectors should work together to discover potential investment destinations by cooperating and sharing roles with the government, implementing agencies, and various stakeholders, and by utilizing JICA's knowledge, human resources, and other resources. Feeding back into the Japanese economy and society through support of Japan Overseas Cooperation Volunteers after their return to Japan is also important.

Source: Expert Group on Mobilizing New Finance for Development, Key Recommendations, July 12, 2024

(2) Efforts to Mobilize Private Sector Funds

International Understanding for Private Finance Mobilization

To achieve sustainable development, there have been international discussions and deliberations on the introduction of private finance. Table 2-18 summarizes the common international understanding toward the introduction of private finance that has taken place in recent years.

Table 2-18 Common International Understanding on Private Finance Mobilization for Development

Body	Consultation on Mobilizing Private Sector Funds
UN Sustainable Development Summit[26]	Agenda for Sustainable Development 2030 (2015) The private sector, which ranges from small businesses to multinational corporations, cooperatives, civil society organizations, and charities, has a role in the implementation of the New Agenda (….) The important use of international public funds, including ODA, is a catalyst for mobilizing additional resources from other sources, both public and private.
International Conference on Financing for Development[27]	Addis Ababa Action Plan (2015) • Develop policies to encourage sustainable practices and promote long-term high-quality investments to better align private sector incentives with public goals • Promote flexibility regarding charitable giving and financial and non-financial contributions by philanthropists
G7 Hiroshima[28]	• We are determined to do our part to mobilize the private and public funds needed to achieve the Sustainable Development Goals by 2030, reduce poverty, address global challenges, including the climate crisis (among others), and support equitable transitions. • Emphasize the important role of the private sector and endorse the Triple I (Impact Investment Initiative) for Global Health.
G20 New Delhi[29]	We call on developed countries to fulfill their respective ODA commitments in a timely and complete manner, which will complement and encourage development financing from all sources, including public and private, domestic and international, and contribute to addressing the financial needs of developing countries.

Source: The JST based on JICA, International Trends and JICA's Efforts on Financial Mobilization for Development, 1 March 2024

Development Partner Support to the Private Sector for Private Capital Mobilization

Cooperation between development partners and the private sector is important for the introduction of private finance, and development partner support to the private sector can stimulate private sector-financed development. The next table presents general types of development partner support and JICA's main support menu.

Table 2-19 Types of Assistance to the Private Sector

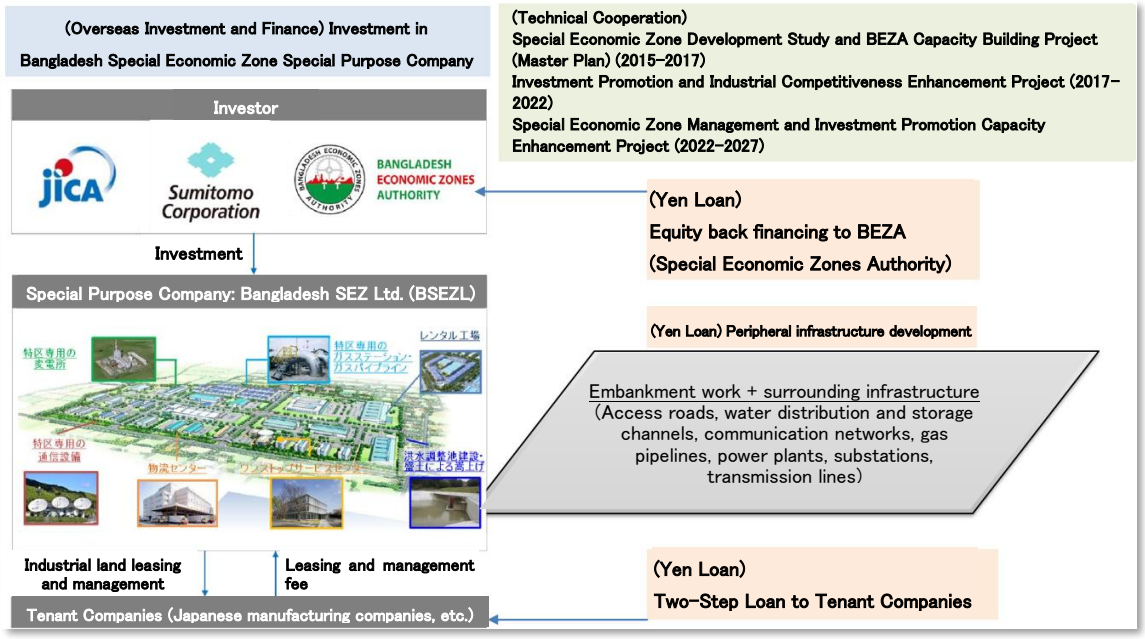
Development Partner Support	Outline	JICA's Main Assistance Menu
Technical Assistance Type	Improvement of the private business environment (legal system, infrastructure development) and capacity building of stakeholders	• Dispatch of Experts / Hosting of Trainees • Technical Cooperation Projects • Development Plan Study Type Technical Cooperation
Proposal Type	Financial support for proposals that contribute to solving social issues	• Business Support Program for SMEs and SDGs (JICA Biz)

[26] 2030 Agenda for Sustainable Development: https://www.mofa.go.jp/mofaj/gaiko/oda/sdgs/pdf/000101402_2.pdf.
[27] Addis Ababa Action Agenda: https://www.mofa.go.jp/mofaj/files/000091207.pdf
[28] G7 Hiroshima Leaders' Communiqué (May 20, 2023): https://www.mofa.go.jp/mofaj/files/100507034.pdf
[29] G20 New Delhi Leaders' Declaration (September 9–10, 2023): https://www.mofa.go.jp/mofaj/files/100550653.pdf

Development Partner Support	Outline	JICA's Main Assistance Menu
Matching Type	Matching of solutions to social issues and businesses that contribute to solutions	• JICA Overseas Cooperation Volunteers (Private Partnership)
Finance Type	Financial support	• Overseas Investment and Lending • Preparatory Survey for Cooperation

Abbreviations: SDG = sustainable development goal, SME = small and medium enterprises
Source: Trends in Private Sector Support in Major Donor Countries, January 2024, prepared by the JST

JICA is working to support the development of both hard and soft aspects of projects by combining components of its support menu, and mobilizing private-sector funds by attracting private-sector investment. In the case of the development of a special economic zone (SEZ) in Bangladesh, as shown in the following figure, JICA supported the development plan and development guidelines through technical cooperation, while the development of the SEZ was implemented as a yen loan project, and an SEZ special purpose company was supported through an overseas investment and loan scheme. The infrastructure development was financed by "yen loans plus back-financing," and technical cooperation was provided for surveys for the development, thereby encouraging Japanese companies to move into the SEZ as tenants. Technical cooperation will continue even after the SEZ is operational to promote investment from the private sector.



Source: International Trends and JICA's Approach to Mobilizing Financing for Development, March 1, 2024

Figure 2-34 An Example of JICA Supporting Hard and Soft Aspects of a Project by Combining Various Components of Its Support Menu (A Special Economic Zone in Bangladesh)

Development of International Rules for Mobilizing Private-Sector Funds

Internationally, there is a growing consensus on the importance of blending development partner funds with private commercial funds (blended finance) to promote the mobilization of private capital, and international rules to mobilize private capital mobilization are being developed.

The Development Assistance Committee (DAC) of the OECD takes into account incentives for private-sector financing, including guarantees as well as grants with reimbursement rights, which became eligible for ODA appropriations in 2023.

The DAC defines blended finance as "the strategic use of development finance to mobilize additional resources to achieve sustainable development in developing countries".

Development Finance Institutions (DFIs) – which include the African Development Bank (AfDB), Asian Development Bank (AsDB), Asian Infrastructure Investment Bank (AIIB), European Bank for Reconstruction and Development (EBRD), European Development Finance Institutions Association (EDFI), European Investment Bank (EIB), Inter-American Development Bank (IDB), the Islamic Corporation for the Development of the Private Sector (ICD), and International Finance Corporation (IFC) – define blended finance as "a combination of donor concessional funds, DFI funds and commercial funds that encourages private sector development and promotes the achievement of SDGs and the introduction of private capital."

Although it is now internationally recognized that blended finance, in which development funds from development partners and other sources are combined with private sector funds, is important for mobilizing private sector funds to fill funding gaps, there are some differences in the definitions of DAC and the DFIs.

Table 2-20 compares the differences between the DAC and DFI definitions of private capital mobilization. This survey will mainly apply DAC's definition of financing for private capital mobilization.

Table 2-20 Definitions of Blended Finance for Private Capital Mobilization by DAC and DFIs

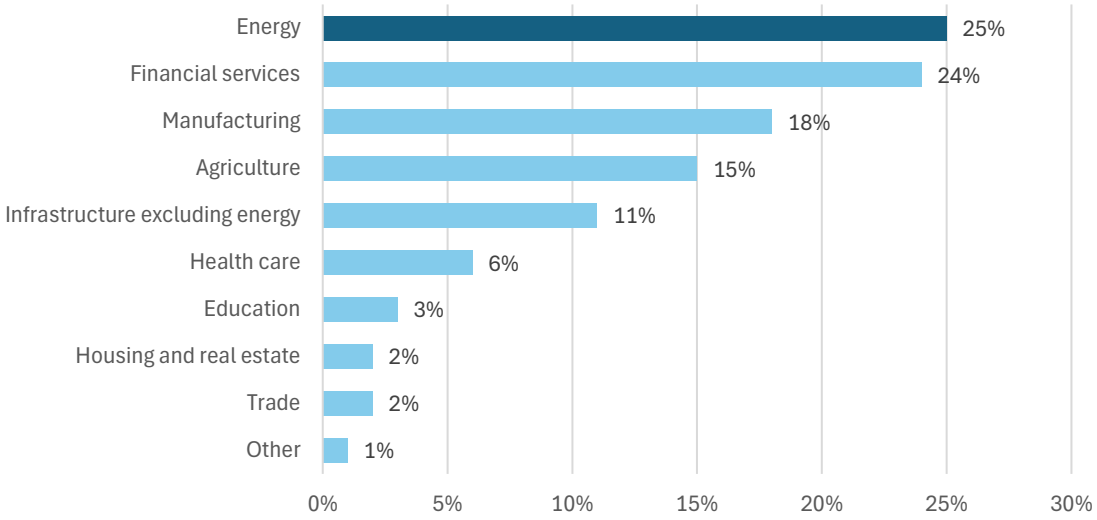
Item	DAC	DFIs
Nature of Funds to be Utilized	The common understanding is that the funds are intended for development and are public and private funds.	
	Includes grants	Does not include grants
Nature of Private Funds to be Mobilized	Commercial funds (commercial purposes)	DFI proprietary and commercial funds
Investment Target	Both public and private projects	Private projects

Abbreviations: DAC = Development Assistance Committee, DFI = Development Finance Institution
Source: The JST based on JICA, Study on Evaluation Methodology for Private Capital Mobilization, March 2021

Private Capital Mobilization by Sector

In the renewable energy sector, some countries and regions have reached grid parity,[30] and private financing is being actively used for development. The energy sector is also the sector with the largest number of blended finance transactions, and is considered to be a sector conducive to private capital mobilization in the promotion of energy conservation. The next figure shows the percentage of financial transactions by sector between 2007 and 2018.

