



United Republic of Tanzania
Ministry of Energy



National Energy Efficiency Strategy

2024 -2034



October 2024

Foreword

Energy plays a pivotal role in achieving Tanzania's development objectives, particularly in improving the quality of life for its citizens while safeguarding the environment. To meet these ambitions, the energy sector is undergoing comprehensive reforms designed to address existing challenges, including the adoption of energy efficiency measures. These reforms are essential not only for enhancing energy security but also for mitigating the impacts of climate change.

Energy efficiency refers to the use of less energy to produce the same output of goods and services, without compromising on quality or quantity. It involves the deployment of advanced technologies that optimize energy use and the adoption of behavioural changes that reduce overall energy consumption. Despite the clear economic benefits of energy efficiency—such as reduced operational costs for industries and lowered electricity bills for consumers—progress in this area has been suboptimal. Factors such as insufficient information, limited financial resources, lack of expertise, and low levels of motivation have hindered the widespread adoption of energy-efficient technologies and practices.

To address these challenges, the Government of Tanzania has initiated a strategy to maximize the potential of energy efficiency across various sectors of the economy. As outlined in the National Energy Policy of 2015, energy efficiency measures can significantly reduce the need for capital investment in new energy infrastructures, thereby easing the financial burden on the state and reducing the environmental impact of energy generation. With energy demand expected to rise in tandem with economic growth, accelerated rural electrification, and grid expansion, addressing inefficiencies in the use of existing energy resources is critical. Furthermore, the aging of energy infrastructures, combined with inefficiencies in energy consumption by end-users, is likely to exacerbate electricity shortages unless energy efficiency measures are adopted on a broader scale.

From an economic perspective, the benefits of energy efficiency extend beyond reduced capital expenditure and operational costs. By improving the energy performance of industries, Tanzania can enhance the competitiveness of its manufacturing sector, reduce pollution, and promote cleaner technologies. Additionally, energy efficiency has the potential to reduce the cost of public services, particularly in sectors with high energy demands, such as healthcare, education, and government operations. Moreover, fostering energy efficiency skills can generate new employment opportunities, contribute to gender-inclusive economic growth, and create a workforce capable of driving innovation in energy technologies.

The National Energy Efficiency Strategy (NEES) provides a framework for achieving these objectives, positioning energy efficiency as a driver for economic growth, climate change mitigation, and social well-being. The strategy emphasizes the need for a holistic, cross-sectoral approach that involves both government and private sector stakeholders in its implementation. It is essential that energy efficiency be integrated into the daily operations of all sectors, not only as a means to reduce costs and environmental impacts, but also as a strategic component of national economic policy. As such, the Ministry of Energy is fully committed to ensuring the realization of the strategy's objectives and delivering measurable outcomes for the Tanzanian economy.

In conclusion, energy efficiency is not merely an environmental concern but an economic imperative for Tanzania. It offers an opportunity to reduce the nation's reliance on costly new energy infrastructures, lower production costs across industries, and drive sustainable economic growth. By embracing energy efficiency measures and promoting the widespread adoption of energy-saving technologies, Tanzania can ensure a more resilient, competitive, and environmentally sustainable economy for future generations.



Hon. Dr. Doto Mashaka Biteko (MP)
Deputy Prime Minister and Minister for Energy

A black ink signature of Hon. Dr. Doto Mashaka Biteko (MP) written over a horizontal line.

Acknowledgement

The Ministry of Energy recognises the importance of energy efficiency as an essential tool to combat climate change, reduce energy costs for consumers, and improve social welfare and business competitiveness. It is clear that if households and buildings use less energy to heat, cool and run appliances, and if manufacturing facilities require less energy to produce goods, this signifies energy efficiency. When we use energy efficiently, the conserved energy can be supplied to more people, making energy efficiency a game changer across many sectors.

In light of the importance of energy efficiency, the Government has prepared a strategy that provides guidance on energy efficiency across various sectors. Key stakeholders in the implementation of National Energy Efficiency Strategy (NEES) include public sector institutions, line ministries, private sector, financial institutions, academia, Non-Governmental Organisations (NGOs), local communities, and development partners, all of whom play a significant role in supporting various activities.

I sincerely thank the European Union (EU) and the United Nations Development Programme (UNDP) for their technical and financial support throughout the preparation of this strategy. I would also like to take this opportunity to express my sincere gratitude to all stakeholders who worked tirelessly in the preparation of this strategy. I extend my acknowledgments to the numerous stakeholders, including line ministries, the private sector, academia, NGOs, and development partners, who participated and contributed to the development of this important strategy.

Lastly, I would like to commend the experts from the

Ministry of Energy for their unwavering dedication. Their efforts in initiating and maintaining momentum have been instrumental in shaping and finalising this strategy.

I encourage everyone to actively participate in the implementation of this strategy, ensuring its success for the benefits of all.



Eng. Felchesmi Jossen Mramba
Permanent Secretary, Ministry of Energy

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Executive Summary

Tanzania's current energy consumption is reliant on various sources, including biomass, natural gas, hydropower, and to a lesser extent, solar and wind energy. Biomass remains the dominant energy source, accounting for approximately 82 per cent of the primary energy used in the country, with over 90 per cent of households relying on wood and charcoal for cooking. This heavy reliance on traditional biomass, coupled with inefficient energy practices across other subsectors, has led to significant environmental degradation, high operational costs, and persistent energy insecurity. To transform the country into an energy-efficient economy, enhance energy security, and contribute to global efforts to mitigate climate change, the National Energy Efficiency Strategy (NEES) has been developed.

The objective of this strategy includes improving energy security, reducing poverty, promoting innovation, and mitigating climate change, with a broad scope covering thematic sectors such as electricity supply, cooking, manufacturing, mining, and quarrying, transportation, and building. The preparation of the NEES involved a comprehensive and inclusive process of engaging a wide range of stakeholders from the public and private sectors, academia, civil society, and development partners. The strategy was developed through a series of consultations, workshops, and working group sessions, ensuring that the perspectives and expertise of all relevant sectors were incorporated. This collaborative approach was critical in identifying the key challenges and opportunities in Tanzania's energy landscape and in developing a strategy that is both ambitious and practical. The NEES builds upon existing National Policies and international commitments among others are Energy Policy 2015, Forest Policy Implementation Strategy 2021-2031, Environmental Conservation and Management Policy 2021, Sustainable Development Goals (SDGs) and the Paris Agreement.

The current energy landscape in Tanzania presents both opportunities and challenges as the country is endowed with diverse energy resource potentials, including biomass, natural gas, hydro, solar, wind, nuclear and geothermal. However, despite these resources, the adoption of energy-efficient practices has been hampered by insufficient regulatory frameworks, access to technical and financial resources, limited public awareness, and a lack of a

dedicated energy-efficiency strategy. For instance, as of July 2024, Tanzania's installed electricity generation capacity connected to the national grid system was 2,607.96 MW, with 50.08 per cent coming from hydro and 45.96 per cent from natural gas. The transmission and distribution losses remain significant, with total system losses at 14.46 per cent. By effectively promoting energy efficiency in the electricity supply ecosystem, Tanzania can save more than 2 per cent per year of its energy consumption, lower greenhouse gas emissions, and improve the competitiveness of its economy, ultimately fostering sustainable development and improving the quality of life for all Tanzanians. This highlights the need for a cohesive strategy that integrates existing efforts and addresses gaps in policy and practice, ensuring that Tanzania can effectively harness its energy resources while minimising environmental impact. Thus, this NEES outlines a clear vision and mission for transforming Tanzania into an energy-efficient nation. The strategy is designed to promote energy efficiency across all sectors of the economy, with the specific aim of raising awareness, improving energy performance, and enhancing innovation, skills, and capacities.