[30] Grid parity is when the cost of generating power from an alternative energy source (e.g., solar or wind) is the same or less than the price of power from the electricity grid.



Source: JST based on JICA, Study on Evaluation Methodology for Private Capital Mobilization, March 2021

Figure 2-35 Percentage of Financial Transactions by Sector (2007-2018)

Energy-Related Projects with the Mobilization of Private Capital

There are already several projects in the energy sector in the African region that have led to the mobilization of private capital for major projects as shown in the following table.

Table 2-21 Projects related to Mobilizing Private-Sector Funds in the African Region (Energy Sector)

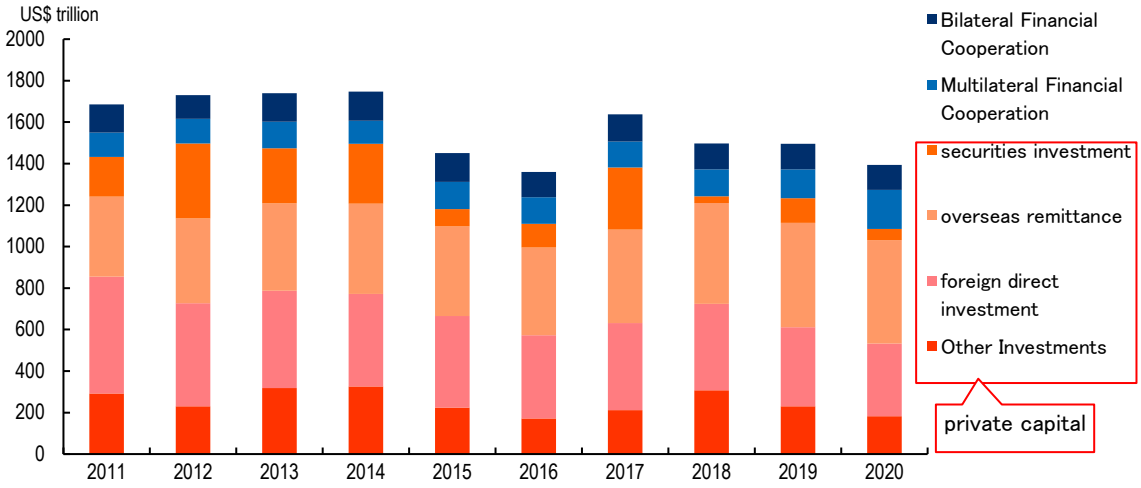
No	Country/ Institution	Project Name	Target Countries	Summary	URL Source
1	Japan	Bilateral Credit System Financial Assistance Program (a subsidized equipment project)	Ethiopia Kenya Senegal Tunisia	To quantitatively evaluate Japan's contribution to reducing greenhouse gas (GHG) emissions through introduction of technologies and implementation of countermeasures for decarbonization, and to promote utilization of the JCM to achieve Japan's emission reduction targets (NDC), this program partially subsidizes initial investment costs for projects to introduce decarbonization facilities under the JCM.	https://www.env.go.jp/press/press_03030.html
2	Climate Investment Fund	Kenya Investment Plan	Kenya	This is a US$70 million plan, including an initial allocation of US$46.39 million, to promote the integration and use of renewable energy in Kenya's power grid and to enable the country to transition to 100% clean energy by 2030. An additional US$243 million in public and private sector funding is to be considered through the implementing partners, the African Development Bank and the World Bank Group.	https://www.cif.org/sites/cif_enc/files/2023-12/december_2023_final_kenya_cif-rei_program_submission.pdf
3	Government of Kenya	VAT exemption on renewable energy products	Kenya	This project implements a VAT exemption policy for renewable energy products such as solar and wind power equipment and clean cooking solutions.	https://www.gogla.org/a-big-win-for-kenya-government-reinstates-vat-exemption-on-renewable-energy-products/
4		The Green Fiscal Incentives Policy Framework	Kenya	This project entails fiscal and economic incentives such as tax exemptions and tax credits for off-grid renewable energy installations. The framework of this project provides definitions of what constitutes a "green" building, including efficient use of energy, renewable energy, and good indoor environmental air quality.	https://www.treasury.go.ke/wp-content/uploads/2023/01/Draft-Green-Fiscal-Incentives-Policy-Framework.pdf

No	Country/ Institution	Project Name	Target Countries	Summary	URL Source
				Project components include buildings, such as tax incentives for building materials manufactured locally using 50% or more recycled materials and incentives for meeting green building specifications and building code requirements.	
10	World Bank	Affordable Mechanization for Small Scale Farmers	Kenya	This project provides subsidies to small farmers for increased productivity.	https://www.usadf.gov/country/ke
11		Solar Cooking Stoves for Rural Marginalized Schools in Kenya	Kenya	This project provides grants to purchase equipment and expand manufacturing facilities, primarily to increase solar cooker production.	https://www.usadf.gov/country/ke
14		Blended Finance Funding to Enhance Access to Clean Energy in Kenya	Kenya	Thus project supports the introduction of renewable and energy-saving equipment using microfinance for sustainable growth of rural communities. (primarily for the installation of biogas, solar home systems, energy efficient cooking stoves, and water catchment programs).	https://www.usadf.gov/press-release/972
19	African Development Fund	Sustainable Energy Fund for Africa	Kenya, Morocco, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa	The overarching goal of this Multi-Donor Special Fund is to ensure universal access to affordable, reliable, sustainable and modern energy services for all Africans, in line with the New Deal and Sustainable Development Goal 7 on energy in Africa.	https://www.afdb.org/en/documents/sustainable-energy-fund-africa-sefa-annual-report-2
20		The Green Mobility Facility for Africa (GMFA)		This facility supports private investment in green mobility in Africa. It is expected to induce about US$300 million in additional private investment in the green mobility sector, contribute to the deployment of 20,000 EVs, reduce greenhouse gas emissions by more than 2.175 million tCO2eq over 15 years, and create 19,000 full-time jobs (50% of which are for women).	

Source: The JST (and the cited URLs)

(3) Challenges in the Mobilization of Private-Sector Funds

As mentioned, the importance of private capital mobilization has been recognized internationally, and there is a trend toward international rules and efforts to mobilize private capital, but as shown in the next figure, the scale of private capital inflows to developing countries has not increased.



Source: Prepared by the JST based on OECD, Global Outlook on Financing for Sustainable Development 2023

Figure 2-36 External Financing for Developing Countries

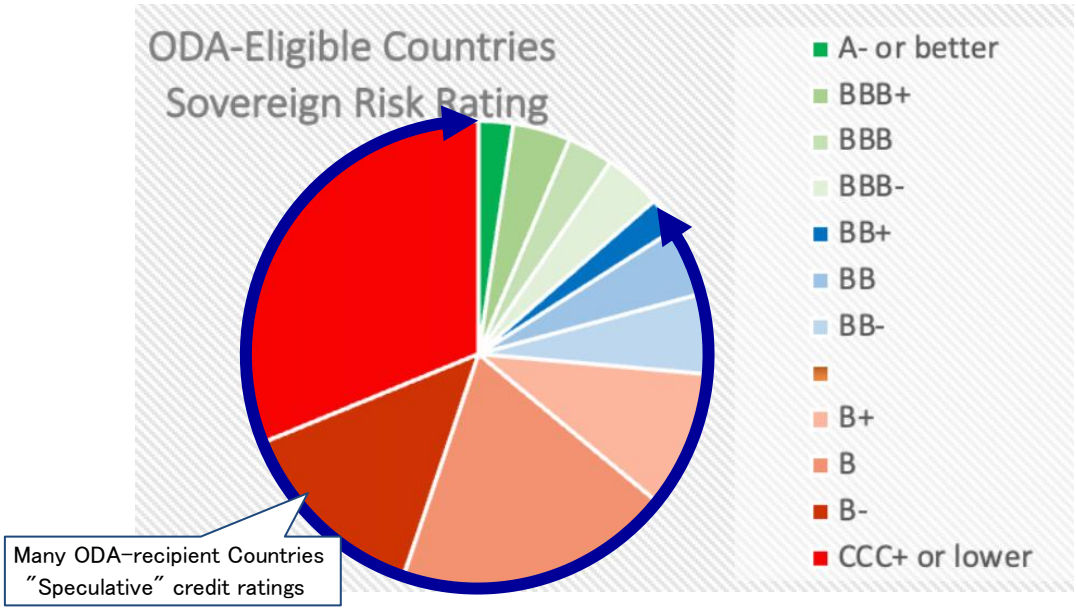
JICA's Study of Evaluation Methodology for Private Capital Mobilization, March 2021, discusses two reasons for this lack of private capital mobilization, and these are issues that development partners, including JICA, should consider when considering measures to mobilize private capital.

Low Credit Ratings in Developing Countries

According to an analysis by Convergence,[31] which includes government agencies and multilateral development banks, including JICA, the majority of investments in ODA-recipient countries are "Highly Speculative," suggesting that private investors may have difficulty making investment decisions because these decisions often exceed the limits of their fiduciary responsibility and presents regulatory risks that private investors must take into account when investing.

The following figure shows sovereign risk ratings of ODA-eligible countries based on classifications by Fitch, Moody's, Standard and Poor's, and OECD. Only about 10% of countries are rated in the A to BBB- range, which are generally considered investment targets, and nearly 90% are BB+ or lower, which are considered speculative investment targets. Of Kenya, Ethiopia, Uganda, Mozambique, Angola, Rwanda, Ghana, Cote d'Ivoire, Nigeria, and South Africa, only South Africa (BBB-) is rated higher than BB+ by S&P, while the other countries are rated BB+ or lower.

[31] Convergence, Increasing the Number of SDG and Climate Projects Implemented by Mobilizing Private Investment through Blended Finance, February 28, 2023 [chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://g24.org/wp-content/uploads/2023/09/Chris-Clubb-Increasing-the-Number- of-SDG-and-Climate-Projects-Implemented-by-Mobilizing-Private-Investment-Through-Blended-Finance.pdf].



Source: Convergence, Increasing the Number of SDG and Climate Projects Implemented by Mobilizing Private Investment through Blended Finance, February 28, 2023

Figure 2-37 Sovereign Risk Rating of ODA-Eligible Countries

Low Bankability in the Business Itself

In addition to low credit ratings for developing country governments, the difficulty in securing loan eligibility for the projects themselves is another reason why private investors are not actively mobilizing funds. Marsh & McLennan, a major insurance group in the United States, reports that only 5-10% of projects in emerging markets are eligible for financing, and more than half of projects are not eligible for private financing.

Loan eligibility from the perspective of private capital takes into account risks to the currency and infrastructure of the developing country implementing the project, which is also closely related to the credit rating of the country itself, as mentioned.

The next table outlines conditions concerning loan eligibility in emerging markets from private funds.

Table 2-22 Loan Eligibility in Emerging Markets from Private Funds

Eligibility for Financing	Outline of Business Aspects to be Evaluated
Projects with high loan eligibility (5-10% of total)	• Projects are mainly denominated in foreign currency and target stable industrial sectors in the country • There is interest from a wide range of investors (including international institutional investors) • The project country is stable
Businesses with moderate loan eligibility (10-15% of total)	• Projects with a stable cash flow • Projects in currencies of G7 countries • Investors are mainly commercial banks, consisting of investors from the country implementing the project and foreign investors with a high risk tolerance
Projects with low loan eligibility (15-20% of total)	• The earnings structure is denominated in the local currency, which poses high currency risk for foreign investors • With often unstable infrastructure, project implementation is composed of domestic capital and risk-taking investors such as funds targeting emerging markets, including commercial banks

Eligibility for Financing	Outline of Business Aspects to be Evaluated
	• There is possible mobilization of private funds, but there is high risk
Projects not eligible for financing (55-65% of total)	• These are projects that do not provide an economically reasonable return on investment • Generally, public works projects require the involvement of the home government or ODA for implementation.

Source: Prepared by the JST based on Marsh & McLennan, Closing The Financing Gap, 2017[32]

(4) Possible Ways for Development Partners (including JICA) to Mobilize Private-Sector Funds

As observed, mobilization of private-sector funds is required to fill the funding gap for development, but the risk is too high for private-sector funds, and the funding gap has not been filled. Therefore, in order to mobilize private-sector funds, it is important to create an environment in which private-sector funds can take on risk through the provision of support from development partners, including JICA.

Investment Environment

The next table presents main types of support and cooperation that could be provided to create an environment for mobilizing private capital in the EE&C sector.

Table 2-23 Possible Development Partner Options for Private Fund Mobilization

Measures	Initiatives
Support for greater policy stability and transparency	Support for the development of clear policy objectives and regulatory frameworks for energy efficiency and conservation investments to create an environment in which private investors can invest with a long-term perspective.
Implementation of Blended Financing	**Financing through a combination of development partner financed development funds and private investment or loans.**
Creation of Incentives	Creation of incentives to facilitate private sector participation in energy efficiency and conservation projects, such as tax incentives, subsidies, and loan guarantee programs.
Risk Reduction	Introduction of insurance and guarantee schemes to mitigate political, foreign exchange, technological, and other risks to which investors may be exposed.
Development of Impact Investments	Development of financial products that promote impact investing, which balances social contribution and profitability, and attracts investment from a long-term perspective

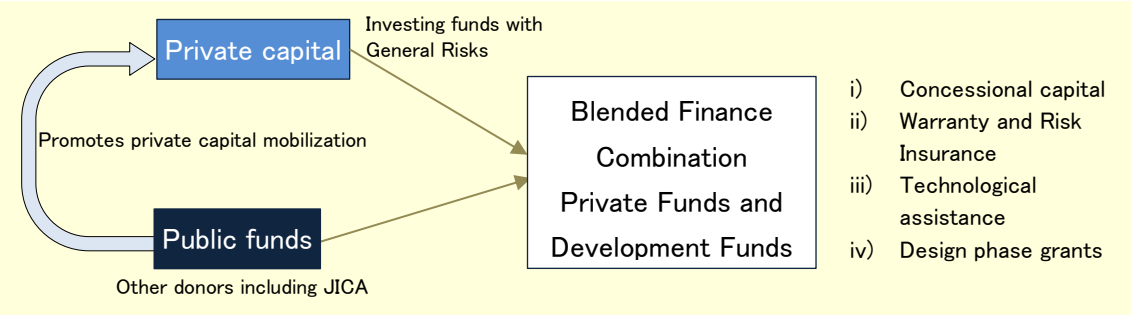
Source: The JST

2.5.2 Initial Study on the Design of an Intra-African Facilities including Other Development Partners

(1) Initial Consideration of Facility Design

As discussed, it is not easy to attract private capital in Africa due to low country credit ratings and the limited eligibility of projects for financing. Therefore, a blended finance mechanism that combines development funds with private investments and loans is considered effective in bridging the gap between the private sector and development funds. As shown in the following figure, blended finance can be structured with (i) concessional capital, (ii) guarantees and risk insurance, (iii) technical assistance, and (iv) design phase grants, among other approaches.

[32] Marsh & McLennan「Closing The Financing Gap」2017 [chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.oliverwyman.com/content/dam/oliver-wyman/v2/publications/2017/jun/ Closing_The_Financing_Gap_Infrastructure_Project_Bankability_In_Asia.pdf]



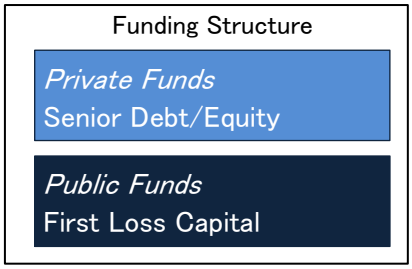
Source: Convergence, Increasing the Number of SDG and Climate Projects Implemented by Mobilizing Private Investment through Blended Finance, February 28, 2023

Figure 2-38 Image of the Combination of Private Capital and Public Funds with Development Funds to Encourage Private Capital Mobilization

Concessional Capital

In cases in which private funds alone are not expected to generate income due to the low credit rating or loan eligibility of the government, public funds and donations (grants) without interest can be used to support the project (cushioning) and increase the probability of profitability. By having public funds bear the first loss, there is an effect of increasing the expected return for private funds. The blue line in the Figure 2-40 shows the probability distribution of annual revenues expected when a project is implemented only with private funds, and the orange line shows the probability distribution of annual revenues expected when the first loss is covered by public funds. A funding structure that allows public funds to provide a "cushion" in the event of a first loss reduces the probability of revenues falling below zero (the red line), and thus can be judged by the private sector as a project with general risk[33].

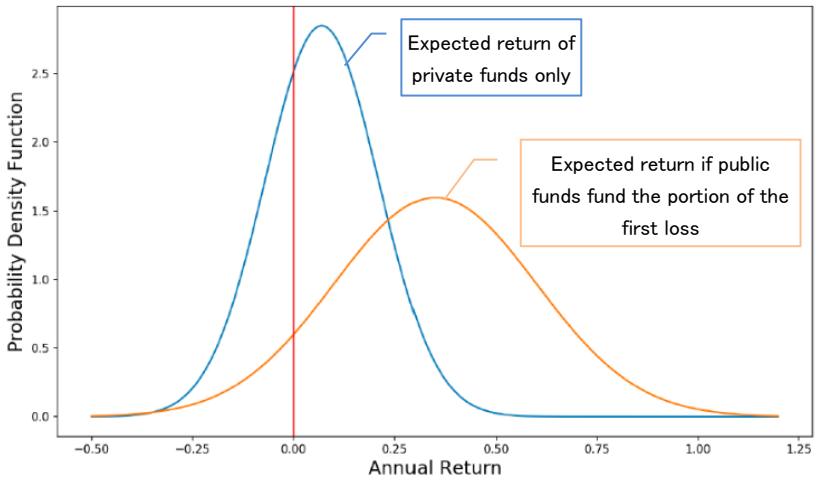
The following figure depicts the structure of the main combination of private and development financing.



Source: The JST

Figure 2-39 Support by Concessional Capital (image)

[33] Convergence Increasing the number of SDG and climate projects implemented by mobilizing private investment through blended finance (28 February 2023)



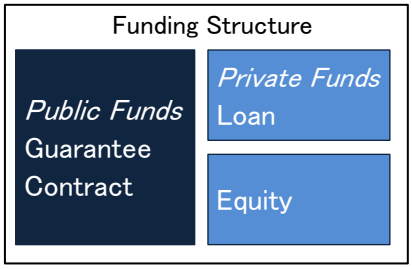
Source: Convergence, Increasing the Number of SDG and Climate Projects Implemented by Mobilizing Private Investment through Blended Finance, February 28, 2023

Figure 2-40 Image of Public Development Funds Entering the Market and Increasing the Expected Returns of Private Funds

Guarantees

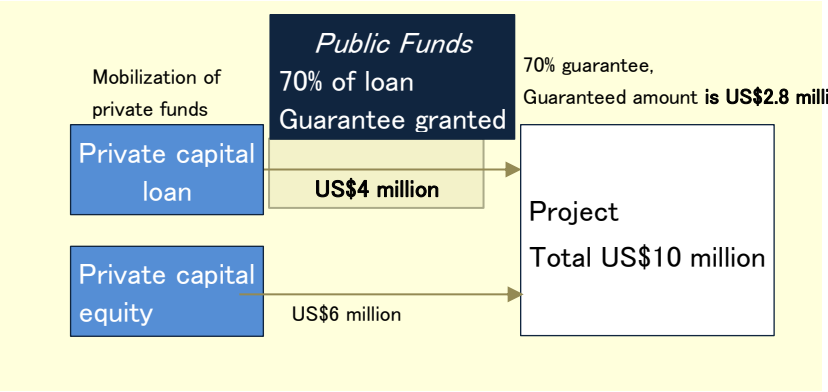
Guarantees by public funds are expected to have the effect of encouraging the mobilization of private funds. A mechanism that obligates private investors to pay an agreed-upon amount under the guarantee contract in the event that the project entity is unable to redeem its debt or the project itself fails can reduce losses incurred by private investors.