For example, one of the strategic objectives is to reduce energy losses in electricity generation, transmission, and distribution systems by June 2028, with a target to implement advanced monitoring systems, adoption of energy management practices and conduct comprehensive energy audits. Another strategic objective is to enhance the uptake of energy-efficient cooking solutions, recognising that up to 82 per cent of the country's energy consumption comes from biomass used primarily for cooking. The strategy also emphasises the importance of integrating energy efficiency in building design and promoting the use of energy-efficient appliances, to implement Minimum Energy Performance Standards (MEPS) and labelling for appliances by 2026. Collaboration among stakeholders, including the government, private sector, academia, and civil society, is essential to achieve these objectives.

Effective implementation of the NEES is critical to its success. The Ministry of Energy will lead the implementation, supported by various public and private sector entities. The strategy outlines the governance structures and financial mechanisms required to support energy efficiency initiatives, emphasising

the importance of stakeholder coordination, regular reviews, and transparent reporting. The successful implementation of the energy efficiency strategy in Tanzania will require substantial long-term financial resources from the central Government, local Governments, other decentralised funds, Development Partners, Public-Private Partnerships (PPP) and non-governmental partners. Financial mechanisms include a mix of government funding, grants, green loans, tax incentives, and public-private partnerships. Monitoring and evaluation are integral to the strategy, with a results framework that includes key indicators to track progress. Regular reviews will ensure that the strategy remains on track to achieve its objectives, with adjustments made as necessary to respond to

emerging challenges and opportunities.

The strategy is organised into four chapters. The First Chapter provides an overview of the concept of energy efficiency, including its principles, benefits, and benchmarking. The Second Chapter examines the current state of energy efficiency in Tanzania by reviewing policies and legal instruments that address energy efficiency issues in the country. The Third Chapter outlines the vision, mission, goals, strategic objectives, targets, and indicators. Finally, the Fourth Chapter details the implementation, monitoring, and evaluation of the NEES by various stakeholders, led by the Ministry of Energy (MoE).

Abbreviations & Acronyms

AC	Air Conditioning/conditioners
AEE	Association of Energy Engineers
AfDB	African Development Bank
BEE	Bureau of Energy Efficiency
BEMS	Building Energy Management System
BEST	Tanzania's Biomass Energy Strategy
CDM	Clean Development Mechanism
CNG	Compressed Natural Gas
EAC	East African Community
EAs	Executive Agencies
EACREEE	East African Centre of Excellence for Renewable Energy and Energy Efficiency
EEBC	Energy Efficiency Building Codes
EEFP	Energy Efficiency Financing Platform
TIRDO	Tanzania Industrial Research and Development Organisation
EES&L	Energy Efficiency Standards and Labelling
EnMS	Energy Management System
EPC	Energy Performance Certification
ESCO	Energy Service Company
ETDCO	Electrical Transmission Distribution Construction and Maintenance
EU	European Union
EV	Electric Vehicles
EWURA	Energy and Water Utilities Regulatory Authority
FYDP	Five-Year Development Plan
GASCO	Gas Supply Company Limited
GCF	Green Climate Fund
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse Gas
GO	Gas Oil
GMO	Genetically Modified Organism
GWh	Gigawatt hour
HFO	Heavy Fuel Oil
ICS	Improved Cookstoves
IEA	International Energy Agency
IFI	International Financial Institution
INGO	International Non-Governmental Organisation
IPPs	Independent Power Producers
ISO	International Organisation for Standardisation
JNHPP	Julius Nyerere Hydro-electric Power Project
LATRA	Land Transport Regulatory Authority
LED	Light Emitting Diode
LGA	Local Government Authority
LPG	Liquefied Petroleum Gas
MDAs	Ministries, Departments and Agencies
MEPS	Minimum Energy Performance Standards
MFI	Microfinance Institutions
MNRT	Ministry of Natural Resources and Tourism
MoE	Ministry of Energy
MW	Megawatt
MFD	Maximise Finance for Development

MTEE	Market Transformation for Energy Efficiency
NAPCC	National Action Plan on Climate Change
NBS	Tanzania National Bureau of Statistics
NDC	Nationally Determined Contributions
NGO	Non-Governmental Organisation
NEES	National Energy Efficiency Strategy
NMEEE	National Mission for Enhanced Energy Efficiency
NRW	Non-Revenue Water
NZE	Net Zero Emissions
PBPA	Petroleum Bulk Procurement Agency
PPM	Planned Preventative Maintenance
PISCS	Public Institutions and Cooperations
PPP	Public-Private Partnership
PSMP	Power System Master Plan
PURA	Petroleum Upstream Regulatory Authority
R&D	Research and Development
REA	Rural Energy Agency
REMP	Rural Energy Master Plan
SDGs	Sustainable Development Goals
SGR	Standard Gauge Railway
SMEs	Small and Medium-sized Enterprises
SPPs	Small Power Producers
TAA	Tanzania Airports Authority
TAZARA	Tanzania-Zambia Railway Authority
TRC	Tanzania Railway Cooperation
TBS	Tanzania Bureau of Standards
TANESCO	Tanzania Electric Supply Company Limited
TANOIL	Tanzania National Oil Company
TCPM	Tanzania Concrete Poles Manufacturing Company Limited
TFS	Tanzania Forest Service Agency
TGDC	Tanzania Geothermal Development Company
TPDC	Tanzania Petroleum Development Corporation
TRA	Tanzania Revenue Authority
TZS	Tanzanian Shillings
UN	United Nations
UNDP	United Nations Development Programme
UNIDO	United Nations Industrial Development Organization
VSD	Variable Speed Drive
VSPPs	Very Small Power Producers
WB	World Bank

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Key Definitions

Appliance: any equipment used to convert the provided energy supply into the energy service required by the user—for example, light bulbs, stoves, or water pumps.

Biomass Energy: energy consists of biological materials derived from wood and bio-residues from industries, agriculture, animals, and forests, which could be solid, liquid, or gaseous. This includes charcoal, firewood, briquettes, pellets, and similar solid biomass.

Building: is a physical structure with a defined purpose, designed and constructed to provide shelter or space for various human activities such as residential, commercial, or industrial uses.

Building Codes, Standards, and Regulations: provide rules and standards for the design, construction, alteration, materials, maintenance, and performance of buildings, including billboards and telecommunication towers.

Carbon Credit: is a credit for greenhouse emissions reduced or removed from the atmosphere by an emission reduction project, which can be used by government, industry, or private individuals to compensate for the emissions they generate elsewhere.