The DAC defines the concept of private funds mobilized by such a guarantee by public funds. Since private funds (US$4 million) are considered to have been mobilized by the guarantee, the entire face value, not just the amount of the guarantee, is the private funds mobilized by the public funds. However, it should be noted that the role of providing the guarantee is not considered to be an eligible JICA operation under current law.



Source: The JST

Figure 2-41 Support by Guarantees (image)



Source: DAC methodologies for measuring the amounts mobilized from the private sector by official development finance interventions

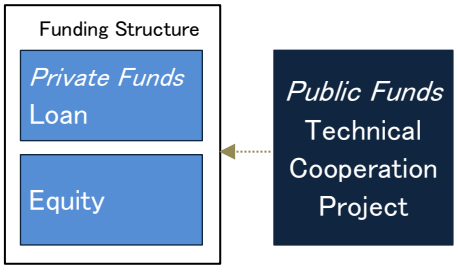
Figure 2-42 Private Capital Mobilization by Guaranteeing Public Funds (image)

Technical Cooperation

JICA has implemented a wide range of projects related to technical assistance aimed at strengthening the capacity of recipient governments and improving their policies and institutions. These assistance projects are considered to have made a significant contribution in mobilizing private-sector funds, and each project has been subject to independent ex-post evaluation and monitoring and evaluation of the technical assistance.

On the other hand, technical cooperation projects such as capacity building often require a certain period of time to show their effects, and it is difficult to evaluate their direct impact on mobilizing private-sector funds. Therefore, it is recommended to consider the contribution of technical cooperation projects to the mobilization of private-sector funds, even though such evaluations are qualitative. Furthermore, technical cooperation projects have the advantage of being linked to the sustainable implementation of projects, such as the dispatch of experts in relation to projects that have also mobilized private-sector funds.

The next figure presents an image of technical cooperation in this context.



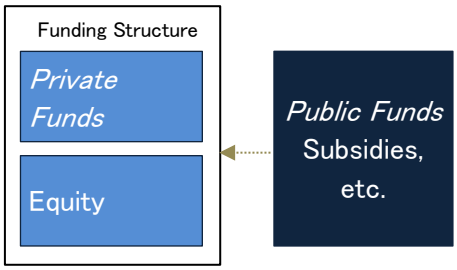
Source: The JST

Figure 2-43 Image of a Technical Cooperation Project (image)

Design Phase Subsidies

The provision of subsidies with public funds during the project construction phase to facilitate the mobilization of private funds is also considered an effective approach (see the next figure). For example, preparatory studies for cooperation prior to project implementation can confirm the feasibility of a project, leading to the introduction of private funds.

In JICA's Preparatory Survey for Cooperation (Overseas Investment and Loan), based on proposals from the private sector, support[34] is provided to develop business plans for projects utilizing private-sector funds on the premise that the project(s) will be implemented using overseas investment and loan funds.



Source: The JST

Figure 2-44 Design-Phase Subsidies with Public Funds (image)

(2) Facility to Encourage Private Capital Mobilization within Africa

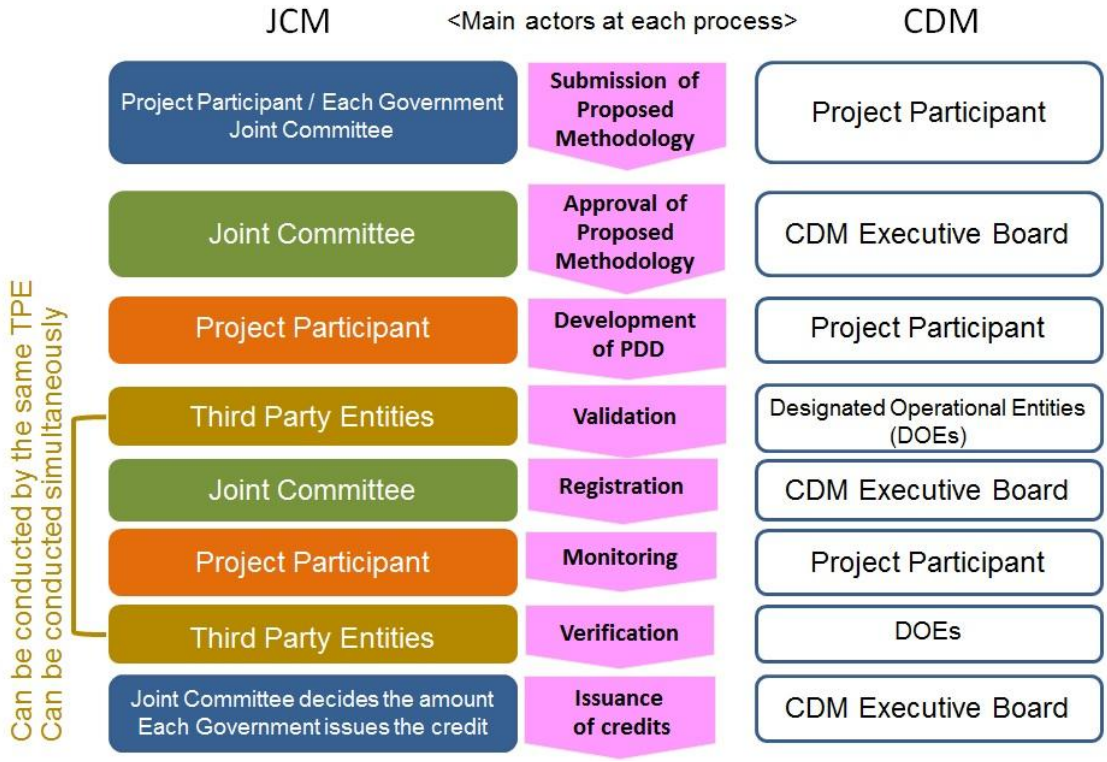
Promotion of the Use of the Joint Crediting Mechanism

The Joint Crediting Mechanism (JCM) is established and implemented with the aim of contributing to sustainable development in developing countries and other countries by accelerating the diffusion of superior decarbonization technologies, products, systems, services, and infrastructure, and the implementation of mitigation activities. In Africa, the JCM has already signed bilateral instruments with Kenya, Ethiopia, Tunisia, and Senegal.

The JCM is based on the use of "superior technologies, products, systems, services, and infrastructure" from the private sector, and provides financial assistance for their introduction. In addition to financial assistance, the program also provides technical assistance to reduce the technical burden on the private sector, including appropriate monitoring of greenhouse gas emission reductions. As shown in the next figure, the system entails a combination of technical assistance and design phase grants.

[34] A Cooperation Readiness Study (Overseas Investment and Loan) is limited to projects utilizing private sector funds that meet all of the following four criteria:

- ✓ Projects that contribute to economic and social development, reconstruction, and economic stability in developing countries'
- ✓ Projects in line with the policies of the Government of Japan and JICA (e.g., country-specific aid implementation policies) and the development plans of the recipient government;
- ✓ Businesses that are expected to utilize overseas investments and loans; and
- ✓ Cases in which the proposing corporation intends to participate in the project in the form of investment.



Source: Global Environment Centre website

Figure 2-45 Government of Japan Support in a JCM Project

Starting in FY 2022, the United Nations Industrial Development Organization (UNIDO) has been providing the following support for reduction of greenhouse gas emissions in JCM partner countries in Africa by utilizing superior decarbonization technologies, and for JCM project formation that targets the acquisition of JCM credits.

Details of the Support by UNIDO (Conditions of the 2024 Open Call)

- Up to US$800,000 per project
- Subsidy rate up to 75% of eligible project costs
- In principle, completion of the project in 2025
- Cost-effectiveness, monitoring period, and the like need to be addressed.
- Simultaneous application to each JCM subsidy project of the Government of Japan is acceptable, but receiving both is not.

※ The target company should be an "international consortium with local companies, etc., including a Japanese company (the applicant and the representative company of the international consortium)" and the participation of a Japanese company is required.

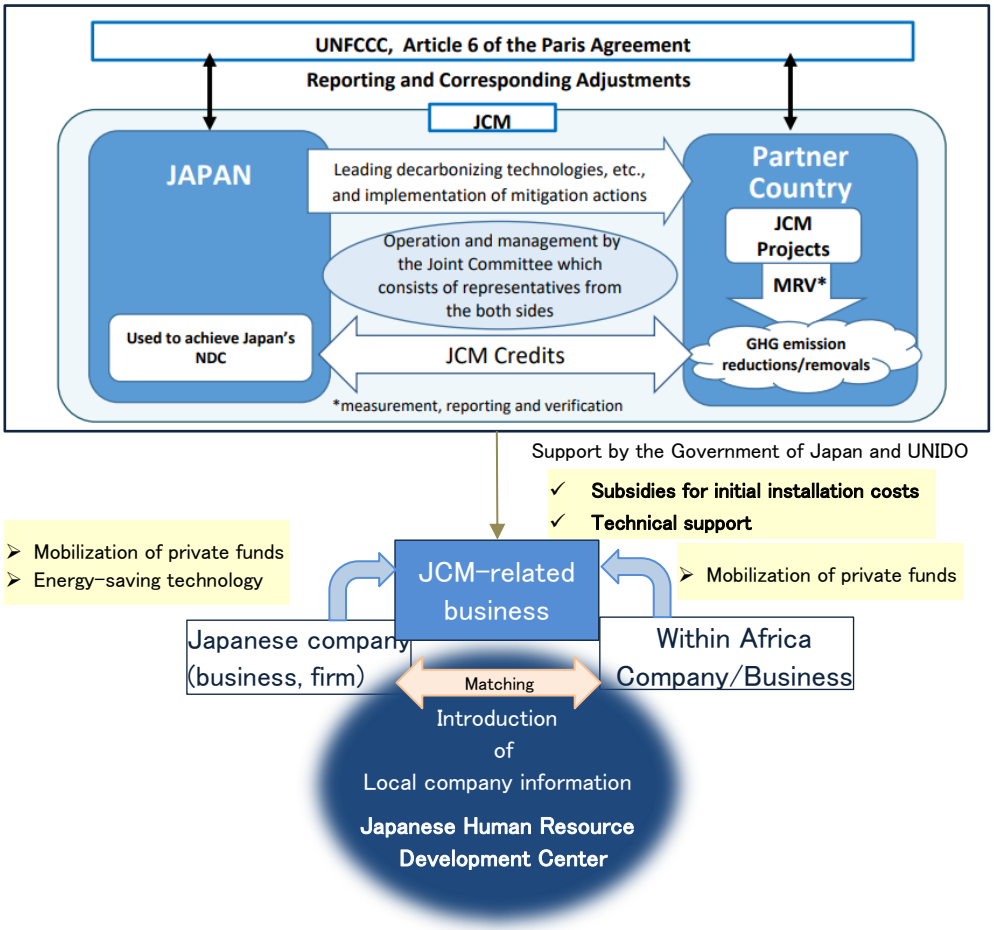
Source: UNIDO Announcement of UNIDO Procurement Opportunity: Open Call for Support for the Formation of Decarbonization Projects under the Bilateral Crediting Mechanism (JCM) for African JCM Partner Countries [http://www.unido.or.jp/news/15076/]

The JCM scheme is being promoted not only by the Government of Japan, but also by partner countries in cooperation with other international organizations. Since participation of a Japanese company is required, it is important to inform Japanese companies about the business environment in Africa.

Since 2000, JICA has sequentially established Japanese Human Resource Development Centers as a base for developing business human resources and building human networks with Japan. Currently, ten centers have been established in nine countries in East and Central Asia, Southeast Asia, and other regions, supporting the development of business human resources and the creation of networks among local management personnel and Japanese companies.

In particular, business matching and business meetings have led to technological tie-ups. In the future, initiatives such as the Japanese Human Resource Development Centers will encourage the use of schemes such as the JCM to mobilize private-sector funds in the African region as well.

The next figure summarizes mechanisms for promoting private capital mobilization though the JCM.



Abbreviations: JCM – Joint Crediting Mechanism; MRV = Measurement, Reporting and verification; NDC = Nationally Determined Contribution

Source: Ministry of the Environment (Japan), JCM Facility Subsidy Project/Co-Innovation Project Public Offering Briefing Session on the JCM Scheme

Figure 2-46 Mechanisms for Promoting Private Capital Mobilization through the JCM

Promote Collaboration with Private Sector Investment Finance (PSIF)

The African Development Bank (AfDB) has been implementing Enhanced Private Sector Assistance (EPSA), and the Government of Japan has been providing such financial support since 2005. The Private Sector Investment Finance (PSIF) was established as a new co-financing facility at TICAD 7 in 2019 (see the next figure).

Source: AfDB EPSA Overview Presentation, September 2020

Figure 2-47 AfDB and Government of Japan Initiatives in EPSA

PSIF is a financial service with a loan and equity structure and is considered to lead to sustainable development, and energy conservation measures are compatible with PSIF, as shown in the next table.

Table 2-24 PSIF Considerations

Item	Content
Partnering Criteria	Companies aligned with SDGs, ESG-centric businesses Private and sub-sovereign companies are eligible
Objective (Impact)	・ Aligned with the SDGs ・ Contribution to climate change action ・ High-quality infrastructure
Risk Supplement	Projects that need to take risks to complement bankability
Connection to Japan	It is desirable to be associated with a Japanese company, but it is not a prerequisite for consideration
Use of Funds	Basically utilized for CAPEX, but can also take into account the initial working capital associated with CAPEX

Source: JST

The following table presents a menu of available PSIF loans and investments, along with the basic terms and conditions of each.

Table 2-25 Menu of Financial Assistance with PSIF

Loan/Equity	Subject	Summary of Eligible Projects
Loan	Corporate loan	Agribusiness, manufacturing, social sectors (e.g., healthcare and education), and infrastructure development, among others.
	Project finance	Infrastructure development in power and energy, transportation (ports, airports, roads, railroads), water and sewage, waste and energy, and health sectors.
	Bank loan	Loans to microfinance institutions and SMEs from the perspective of financial inclusion and projects that contribute to climate change, among others.
Equity	Private equity	The project can be from the early stage to the growth stage. However, since this is an investment in a private project, international development partners such as JICA are required to objectively guarantee the legitimacy of the investment.
	Fund (Limited Partner)	Climate change (renewable energy, energy efficiency), SMEs, vulnerable regions/countries.

Source: JST based on an AfDB EPSA Overview Presentation with September 2020

Table 2-26 presents the main loan terms of PSIF, while Table 2-27 presents basic investment conditions.

Table 2-26 Main Loan Terms of PSIF

Item	Terms
Monetary scale	US$10-150 million is the standard size
Currency	Based on Japanese Yen, US Dollar, and Euro
Interest rates	Yen: Fiscal Investment and Loan Rate + Margin (Fixed) Dollar: SOFR[35] + Margin (variable)
Retention period	Up to 20 years (up to a five-year grace period)
Repayment	Semiannual
Commission	Front-end fees at the same rate as co-funders
Loan Terms	Standard loan terms
Risk management	Compliance with environmental and social considerations

Note: The Secured Overnight Financing Rate (SOFR) has replaced LIBOR (US$) in the AfDB in January 31, 2024 [https://www.afdb.org/en/documents/adb-applicable-lending-rates-standard-non-sovereign-guaranteed-loans-1-february-31-july-2024]
Source: Prepared by the JST based on AfDB EPSA Overview Presentation (September 2020 data)

Table 2-27 Basic Investment Conditions

Item	Terms
Monetary Scale	Equity: largest among minorities (about $5-20 million) Funds: up to 25% of fund size (about $10-$50 million)
Currency	No currency restrictions (in principle)
EIRR	Determined by assessing the risk at the time of investment
Exit Strategy	Generally, 5-7 years (e.g., M&A, IPO)
Confirmation of Need	Requirement for investment in private projects (content that is required for private-sector investment decisions for project implementation, such as projects that require sovereign hooks or long-term investment in the country where the project is to be implemented).
Risk Management	Compliance with environmental and social considerations

Abbreviations: EIRR = economic internal rate of return, IPO = initial public offering, M&A = mergers and acquisitions
Source: The JST

For the private sector to take advantage of such financial assistance, appropriate evaluation and continuous monitoring (Measurement, Reporting and Verification or MRV) of the project are important. For proper evaluation and monitoring of energy-related projects, technical assistance from organizations such as the Energy Conservation Center, Japan, and verification by experts such as energy managers and energy auditors will be effective.

JICA has been providing effective technical cooperation to support the introduction of energy efficiency and conservation systems and human resource development, and continuous technical cooperation within Africa is considered important.

The following figure presents mechanisms to promote the mobilization of private-sector funds through the PSIF.

[35] At the African Development Bank (AfDB), SOFR has replaced LIBOR (USD) as the benchmark rate effective January 31, 2024.
https://www.afdb.org/en/documents/adb-applicable-lending-rates-standard-non-sovereign-guaranteed-loans-1-february-31-july-2024

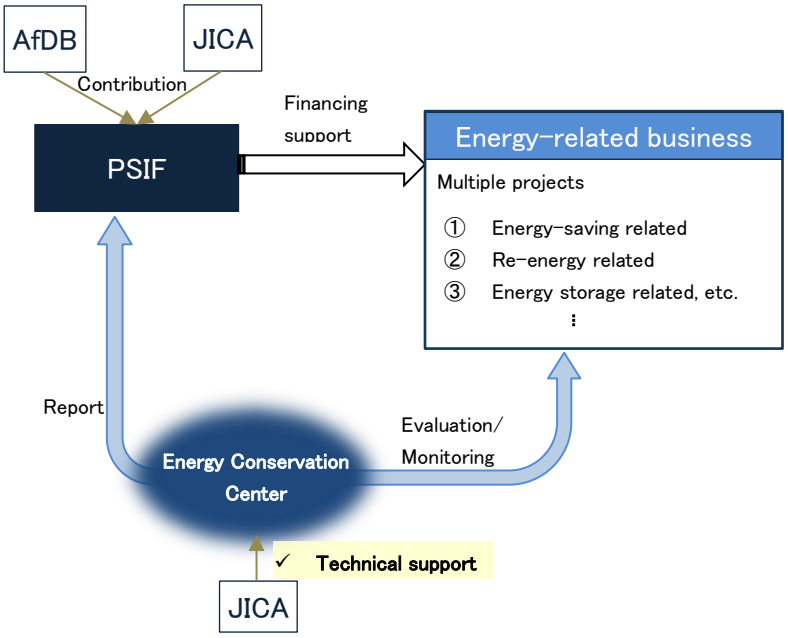


Figure 2-48 Mechanisms to Promote the Mobilization of Private-Sector Funds through the PSIF

(3) Initial Study of a Scheme to Introduce DSM/Energy Saving Technology Using Private Funds

Organizing incentives for each stakeholder

The results of the electricity usage survey conducted in five households each in Nairobi and Mombasa, along with the analysis on mitigating peak demand, indicate that the introduction of DSM (Demand Side Management) and EE&C technologies in households is an effective approach to reducing nighttime peak demand.

When considering mechanisms for introducing DSM and EE&C technologies in households, it is crucial to align the incentives of relevant stakeholders to ensure effective implementation. For example, while end-users benefit from lower electricity bills through energy savings, electricity providers may experience reduced electricity sales, which could act as a disincentive for their participation.

Therefore, the on-site interview survey for the scheme study was conducted after considering the impact of the introduction of DSM/EE&C on each stakeholder, as shown in the next table. In addition, this review considered not only economic incentives but also the benefits (co-benefits) that can be obtained by introducing DSM/EE&C technology.