Clean Cooking Solutions: refers to the use of fuels and appropriate technologies that collectively produce energy efficiently and a minimum level of toxic emission when used appropriately. This concept aims to ensure the safety, sustainability, and easy accessibility of cooking energy, saving time and reducing usage costs, as well as minimising environmental and health impacts for users.

Climate Change: is a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable periods.

Deforestation: is the conversion of forest to another land use or the long-term reduction of tree canopy cover below the 10 per cent threshold.

Energy Access: refers to the availability of modern energy services, which include sustainable, acceptable, reliable, and affordable energy.

Energy Audit: is an assessment of the energy needs and

efficiency of a building, or buildings used to find the inefficiencies, done through an inspection survey and an analysis of the energy use, to identify improvements needed to increase energy efficiency. These are used to improve the energy efficiency of homes, businesses, and other buildings.

Energy Management: the proactive and systematic monitoring, control, and optimisation of energy consumption to conserve use and decrease energy costs.

Energy Performance Contracting : is a form of creative financing for capital improvement that allows funding for energy upgrades based on cost reductions. Under an EPC arrangement, an external organisation (Energy Service Company - ESCO) implements a project to deliver energy efficiency, using the stream of income from the cost savings to repay the project's costs.

Energy Services: are a variety of tasks that use energy to satisfy an energy need or demand, including heating, transportation, electrical, and transmission.

Energy Supply: a usable form of energy that can be inputted into an appliance to provide the required energy service. For example, solid fuels (such as wood or charcoal), electricity, or mechanical power (such as the rotation of a flour mill) can be burned.

Energy Tax Credits: are Government incentives to provide tax savings (tax incentives or exemptions) to homeowners (individuals), businesses, and other organisations when investing in energy-efficient technologies.

Forest Degradation: is a process leading to a 'temporary or permanent deterioration in the density or structure of vegetation cover or its species composition'. It is a change in forest attributes that leads to a lower productive capacity caused by an increase in disturbances. The timescale of processes of forest degradation is in the order of a few years to a few decades. Forest degradation is assumed to be indicated by the reduction of canopy cover and/or stocking of the forest.

Household: is a person or persons living in one compound, one building, or one apartment and usually eating from the same pot.

Grants and Subsidies are non-refundable funds invested directly for energy efficiency actions or services to cover a portion of the capital costs or ongoing operational expenses of an energy efficiency project.

Greenhouse Gas Emission: These are gases that trap heat in the Earth's atmosphere, contributing to the greenhouse effect and global warming. Key greenhouse gases include carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), and fluorinated gases. These emissions primarily come from human activities such as burning fossil fuels such as coal, oil, and natural gas, deforestation, industrial processes, and agriculture. Reducing greenhouse gas emissions is critical to mitigating climate change and its impacts on the environment and human societies.

Improved Cook Stoves: Solid-fuel stoves that improve on solid-fuel technologies in terms of fuel savings via improved fuel efficiency. Some improved cook stoves also lower particulate emissions through improved efficiency of combustion. However, the critical distinction from "clean" cooking solutions is that "improved" stoves may not reach sufficiently low emissions levels to generate meaningful health benefits.

Land degradation: Acts synergistically with forest degradation. Land degradation often follows deforestation and forest degradation. It is most associated with soil erosion, nutrient depletion, water scarcity and disturbances in biological cycles, but can also be the result of chemical contamination and salinity.

Minimum Energy Performance Standards (MEPS): Specify the minimum level of energy performance that appliances and equipment must meet or exceed before they can be supplied or used for commercial purposes.

Sustainable Development: It is the development which meets the needs of current generations without compromising the ability of future generations to meet theirs.

Technology Transfer: A broad set of processes covering the flows of know-how, experience, and equipment for mitigating and adapting to climate change amongst different stakeholders such as governments, private sector entities, financial institutions, non-governmental organisations, and research/education institutions.



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CHAPTER ONE - INTRODUCTION

1.1 The Concept of Energy Efficiency

Energy efficiency means using less energy to accomplish the same task or achieve the same outcome. It is one of Tanzania's easiest and most cost-effective ways to combat climate change, reduce consumer energy costs, and improve social welfare, productivity, and

business competitiveness. Energy-efficient homes and buildings should use less energy for heating, cooling, operating appliances, and electronics, while energy-efficient manufacturing facilities should use less energy to produce goods.

1.2 Energy Efficiency Benefits and Principles

Energy efficiency increases the resilience and reliability of the energy systems, and provides environmental, community, economic and health benefits, among others: -

- a. **Cost Savings:** – enables saving money on energy bills by making energy-efficient and weatherisation upgrades - such as adding insulation, using Light Emitting Diode (LED) lighting, and installing a heat pump - that reduce energy use and improve comfort. Energy-efficient buildings cost less to heat, cool and operate, while industry and manufacturing plants can make products at lower cost. Energy-efficient transportation results in fuel savings.
- b. **Community Benefits:** - energy-efficiency programs improve community resilience and address energy equity by bringing efficient, cost-effective technologies and infrastructure to all communities—including the poor and the disabled. These communities are disproportionately affected by air pollution and have a higher energy burden, which is the percentage of gross household income spent on energy costs.
- c. **Environmental Benefits:** - reducing energy use is essential in the fight against climate change because traditional power plants burn fossil fuels that release greenhouse gases and contribute to air pollution. Available energy serves many consumers by avoiding losses during consumption. Furthermore, energy-efficient homes and businesses bring us closer to a greener and healthier planet. Reducing energy usage reduces the demand for fossil fuels and, in turn, lowers carbon dioxide levels in the atmosphere. Energy-efficient homes and buildings are also better equipped to switch to renewable energy, which does not produce harmful emissions.
- d. **Resiliency and Reliability:** Energy efficiency improvements reduce the amount of electricity on the grid at one time, known as load, minimising congestion and stress on Tanzania's electric grid system. This improvement can prevent power disruptions.
- e. **Health Benefits:** - Reducing fossil fuel use results in cleaner air, water, and land, all of which directly affect human health - especially those in marginalised communities and people with conditions that are exacerbated by pollution.
- f. **Enhances energy security and independence:** – reducing overall energy demand and adopting renewable energy technologies helps minimise reliance on fossil fuels' import (oil, gas, coal etc.) hence playing a crucial role in ensuring both long- and short-term energy security in a cost-effective manner.

1.3 Energy Efficiency in Various Sectors in Tanzania

Energy Efficiency is the “first fuel” in clean energy transitions, as it provides some of the quickest and most cost-effective CO₂ mitigation options while lowering energy bills and strengthening energy security. Energy efficiency is the single largest measure

to avoid energy demand in the Net Zero Emissions (NZE) by 2050 Scenario, along with the closely related electrification measures, behavioural change, digitalisation, and material efficiency. The energy performance of each sector in Tanzania is focused

on reducing energy demand and helping improve energy intensity by employing specific measures. However, the full understanding of consumption per sector is undermined by data availability – collection

and repository. According to the report produced by the International Energy Agency report of 2021, Tanzania's energy consumption sharing by sector is shown in Figure 1 (IEA, 2021).