Table 2-28 Incentives for Each Stakeholder through the Introduction of DSM/EE&C Technology (including some disincentives)

Stakeholder		Incentives (including some disincentives)	Co-benefit
Client	Installation of DSM/EE&C equipment	• Reduction of electricity charges (direct reduction in electricity consumption: significant effect)	• Improving quality of life
	General Consumer	• Reduction of electricity charges (reduction of electricity charges due to the cost reduction effect of electric power companies due to DSM/EE&C)	• Awareness effects on DSM/EE&C effects for general consumers

Stakeholder	Incentives (including some disincentives)	Co-benefit
Power transmission/distribution companies	• Stable power supply • Postponing the installation costs of additional transformer equipment and power transmission equipment • Reduce maintenance costs	• Contributing to environmental considerations • Reducing greenhouse gas emissions • Peak shift/energy saving measurement data collection
Renewable energy power generation company	• Increased profits due to improved utilization rate	
Geothermal power generation operator	• Decrease in profits due to a decrease in the amount of electricity sold due to peak shift	
Government related organizations	• Budget cuts needed for fossil fuel imports. • Considering appropriate investment targets • Decrease in tax revenue due to reduction in electricity usage	• Contribute to greenhouse gas emissions reduction targets • Fostering energy-saving related businesses • Setting appropriate electricity rates • Gathering information on electricity consumption trends for consideration of measures related to ESCO business and TOU
Society	• Economic revitalization due to the introduction of related businesses and products	• Reducing greenhouse gas emissions • Horizontal deployment of good practices

Source: The JST

Step-by-step market creation for popularizing DSM and energy-saving devices

In Kenya, the development of ESCO business is also listed in the National Energy Efficiency and Conservation Strategy 2020 and 2022, and it is expected that the foundation for business will soon be formed that utilizes the economic incentives obtained from energy conservation effects.

On the other hand, according to interviews with a company (Chameleon Solutions LTD[36]) that sells solar water heaters and heat pump water heaters for households, the current general consumer awareness in Kenya is that the focus is on how to reduce initial costs, rather than equipment purchases that take monthly electricity bills into account. This tendency for the initial cost to be an important decision-making factor when purchasing equipment has been similarly pointed out in meetings with the AfDB and electricity-related businesses. In particular, there is an opinion from AfDB and EPRA that "creating a market for DSM/EE&C equipment" is a challenge for the widespread adoption of DSM/EE&C equipment in the future. Against this background, in order to mobilize private funds, it is considered important to accumulate local success stories of economic incentives through DSM/EE&C equipment.

With an eye to the future expansion of the ESCO business nationwide, through discussions with stakeholders, measures to gradually create a market for the introduction of advanced DSM/EE&C equipment as shown in the following diagram will be confirmed to mobilize private funds.

[36] Chameleon Solutions LTD A service provider that is a vendor of solar power generation, solar water heaters, heat pump water heaters, etc., and also handles engineering for installation.

Source: The JST

Figure 2-49 Gradual Market Creation for the Introduction of DSM and Energy-saving Equipment

Studying Schemes for Gradual Market Development

[Introduction phase: Business development for high-income groups ~Implementation of pilot business~]

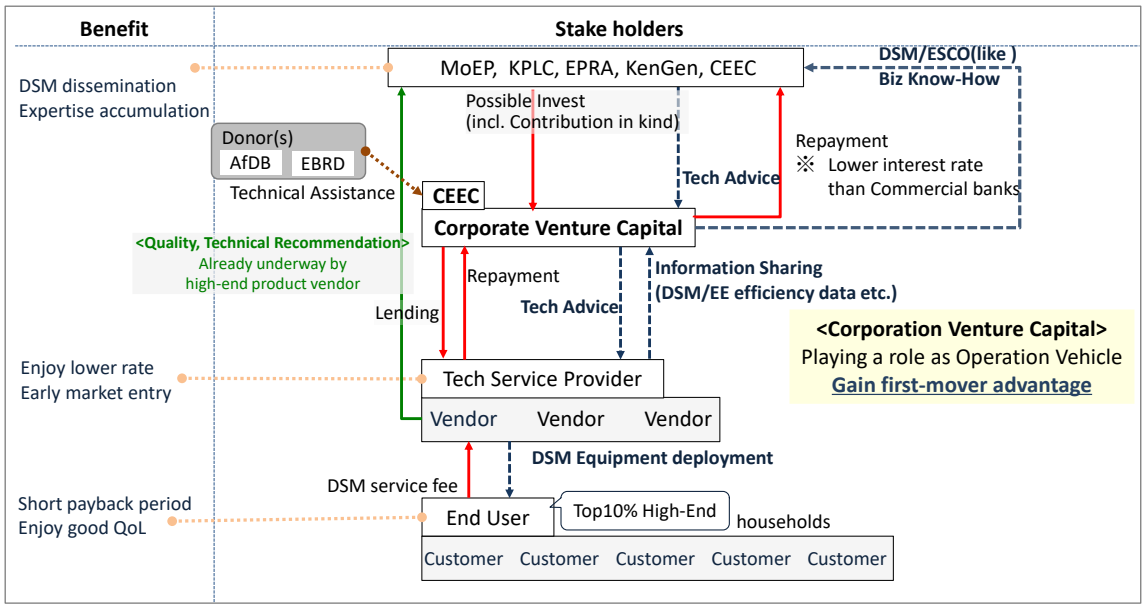
By actually implementing a pilot project and verifying the economic effects of introducing DSM and EE&C equipment, barriers to entry for private businesses can be lowered. The pilot project aims to benefit high-income households with relatively high household electricity consumption by introducing DSM and EE&C devices. Since the project will be implemented for household use, it is expected that the scale of the economic effect of the pilot project alone will be small, but it will be possible to obtain data that will steadily yield a return on investment through the introduction of DSM and EE&C equipment.

The role of each stakeholder in this implementation phase is summarized in the next table, and the relationship between each stakeholder is shown in the following scheme diagram.

Table 2-29 Roles and Benefits of Stakeholders

Stakeholders	Main Roles and Benefits
MoEP, KPLC, EPRA, KenGen, CEEC	• Providing human resources to Corporate Venture Capital, which will be the main body implementing the pilot project. • Monitoring the effects of introducing DSM/EE&C equipment (collection of basic data for future ESCO project consideration) • Gathering information on the latest technology trends from technical service providers (vendors)
Donor	• Technical cooperation for pilot project implementation • Creation of investment/finance sources for excellent energy-related businesses
Technical service provider (Vender)	• Utilize existing customer network and expand customer base • Opportunities for smooth communication such as provision of technical advice and market information from electricity-related administrative organizations • Low-interest financing from commercial banks when procuring equipment • Advertising effect on customers who receive technical support from government-related organizations.
End user	• Reducing electricity costs and improving quality of life through high-performance products and technology

Source: The JST



Source: The JST

Figure 2-50 Introduction Phase - Implementation of Pilot Project - (Initial Consideration Plan)

In order to implement the pilot project, it is envisaged that MoEP and other organizations related to the electric power business will participate, and a project implementation entity such as Corporate Venture Capital will be created. Furthermore, in order to ensure smooth project implementation, an advice has been received from the AfDB that it is better to clarify the organization that will be the lead organization when creating a project implementation entity, even though personnel may be dispatched from related organizations. After receiving this advice and having discussions with EPRA and CEEC, it became clear that it would be desirable for CEEC to be the main implementing body for the following reasons.

<Reason why CEEC is desirable as a pilot project implementation entity>

- Personnel from KPLC, KenGen, and EPRA are also dispatched to CEEC, making it easy to communicate between organizations.
- Administrative organizations such as EPRA are limited in their activities by law, but CEEC is an organization whose purpose is to implement energy conservation programs, so it can carry out pilot projects without restrictions.
- CEEC was established primarily by the Kenya Association of Manufacturers (KAM) to lower the entry barrier for energy-saving equipment at the industrial level through the implementation of energy-saving projects (2001-2006) supported by the Global Environmental Facility (GEF). It is a well-established organization and has knowledge of equipment introduction-related businesses.
- CEEC plans to establish the Clean Tech Platform in April 2025, and there is a high level of interest in the project to actually introduce DES and energy-saving equipment, and at the time of the hearing, it was shown that there is a possibility of becoming a project implementation entity.

[Development phase: Mobilization of private funds - Market formation through private business]

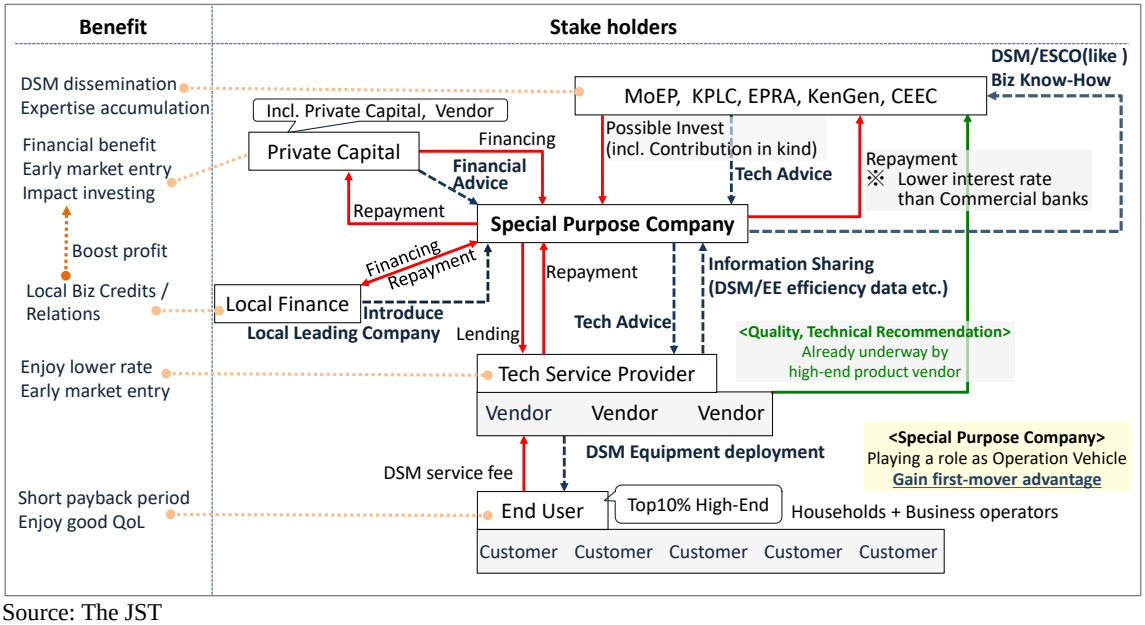
It is expected that private businesses will enter the market by demonstrating the results and effects of introducing DSM/EE&C equipment through the implementation of the pilot project. When implementing a pilot project, high-income groups will be targeted to ensure steady results, but from the phase of mobilizing private funds, the target will be expanded to include hotels, shopping malls, factories, etc., and provide economic incentives for each project. It is envisaged that the project will be implemented in such a way. Furthermore, successful cases of DSM/EE&C equipment introduction projects are expected to lead to the expansion of the market for these businesses by attracting related private businesses.