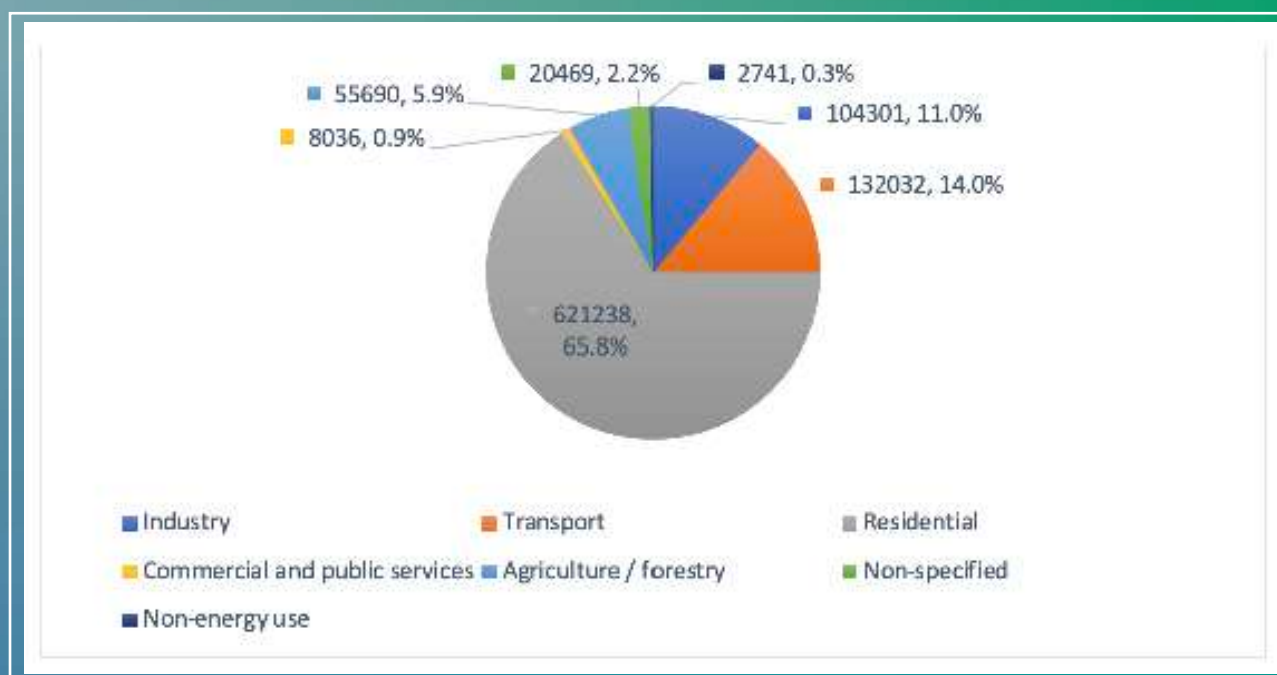


Figure 1: Total Energy Consumption by Sector (source: IEA, 2021)

As per the International Energy Agency (IEA) report, the residential sector is the country's largest energy-consuming sector, followed by transport, industry, agriculture, and services.

The following are some of the initiatives towards improving energy efficiency across the country:

- Development of Minimum Energy Performance Standards (MEPS) and labelling for five (5) applicable energy-consuming appliances i.e., fans, motors, televisions, air conditioners and refrigerators. Other appliances are also to be taken into consideration.
- Clean cooking initiatives: the Tanzanian Domestic Biogas Program which promotes solutions like ICS or biogas digester, preservation of biomass through energy-efficient equipment like improved cook stoves, and promoting the use of LPG (butane, propane).
- Development of Energy Efficiency Building Codes (EEBC) in the building sector. These codes

will enforce technical requirements related to the performance of construction materials and adherence to appropriate thermal standards.

- Development of Transport Infrastructures such as railway network for Standard Gauge Railway (SGR) in Intra-cities, Bus Rapid Transit in Dar es Salaam, Maritime transport in coastal and lake regions and Air transport. Furthermore, adding to EV cars, E-bikes, (Compressed Natural Gas) CNG vehicles and charging stations are of considerable amount.
- Development of energy performance certification in large buildings and industries. Monitoring production, energy costs and installing Energy Management Systems (EnMS) are designed by Certified Energy Auditors and Managers who are currently present in Tanzania.
- Create awareness among the public on the appropriate use of energy through different media, platforms, working groups, sessions, and capacity buildings. fective manner.

1.3.1 Cooking Initiatives in Tanzania

Over 80 per cent of Tanzania's population relies on traditional cooking methods, with firewood (58.6 per cent) and charcoal (27.1 per cent) being the primary fuels. The sector faces issues such as limited clean cooking technologies, awareness, availability, affordability, and financing options. The government is implementing the National Clean Cooking Strategy 2024 – 2034 (MoE, 2024) as well as the National Charcoal Strategy and Action Plan 2021 – 2031 (MNRT, 2022) to address these challenges.

Wood fuel, particularly charcoal, is heavily used, with more than 90 per cent of households in urban areas relying on illegally and inefficiently sourced biomass (MNRT, 2022). Charcoal consumption has doubled over the past decade, and without intervention, it is expected to double again by 2030. Population growth and urbanisation are significant factors driving this demand growth. Tanzania's population is projected to grow from 59 million in 2020 to 138 million by 2050, with urban populations expected to increase significantly.

The National Charcoal Strategy and Action Plan (2021 – 2031) as well as the National Clean Cooking Strategy (2024 – 2034) have established strategies, targets, and outcome indicators that will serve as tools to ensure the following outcomes: -

- a. Enhanced sustainable charcoal production and utilisation.
- b. Enhanced production and use of alternative charcoal.
- c. Increased market niche for sustainable charcoal.
- d. Enhanced institutional, and human resource

capacity and coordination.

- e. Mainstreamed gender inclusion along the charcoal value chain.
- f. Enhanced good governance in the charcoal value chain.
- g. Enhanced adoption of alternative cooking energy.
- h. Increased awareness among citizens and institutions on the importance of using clean cooking solutions.
- i. Increased access to clean, affordable, sustainable, and reliable cooking solutions by improving infrastructure, ensuring the availability of raw materials, and simplifying procurement processes.
- j. Reduced cost of clean energy, appliances, and efficient cookstoves.
- k. Existence of enabling policies, laws, regulations, and guidelines to facilitate the adoption of clean cooking solutions.
- l. Increased investment in clean cooking solutions, thereby contributing to economic growth.
- m. Enhanced capacity to effectively implement clean cooking projects.
- n. Expanded scope of research and innovation in technologies related to cooking solutions.
- o. Reduced impact of HIV and AIDS infections along the charcoal value chains and promotion of gender equality and good governance in clean cooking.

Therefore, this National Energy Efficiency Strategy 2024 – 2034, provides important inputs and contributions in guiding energy efficiency initiatives across various sectors, which are energy-intensive.

1.3.2 Electricity Supply in Tanzania

From the TANESCO generation report of July 2024, the National Grid system is synchronised from power plants with an installed capacity of 2,645.32 MW. The installed capacity is contributed by 1,306.27 MW (50.08 per cent) from hydropower, 1,198.82 MW (45.96 per cent) from natural gas, 92.37 MW (3.54 per cent) from diesel and heavy fuel oil (HFO), and 10.50 MW (0.42 per cent) of electricity generated from biomass. Off-grid plants generate about 32.82 MW. The electricity demand as of 15 July 2024 has reached 1,683.57 MW as compared to the maximum demand recorded in

August 2023, which was 1,482.80 MW. The Tanzania Electric Supply Company (TANESCO) estimates that the power demand is growing at a rate of 10-15 per cent per year. Figure 3 illustrates the installed capacity by energy source (MoE 2024).

To supply the generated power, Tanzania's electricity transmission network is 7,745.38 km which is owned and operated by TANESCO. Of the total transmission network, 1,244.75 km carries 400 kV, 4,095.62 km carries 220 kV, 1,825.01 km carries 132 kV and 580 km carries 66 kV. The electricity distribution network

comprises 176,750.88 km, connecting 4,957,278 customers across the country. The overall household connectivity rate for Tanzania Mainland is 46 per cent - of which 73.9 per cent accounts for urban areas, and 36 per cent accounts for rural areas. The overall access

to electricity for Tanzania Mainland is 79.5 per cent of which 99.6 per cent is for urban areas and 69.8 per cent for rural areas.

1.4 Financing Mechanism and Incentives for Energy Efficiency Initiatives

Financial incentives are pivotal in promoting energy efficiency initiatives by reducing the financial barriers and risks associated with implementing energy-saving measures. These incentives can take various forms, including carbon credits, grants, energy tax credits, subsidies, self-financing and low-interest loans, each tailored to encourage different sectors to adopt energy-efficient technologies and practices. By providing

direct financial support and attractive financing options, these incentives can make energy efficiency projects more viable and appealing. Some of the best practices in implementing energy efficiency financial incentive plans are being carried out by various countries around the world such as India, Ghana, the United States, South Africa, the Netherlands etc.

1.5 Rationale for the National Energy Efficiency Strategy (2024–2034)

The strategic development and implementation of energy efficiency measures are crucial for Tanzania's sustainable economic growth, environmental protection, and improved quality of life. Despite the significant contributions of various energy sources and sectors to the country's economy, the Ministry of Energy lacks a comprehensive strategic document that outlines the long-term vision for energy efficiency along their individual supply and value chains. This NEES aims to fill that gap and provides a detailed roadmap to enhance energy efficiency across multiple sectors: cooking, water supply and use, transport, electricity, manufacturing, industries (business, tourism, textile, commerce, trade, and traffic etc), fishing, and residential and commercial buildings.

In addressing energy efficiency across various sectors, most national strategies (e.g. National Renewable Energy, National Clean Cooking, and the National Charcoal Strategies) targeting energy management lack the attention and measures to support the absorption of energy efficiency practices. Although through a piece-meal approach, there exists several national policies and other strategies (e.g., National Energy Clean Cooking Strategy 2024 - 2034) that have set the stage by highlighting the importance of energy efficiency across various sectors, underscoring the need for a consolidated national strategy dedicated to addressing energy efficiency.

Apart from the shortfalls across strategies, the deployment of energy efficiency is also undermined by various bottlenecks across sectors that make a consolidated strategy a necessity. For example, the

cooking sector of Tanzania is dominated by firewood and charcoal fuels, which are inefficiently produced and processed along the value chain. Similarly, electricity generation and consumption patterns in Tanzania exhibit inefficiencies that lead to high energy costs and environmental impacts. Losses are rampant in electricity generation, transmission, and distribution through aged and overloaded equipment, appliances, and untimely maintenance. TANESCO estimates that in 2020 - 2021, electricity energy losses at 15.16 per cent - of which 5.89 per cent was for the transmission system and 9.27 per cent for the distribution system. Other distributors such as Mwanga and Andoya reported 6 per cent and 3.98 per cent losses on their distribution grid, respectively. These losses are derived from technical (inefficient power infrastructure, expired and defective meters) or non-technical (like theft) issues. Despite power losses along transmission and supply, there is a significant drop in losses due to an increase in the rate of inspecting customers and efforts to replace conventional electricity meters with smart meters and construction of high voltage transmission lines (400 kV) to connect significant load centres (power loads). This will align well with the ambition set under NEES.

Furthermore, the transport sector in Tanzania heavily relies on fossil fuels thus contributing significantly to greenhouse gas emissions. The use of efficient Compressed Natural Gas (CNG) for powering transport is still limited, and at the same time, the capacity for required modifications and refuelling infrastructure is still limited in the country. Similarly, the development of electric mobility (e-mobility) is in

its nascent stages and requires substantial investment, resources, and capacity.

Manufacturing and fishing are also high energy-intensive industries. The manufacturing processes in Tanzania are often energy-intensive and rely on outdated technologies, leading to high energy consumption and costs. As of 2024, only a handful of manufacturing industries are implementing energy audits and energy management systems. The fishing industry relies on fuel-intensive practices, impacting both economic and environmental sustainability. The use of kerosene lamps and fossil fuels in powering fishing gears further aggravates the pollution potential of the same. There is a limited focus on energy efficiency within this industry including the use of efficient renewable energy-powered fishing engines and solar lights. Adaptive research and development of sustainable fishing methods that enhance energy efficiency are still limited, if any.

Apart from that, residential energy consumption is characterised by inefficient practices and appliances. This includes a high reliance on inefficient biomass technologies and fuels for cooking, as well as inefficient domestic appliances such as air conditioners. Energy efficiency in households can significantly reduce national energy consumption, improve living standards, and reduce poverty at households' levels. Moreover, buildings consume a substantial amount of energy for heating, cooling, lighting, and other functions. The

integration of energy efficiency in building design and construction is limited in Tanzania. It is very common to see large buildings in Tanzania fully covered with glass, sometimes tinted in black colour even in locations where there are high insulation values and temperatures such as Dar es Salaam. Therefore, knowledge, awareness, and skills are necessary to transform the situation and status quo.

The gaps across sectors and lack of a consolidated national approach necessitated the development of the National Energy Efficiency Strategy (2024 – 2034) to guide Tanzania towards a sustainable energy future. By targeting key sectors, the strategy aims to enhance energy efficiency, reduce greenhouse gas emissions, improve the health of citizens, and promote economic growth. The strategy aligns with global efforts to mitigate climate change and supports Tanzania's commitments under the Nationally Determined Contributions (NDC). The strategy will build on existing sectoral strategies and plans that have elements of energy efficiency, including the National Charcoal Strategy and Action Plan (2021 – 2031) which aim to address forest deforestation and degradation through clean cooking initiatives, the National Renewable Energy Strategy (2024–2034) aim support renewable energy applications in the country and the National Five-Year Development Plan (FYDP) III (year-year) which aims to increase efficiency and productivity in the manufacturing sector.

1.6 Benchmarking Energy Efficiency Initiatives

Several lessons can be borrowed for NEES from various initiatives undertaken in other African countries and internationally. Below are the highlights of

1.6.1 Ghana

Ghana has implemented several aimed at reducing energy consumption and improving energy efficiency across various sectors. These initiatives include the establishment of Minimum Energy Performance Standards (MEPS), and the Energy Efficiency Standards and Labelling (EES&L) program (2017-present). These standards and the program require that appliances such as refrigerators, air conditioners, and lighting products meet specific energy efficiency criteria before they can be sold in the country. A notable program is the National Refrigerator Rebate Scheme, launched in 2012, which encouraged consumers to replace inefficient refrigerators with more energy-efficient models. The rebate scheme not only helped

these initiatives, including successes and challenges encountered during their implementation: -

reduce energy consumption but also raised awareness about energy efficiency.