The next table summarizes the benefits that private businesses can gain by entering the market, and the relationship between each stakeholder is shown in the following scheme diagram.

Table 2-30 Advantages of Private Operators Entering the Market

Private Operator	Advantages of Entering
Private capital	• Understanding market trends by entering services using DSM/EE&C equipment (future ESCO business market) at an early stage • Impact investment targets for solving social issues
Local finance (Bank)	• Leverage good network with existing customers • Reduce recovery risk by making loan decisions based on confirmation of pilot project performance • Incorporating environmentally friendly projects into the portfolio
Technical service provider (Vendor)	• Reduce recovery risk by improving project profitability by leveraging knowledge of finance from financial institutions and customer networks • Expansion of business scale/increase of profit amount per project • Expanding the market for introducing DSM/EE&C equipment/acquiring new customers

Source: The JST



Source: The JST

Figure 2-51 Development Phase - Market Formation through Private Business - (Initial Consideration Proposal)

<Market formation through private business envisioned based on the current market>

An assessment of the current market potential for DSM equipment, specifically heat pump water heaters, estimated a market size of approximately 525,000 units.

Chameleon Solutions LTD, which is an equipment sales vendor but also handles the engineering and installation work involved in installation, has been providing heat pump water heater sales and installation services for the past three years, and has been providing heat pump water heater sales and installation services in Kenya, Uganda, Tanzania, and other East African regions. They have installed a total of 25,000 units annually.

Chameleon Solutions LTD conducts sales activities targeting high-income groups (top 10%) who can consider purchasing equipment based not only on initial installation costs but also on life cycle costs. Based on Chameleon Solutions LTD's experience in the local market, it has been confirmed that the currently assumed market potential for heat pump water heaters (approximately 525,000 units) is an appropriate assumption. There was a comment that it would be difficult for current service providers to respond to this market potential exceeding 500,000 units. Regarding the issue of lack of service providers, it can be expected that new service providers to enter the market as the market expands through the deployment phase. In addition, the next table shows information on companies that are considered to have service provider functions for DSM/EE devices and that were confirmed through field surveys.

Table 2-31 Current Service Provider Information

Company Name	Characteristics
Chameleon Solutions	A service provider that takes into consideration the characteristics of heat pump water heaters, solar water heaters, etc., and provides consultation to customers.
Daisy Heat Pumps	Services specialized in heat pump technology
Harmonic Systems	Sales and installation of pool water heaters using heat pump technology
Davis & Shirtliff	Sales and installation of a wide range of air conditioning equipment such as heat pumps, inverter A/C, etc.
Haier	Sales and installation of a wide range of air conditioning equipment such as heat pumps, inverter A/C, etc.
Tile and Carpet Centre	Works on the interior of buildings and also install heat pumps, inverter A/C, etc.
Chloride Exide Kenya Ltd.	Installation of heat pump water heaters, solar water heaters, etc.
Orb Energy Private Limited	Specializing in solar water heater installation
Illumina Africa Limited	Residential solar/solar thermal equipment installation
DAIKIN	Service provider including installation of high-efficiency equipment and consultation Makes technical recommendations such as how to evaluate equipment efficiency for EPRA.

Source: The JST

Since Chameleon Solutions LTD primarily serves high-income customers, the risk of payment collection is minimal. However, for customers opting for installment payments, the company will connect them with local banks. Additionally, financial institutions will be utilized for managing fee collection.

Given this situation, when forming the appropriate circumstances in the deployment phase, a scheme consideration that collaborates with local financial institutions will allow many service providers to enter the expanding market while reducing the risk of service fee collection.

[Fund formation phase: National dissemination of DSM/energy-saving equipment using public funds]

By creating a fund that reflects the know-how accumulated through the dissemination and deployment phase of DSM/EE&C equipment, such as information on the effects of introducing EE&C equipment and market trends, the development of national EE&C measures will be promoted.

The formation of the fund allows us to utilize the knowledge of the introduction of EE&C equipment obtained through the dissemination and development phase for the ESCO business, which is listed in the "NEECS 2020 and its action plan 2022" and is expected to develop in the future. This will lead to the promotion of energy-related businesses on the end-user side.

In addition, this fund is required to conduct activities with a view to implementing projects that require a relatively large amount of investment, such as pumped storage power generation and storage batteries, which are effective power load leveling/DSM measures as indicated in "LCPDP2024-43."

The role of each stakeholder in forming a fund is summarized in the next table, and the following figure shows an initial proposal for a stakeholder implementation system.

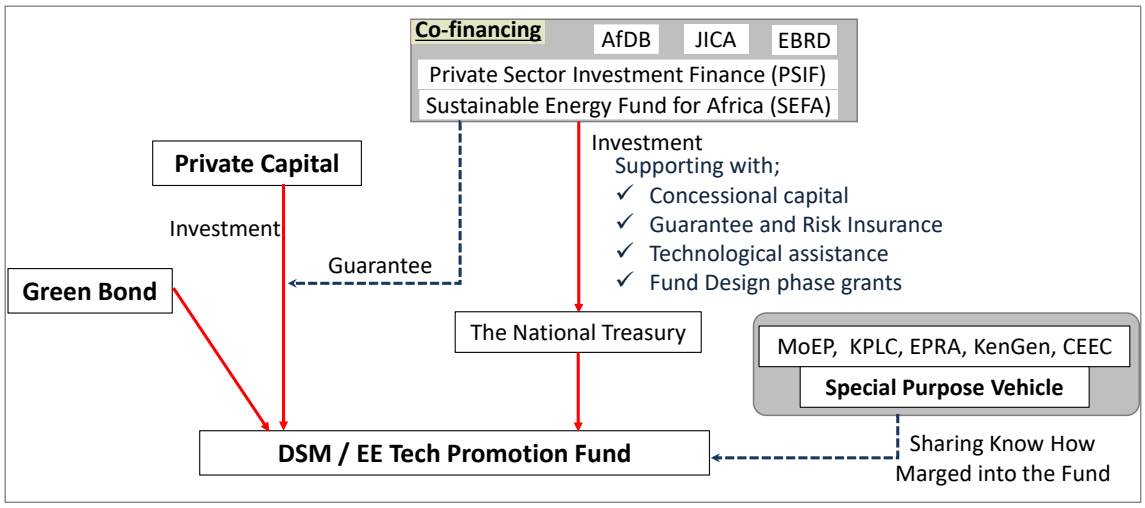
Table 2-32 Roles of Stakeholders

Stakeholder	Main Roles
Donor	• Support such as concessional capital, guarantees, technical assistance and design phase grants. • Appropriate financial management based on pilot projects and private projects (*Experts are required to be dispatched to provide operational support to avoid crowding out of private businesses.) • Communication for co-financing among donors
MoEP, KPLC, EPRA, KenGen, CEEC	• Fund management leveraging the track record of DSM/EE&C equipment introduction business • (Dispatch of human resources to the Fund being established, etc.) • Technical evaluation of contributions towards promoting measures and achieving goals such as "Kenya Vision 2030" and "National Energy Conservation Strategy Implementation Plan 2022" • Examination of project implementation priorities • (Consideration and evaluation of ESCO business, pumped storage power generation, storage batteries, TOU, etc.)
Private investment	• Investment after appropriately evaluating perceived risks as a private financial institution. • Monitoring function for fund management
Green bond[37]	• Business evaluation using loan history for green buildings • Considering further financing business using interest acquisition[38]

Source: The JST

[37] In Kenya, green bonds were issued in June 2020 after the World Bank provided support for issuance of green bond guidelines. To date, we have issued two green bonds in the green building field in the renewable energy and energy efficiency fields with financing from International Finance Corporation (IFC).
(Source: "Green Bond and Social Bond Impact Report (2023) IFC" and "Information Collection and Confirmation Survey on Green Finance and JICA's Contribution (July 2022) JICA")

[38] Kenya Gazette Supplement No. 178 (Acts No. 23), 2019 stipulates a tax exemption on interest earned from green bonds issued for projects conducted in accordance with the Green Bond Guidelines.



Source: The JST

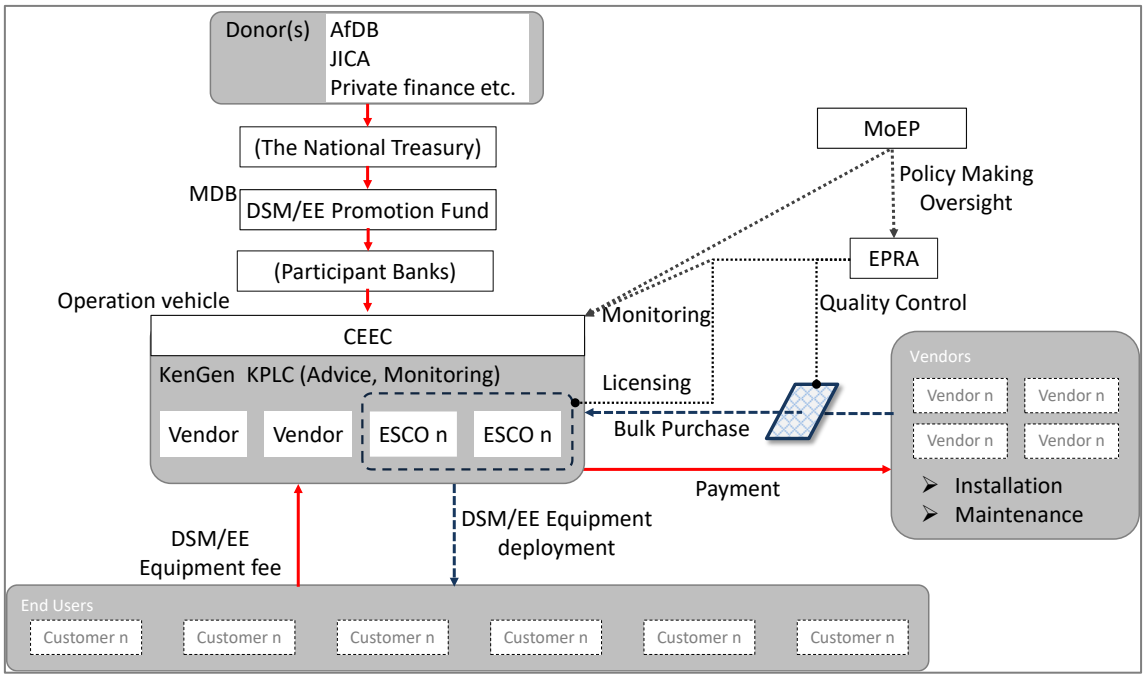
Figure 2-52 Formation of a Fund for the Nationwide Dissemination of DSM/EE&C Equipment (Initial Consideration Proposal)

Furthermore, the specific roles of each stakeholder during fund management are summarized in the next table, and the following figure shows an initial proposal for a stakeholder implementation system.