Despite these successes, Ghana continues to face challenges in fully implementing its energy efficiency policies. One major issue is the enforcement of regulations, particularly at points of entry, where inefficient appliances may still be imported illegally. Additionally, there is a need for more comprehensive public education campaigns to ensure that consumers are fully aware of the benefits of energy-efficient products and practices. The initial cost of energy-efficient appliances can also be a barrier for low-income households, despite the long-term cost savings.

1.6.2 Kenya

Kenya has developed a comprehensive framework to promote energy efficiency through various policy instruments and initiatives. The country's primary document governing this area is the Kenya National Energy Efficiency and Conservation Strategy (2020-2025) which aims to enhance energy conservation and efficiency across multiple sectors. Further, the country has several existing national standards and regulations to support its ambitions, these include the Energy Management Regulation of 2012, which mandates energy audits for large energy consumers, leading to the implementation of energy-saving measures; and the appliances' Energy Performance and Labelling Regulations of 2016 that set efficiency standards and labelling requirements for appliances, helping consumers make informed choices.

In Kenya, the ESCO model has been promoted as a key strategy for improving energy efficiency, especially in the industrial and commercial sectors - the typical business model of an ESCO is to enter an agreement with energy consumers either through shared savings or a guaranteed savings contract. Under a shared savings contract, the cost savings are split with a predefined percentage, while the investment is often

shared between the ESCO and the Customer. The model's implementation has been supported by various international organisations and initiatives, including the World Bank and the United Nations Industrial Development Organization (UNIDO). Also, Kenya has partnered with international bodies, including the World Bank, to implement financing models such as the Maximise Finance for Development (MFD) approach of 2018.

In its pursuit of various initiatives and partnerships, Kenya has seen significant improvements in energy efficiency, particularly in the industrial and commercial sectors. The adoption of energy-efficient technologies and practices has led to reduced energy consumption and cost savings. A key challenge remains the coordination among various stakeholders, including government agencies, private sector players, and international partners. The inadequacy in coordination often leads to fragmented efforts and missed opportunities for synergy. Additionally, the financial constraints faced by small and medium enterprises (SMEs) hinder their ability to invest in energy-efficient technologies.

1.6.3 India

India has a well-established framework for energy efficiency, primarily driven by the Bureau of Energy Efficiency (BEE) under the Ministry of Power. The key policy instrument is the National Mission for Enhanced Energy Efficiency (NMEEE) 2020 - part of the National Action Plan on Climate Change (NAPCC) (2023-2030). The mission of the policy includes initiatives like Perform, Achieve and Trade (2019), Market Transformation for Energy Efficiency (2019), and the Energy Efficiency Financing Platform (2020). As part of contributions by these initiatives, India has seen substantial energy savings and carbon emission reductions. For example, the Ujala Scheme, under the

Market Transformation for Energy Efficiency (MTEE), successfully distributed millions of LED bulbs across the country significantly lowering energy consumption and reducing household electricity bills.

Despite these successes, India faces several challenges in scaling up energy efficiency practices, including limited access to finance remains a significant hurdle, particularly for the SMEs and public sector projects; and inconsistent enforcement of energy efficiency standards and regulations, along with a lack of awareness and technical expertise, poses challenges to broader adoption.

1.7 Preparation Process of the National Energy Efficiency Strategy (2024–2034)

The National Energy Efficiency Strategy (2024–2034) was prepared through a desk review of relevant policies and regulatory frameworks, and stakeholders' engagement to capture broader perspectives. The desk work included a review of policies and legal frameworks established under the Vice President's Office (Division of Environment), the Ministry of Energy, the Ministry of Natural Resources and Tourism, the Ministry of Industry and Trade, the Ministry of Transport, the President's

Office Regional Administration and Local Government, the Ministry of Agriculture and the Ministry of Land and Settlements. The relevant stakeholders were involved through working sessions conducted in the form of workshops, one-on-one interviews, focus groups and retreats. The consultations involved Government ministries, departments, and agencies (MDAs), academia, research and development institutions, NGOs, multilateral organisations, donors, national and

international financial institutions/banks, Civil Society Organisations (CSOs), UN agencies, private sector and development partners supporting the energy sector.

This Strategy has been informed by the situational analysis - which explored the energy efficiency initiatives in Tanzania as well as the experience from other countries in Africa and beyond. Similarly, the

analysis covered legal, institutional, and regulatory status related to energy efficiency initiatives in the country. Furthermore, a review of energy efficiency initiatives, financial mechanisms necessary for leading to efficiency, and the country's development outlook has also contributed to the development of this strategy.



02

CHAPTER TWO - SITUATION ANALYSIS

2.1 Institutional Frameworks

The Ministry of Energy has the lead role in developing Tanzania's energy efficiency policies, creating technical regulations for energy labelling, and guiding the requirements of energy-related products. The Renewable Energy Section is responsible for administering all energy efficiency issues in the country.

As shown in Figure 2, (EAs & PISCS) several other institutions under the Ministry have important roles

in shaping and implementing the country's energy efficiency framework including, TANESCO, TGDC, REA, TPDC, PBPA, PURA and EWURA. Despite having departments and sections in the ministry responsible for renewable energy, it is observed that energy efficiency portfolios necessitate a dedicated unit that will foster and spearhead development, implementation, and general oversight of the national sustainable energy efficiency ecosystem.