Table 2-33 Roles of Stakeholders in Fund Management

Stakeholder	Main Roles
Donor	• Monitoring of fund management
MoEP	• System design for ESCO business • Supervision of ESCO-related projects and DSM/EE&C equipment introduction projects
EPRA	• Setting and monitoring quality standards for DSM/EE&C equipment • Granting licenses to ESCO operators
CEEC	• Implementing body for ESCO-related projects and DSM/EE&C equipment introduction projects • Communication with financial institutions regarding selection of excellent service providers (vendors) and ESCO operators and financing for equipment purchases • Monitoring and evaluation of ESCO business
KenGen,KPLC	• Technical advice • Monitoring of equipment introduction effects (verification of beneficial effects on electric power business) • Educational activities for end users (KPLC)
Service provider (Vendor), ESCO	• Introducing equipment that meets defined quality standards (Reducing the cost of individual equipment through bulk purchasing) • Reporting of monitoring contents • Maintenance of installed equipment

Source: The JST



Source: The JST

Figure 2-53 Stakeholder Implementation Structure for Fund Management (Initial Consideration Proposal)

Chapter 3 Conclusion and Recommendations

3.1 Conclusion

In Kenya, peak demand occurs during nighttime hours (18:00–22:00). To better understand the primary factors contributing to this peak demand in the residential sector, an on-site measurement survey of electricity consumption by household appliances was conducted in five households each in Nairobi and Mombasa. The results revealed that in Nairobi, where air conditioning is not commonly used, hot water supply systems (approximately 40%) and refrigeration/freezer units (approximately 22%) accounted for the largest share of household electricity consumption. In Mombasa, refrigeration/freezer units (approximately 32%) and room air conditioners (approximately 22%) were identified as the most energy-intensive appliances.

As electrification policies, including the promotion of e-cooking and e-mobility, continue to advance, peak demand is expected to grow significantly. Considering this trend, it is essential not only to implement supply-side measures but also to introduce various demand-side policies—such as regulatory frameworks, subsidy programs, and electricity tariff structures—at an early stage. This proactive approach would help prevent potential supply-demand constraints and ensure greater flexibility in supply-demand management.

To promote the adoption of DSM and EE&C technologies in the residential sector, it is critical to first establish a market by accumulating successful cases. Once the business feasibility is confirmed, a phased approach for mobilizing private-sector financing should be pursued, working in collaboration with local financial institutions to expand the market. Discussions with the counterpart confirmed that this step-by-step approach is both necessary and effective.

Particularly in the initial phase, donor-supported technical cooperation should be implemented to verify the benefits of DSM and EE&C technologies. Additionally, this cooperation would facilitate the accumulation of technical expertise among stakeholders, ensuring a more sustainable and scalable adoption of these technologies.

3.2 Proposal and Recommendations for JICA Projects

Based on the findings obtained through this study, the following technical support initiatives are proposed to promote nighttime peak demand mitigation and energy efficiency and conservation.

First point is the implementation of a pilot project for the nationwide deployment of residential DSM and EE&C technologies. Utilizing the findings of this study, which identified the key factors contributing to peak demand, this project should promote the adoption of DSM and EE&C technologies at the national level in Kenya. The results could also be applicable to other African countries with similar electricity consumption patterns, creating potential for wider regional impact.

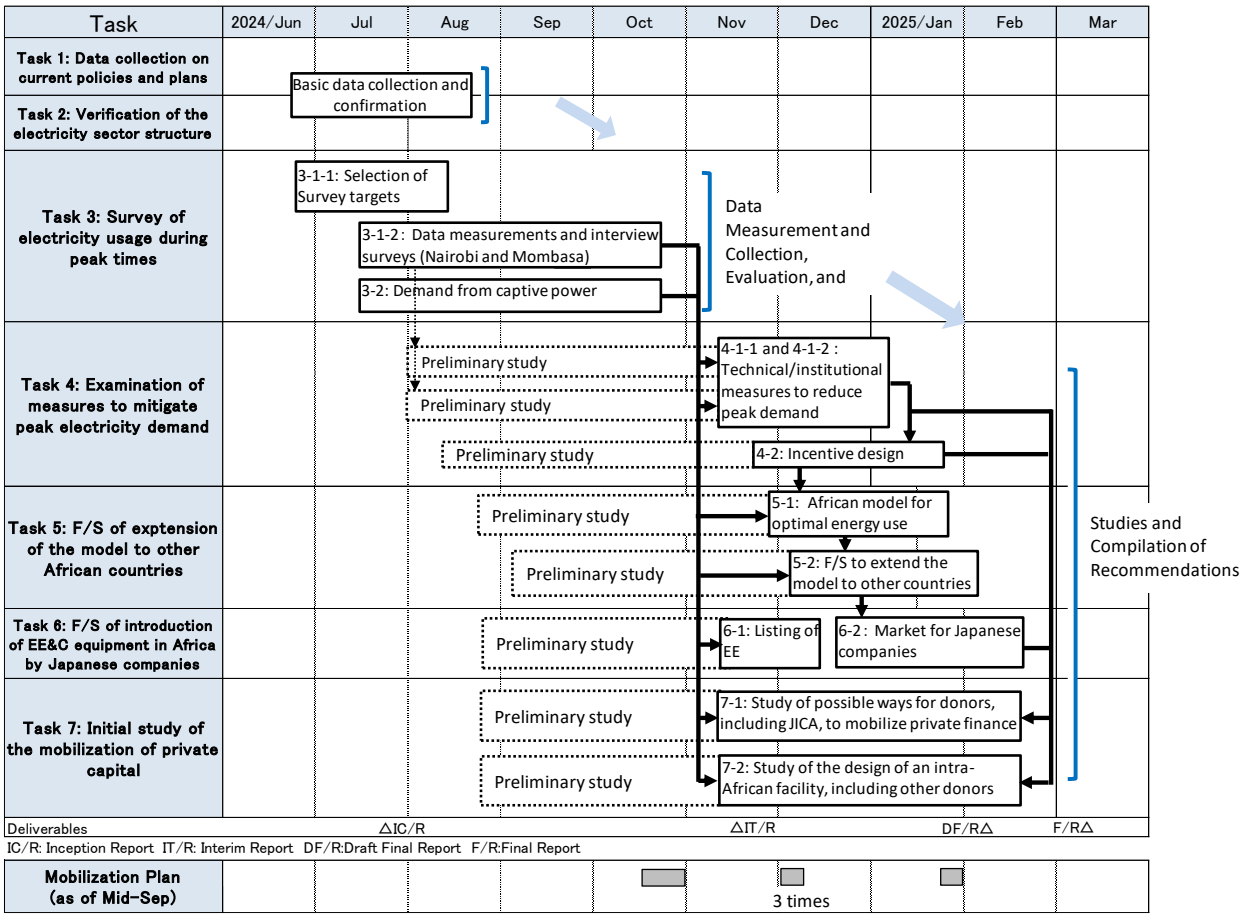
Second point is the provision of technical cooperation for the formulation of demand-side policies. Japan has extensive experience in addressing recurring power supply-demand constraints and has developed a well-established legal framework for demand side management based on the Energy Conservation Act. Additionally, various demand-side measures, such as tariff structures including time-of-use pricing to encourage load leveling and incentive programs for DSM and EE&C technologies, have been implemented. Leveraging Japan’s expertise to develop a framework for policy collaboration with African countries is proposed.

Third point is the enhancement of market penetration for high-efficiency Japanese air conditioners and refrigerators. To expand the market share of high-efficiency Japanese appliances, technical

cooperation projects should be utilized to address and improve the existing energy efficiency evaluation and labeling programs. Additionally, promoting the economic benefits of energy-efficient technologies, such as the short investment payback period of high-efficiency air conditioners, would be essential in increasing the presence of Japanese companies and facilitating deeper market penetration.

3.3 Overall Schedule

This survey has been conducted according to the schedule/workflow shown in the next figure, with each process carried out as planned.



In the January 2025 mobilization, in addition to Kenya, field survey research in Tanzania was conducted.
Source: The JST

Figure 3-1 Workflow

3.4 Other Aspects of the Survey

3.4.1 The Equipment Procurement Plan

The data measurement equipment (including smart eco meters developed by the Egypt-Japan University of Science and Technology, E-JUST) has been rented, with the full cooperation of E-JUST. The next table lists the equipment utilised for onsite operations.

Table 3-1 Equipment Necessary for Onsite Operations

No.	Item of Equipment	Number of Units	Purpose
1	Smart Eco Meter	50 Units	Measurement of electricity consumption in households
2	Power Logger	4 Units	Same as above

3.4.2 Preparation and Submission of Deliverables

Interviews conducted with relevant institutions during the course of the study, as well as discussions between JICA and related institutions, were documented in English as meeting records and minutes. These records included the date, location, participants, and key points, and were submitted to JICA in a timely manner. Additionally, all materials and documents obtained during the study were digitized, standardized with file names indicating the date and content, and compiled as an annex to the report, including meeting records, minutes, and image collections.