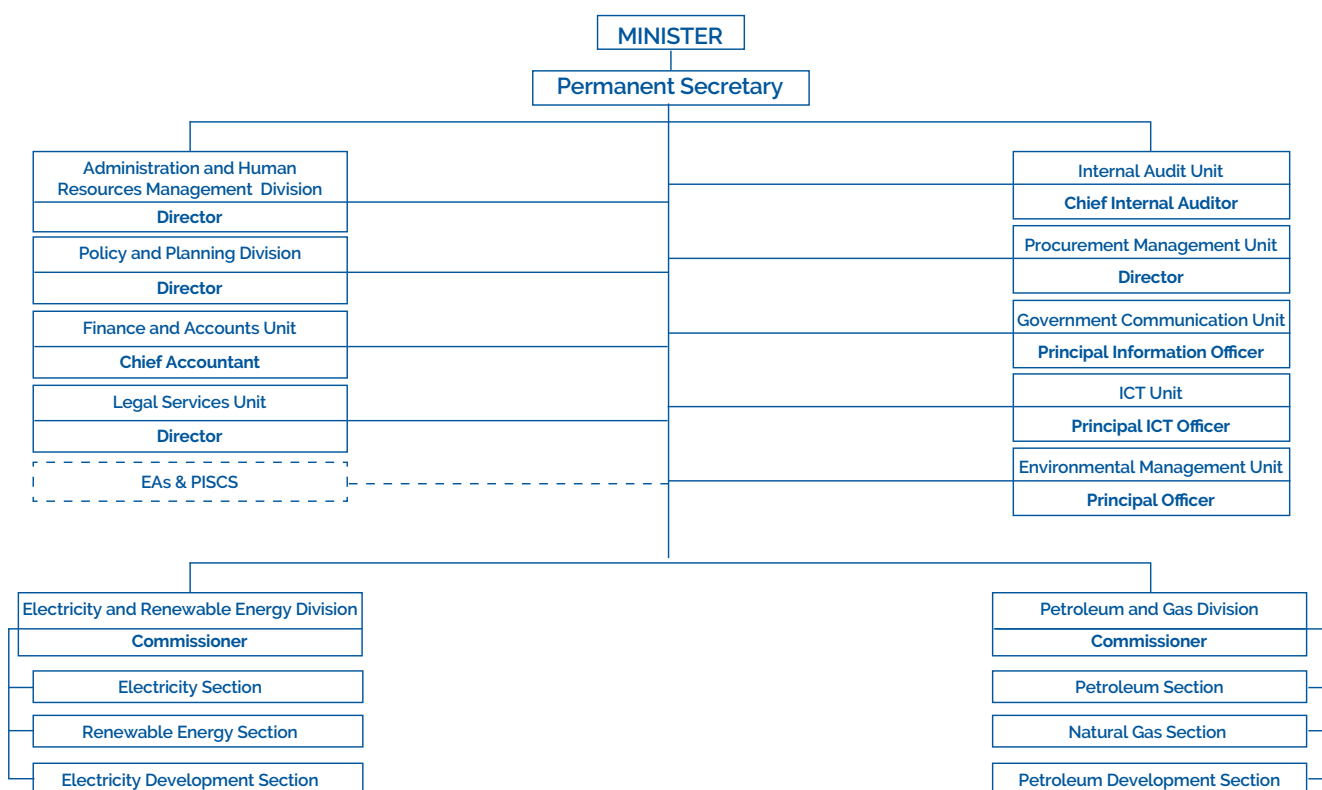


Figure 2: Organization Structure of the Ministry of Energy (Source: MoE website, 2024)

Policy and Legal Frameworks Related to Energy Efficiency in Tanzania

Several national and international policies and legal instruments have been implemented to address energy and energy efficiency issues in Tanzania while others are in the development process – both at national and local levels. The following policy analysis provides an overview of some of these measures taken, as well as the strengths and gaps to be addressed. The proposed strategy builds upon the existing progress and policies, aiming to create a cohesive approach that aligns with other national actions. By leveraging the advancements achieved thus far, this strategy seeks to develop a comprehensive framework that is in harmony with the existing national efforts.

Although, to date, the country has no comprehensive

policy, instrument or strategy targeting Energy Efficiency, the Government of Tanzania has begun to address this issue through the implementation of programmes and projects at an institutional level and in cooperation with several Development Partners. For instance, the Implementation of the Tanzania Energy Efficiency Action Plan Project which is being implemented by the United Nations Development Programme, is funded by the European Union, and the Embassy of Ireland. Targets to improve transmission and distribution efficiency in the power sector, petroleum consumption and electricity consumption in manufacturing industries and households, were set in the MEM Strategic Plan 2011/12-2015/16.

2.1.1 National Energy Efficiency Regulatory Frameworks

The National Energy Policy, 2015

The policy introduces the concepts of sustainable energy and energy efficiency. One of the policy objectives is to enhance energy efficiency and conservation in all sectors such as agro-based and small-scale industries. The policy also states that the government shall establish standards and a code of practice for energy management; ensure energy uses are benchmarked to industry prudent practices; facilitate efficient biomass conversion and end-use technologies; and ensure integration of energy

efficiency aspects in housing policies and building codes.

The National Energy Policy (2015), therefore, lays a solid foundation for preparing the National Energy Efficiency Strategy and Action Plan to guide a stepwise approach towards enhancing energy efficiency concepts, behaviours, knowledge, and practices in Tanzania.

Tanzania Power System Master Plan, 2020

The Tanzania Power System Master Plan (PSMP) (2020) and its updated version, which was still under development during compilation of this NEES, outlines the long-term development plan for the country's

power sector. While the PSMP aims to reduce energy losses, it is not explicit on how to address losses through efficient technologies, behaviour, and practices.

Tanzania National Development Vision 2025

The Tanzania Development Vision 2025 is a long-term plan that outlines the country's goals and aspirations for various sectors. The document has three main objectives: to achieve a quality and good life for all; to achieve good governance and the rule of law; and to build a strong and resilient economy that can effectively withstand global competition. The national

vision calls for the need to build capacity in the public sector, develop the role of local actors and decentralise the political administration using the principle of subsidiarity, among others. However, Vision 2025 does not go into detail about the importance of energy efficiency to achieve its targets.

Rural Energy Master Plan, 2022

The Rural Energy Master Plan (REMP) 2022/23 to 2029/30 supports the operationalisation of Tanzania's objective for expanding access to modern energy services in rural areas. The objective, as per the REMP, is in line with Sustainable Development Goal number 7 (SDG-7) and the Government SE4All Action Agenda:

100 per cent access to electricity by 2030; 75 per cent connectivity to electricity by 2030; and 75 per cent access to modern cooking solutions by 2030. However, the REMP does not explain how energy efficiency contributes to the achievement of SGD-7 and the Government SE4All Action Agenda.

National Forest Policy and Implementation Strategy of the National Forest Policy (2021-2031)

The Tanzania National Forest Policy (1998) is related to energy sector developments in several ways. The policy recognises the important role of forests and trees in providing energy for domestic and industrial use and promoting sustainable energy development. However, the policy has not dwelt on the importance of efficient technologies in the use of forest products for cooking, heating etc.

The policy is supported by the Forest Act (2021) to provide a legal and institutional framework for

sustainable forest management and the promotion of renewable energy sources, including biomass, in addressing energy issues. The act provides guidelines and standards to ensure that forest resources are managed sustainably to support energy production and other socio-economic activities while protecting forest ecosystems and biodiversity. However, the Forest Act (2021), has not prioritised the importance of efficient technologies with the sustainable use of forest products (biomass/biofuels) for cooking, and heating.

Environmental Conservation and Management Policy, 2021

To ensure environmental conservation and sustainable use of natural resources, the first National Environmental Policy (1997) was adopted. The policy was reviewed in 2021 to integrate the limitations and ineffective implementation of the policy. These concerns included inadequate coordination among sectors in managing surroundings; low public awareness and knowledge of environmental management; inadequate enforcement and compliance of various legislation related to environmental management; inadequate alternative sources of energy and dependence on charcoal and firewood as the main source of energy; limited capacity in terms of human, financial, infrastructure, technology, and tools;

and inadequate environmental research, data and information on environmental issues. The policy is supported by the Environmental Management Act (2004) to provide a legal and institutional framework for sustainable management of the environment. Since the inception of the first policy in 1997, the Government in collaboration with other stakeholders has implemented several strategies, programs, plans, and projects. However, the Environmental Conservation and Management Policy (2021) is silent on energy efficiency - as a concept and strategy - in addressing environmental-related challenges such as air pollution, and emissions, among others.

National Five-Year Development Plans (FYDP) III (2020/2021- 2026/2027)

The Third and final Five-Year National Development Plan 2021/22 - 2025/26 aims to foster competitiveness and industrialisation for human development. The goal is to increase efficiency and productivity in manufacturing using the resources abundantly available within the country. The third Plan aims to strategically use resources to achieve the goals of the National Development Vision 2025. In addition,

the FYDP III targets the implementation of sectoral strategic plans, agreements and regional and international strategic plans including the SDGs to accelerate economic growth and social development. The National Five-Year Development Plans (FYDP) III (2020/2021- 2026/2027), however, has not prioritised energy efficiency as a strategy for economic development.

Forest Act, 2021

This legislation serves multiple purposes in the energy sector. It regulates the generation, transmission, distribution, and use of electrical energy, including cross-border trade and rural electrification. It promotes market liberalisation, allowing individuals to participate in power activities if licensed. The legislation empowers the Minister in charge to develop

energy policies and the Regulator to set tariffs, issue licenses, resolve disputes, and approve power projects. It also emphasises the acquisition of wayleave for licensees near energy facilities. The legislation requires the Minister-in-charge to submit annual reports on rural electrification progress and achievements, including off-grid and renewable energy systems.

Electricity Act, 2008

This legislation serves multiple purposes in the energy sector. It regulates the generation, transmission, distribution, and use of electrical energy, including cross-border trade and rural electrification. It promotes market liberalisation, allowing individuals to participate in power activities if licensed. The legislation empowers the Minister in-charge to develop energy policies and the Regulator to set tariffs, issue licenses, resolve disputes, and approve power projects. It also emphasises the acquisition of wayleave for licensees near energy facilities. The legislation requires the Minister in-charge to submit annual reports on rural

electrification progress and achievements, including off-grid and renewable energy systems.

The Electricity Act (2008) proposes ways to regulate the generation, transmission, distribution, and use of electrical energy, including cross-border trade and rural electrification. The Act establishes a foundation for implementing a prudent national energy efficiency strategy, but it lacks specific measures and guidelines to enforce practices that promote sustainable energy efficiency.

Rural Energy Act, 2005

This act established the Rural Energy Board, Rural Energy Fund (REF) and REA. It is responsible for promoting improved access to modern energy services in rural areas of mainland Tanzania and, through the REF, providing grants to developers of rural energy projects and TANESCO for rural grid distribution investments.

Public Private Partnership Act No. 18, 2010

The Act encourages the involvement of private enterprises in delivering public services by facilitating Public-Private Partnership (PPP) projects that bring in investment capital, managerial expertise, and advanced technology. The Act defines the roles and responsibilities of all parties involved, outlines penalties, remedies, and available assistance, establishes guidelines for financial management and control, and provides mechanisms for resolving disputes. In this

The role of the Rural Energy Act (2005), among other things, is to promote and facilitate access to modern energy services in rural areas of Mainland Tanzania. However, specific guidelines and measures needed to promote projects that will stimulate energy efficiency practices in the country are missing.

regard, the PPP Act provides an opportunity for energy efficiency investment from both private and public sectors to spearhead the energy-efficient adoption in the country. However, the Public Private Partnership Act (2010) lacks clear provisions on how PPP projects could either integrate energy efficiency practices or how resources will be mobilised to promote the adoption of energy-efficient technologies within the country.

The Petroleum Act No. 21, 2015

This Act provides for regulation of upstream, midstream, and downstream petroleum activities. It establishes the Petroleum Upstream Regulatory Authority (PURA) and the National Oil Company to secure the accountability of petroleum entities and to provide for other related matters. This Act also ensures compliance with environmental principles and safeguards to any person who exercises or performs functions, duties, or powers

about petroleum operations. The Petroleum Act (2015) supports climate change adaptation and mitigation interventions but does not provide sufficient guidance from fossil fuels to cleaner energy. Furthermore, the Act falls short in relating energy efficiency to climate change adaptation and mitigation interventions.

International Energy Efficiency Regulatory Frameworks Sustainable Development Goals (SDGs), 2015

The United Nations introduced SDGs in 2015. Tanzania has incorporated the SDGs into its national policy frameworks and plans. Increasing the energy efficiency in the country can help to improve the following SDGs:

- a. SDG 7: Affordable and Clean Energy - Energy efficiency plays a crucial role in achieving this goal by promoting the efficient use of energy resources, reducing energy consumption, and enhancing the accessibility of affordable and clean energy for all.
- b. SDG 9: Industry, Innovation, and Infrastructure - Energy efficiency measures contribute to the development of sustainable and efficient industrial processes, infrastructure, and technologies, fostering innovation and sustainable economic growth.
- c. SDG 11: Sustainable Cities and Communities - Energy-efficient buildings, transportation systems, and urban planning can help create sustainable cities and communities, reducing greenhouse gas emissions, improving air quality, and enhancing resilience.
- d. SDG 12: Responsible Consumption and Production - Energy efficiency encourages responsible consumption by minimising energy waste, promoting sustainable production processes, and supporting the transition to a circular economy.
- e. SDG 13: Climate Action - Energy efficiency measures are vital in mitigating climate change by reducing greenhouse gas emissions associated with energy production and consumption.
- f. SDG 17: Partnerships for the Goals - Energy efficiency initiatives require collaborations and

partnerships between governments, businesses, civil society, and international organisations to mobilise resources, share best practices, and achieve sustainable development targets.

The Paris Agreement, 2015

Tanzania's Nationally Determined Contributions (NDCs), which were publicised in July 2021, provide national ambition on the needed mitigation strategies which are expected to contribute to the global effort of reducing greenhouse gases (GHG) emission.

To achieve the mitigation objective, the NDC centres its focus on four sectors: energy, transport, forestry, and waste management. The NDC calls for the expansion of the country's rail and road networks to promote the use of public transport, reduce the consumption of charcoal in urban and rural areas by promoting affordable alternative energy sources, and develop

the use of Clean Development Mechanism (CDM) in the areas of renewable energy and energy efficiency. In conclusion, the policies and frameworks presented here mainly insist on energy use - with less emphasis on energy-efficient technologies and practices. Furthermore, Tanzania does not have an energy efficiency strategy or a comprehensive action plan that consolidates all sectoral ambitions and actions. The Energy Efficiency Strategy (2024-2024) will therefore respond to the need for one national plan which aligns with both national and international policy and regulatory frameworks related to Tanzania's energy efficiency.

2.2 Energy Resources and Reserves

Tanzania is endowed with diverse energy sources including biomass, natural gas, hydro, coal, geothermal, solar, wind, and uranium as shown in Table 1. The Ministry of Energy is currently preparing a National Renewable Energy Strategy 2024–2034 to enhance the use of renewable energy resources – much of which are untapped.

Harnessing these diverse resources effectively can help Tanzania achieve energy security, reduce dependence on imported fuels, and support economic growth while promoting sustainability and environmental stewardship. Table 1 shows Tanzania's Resource potential and current application (MoE, 2024).

Table 1 Tanzania's Energy Resources and Reserves

Resource	Potential	Application
Large hydro	7,500 MW	36 per cent harnessed for power generation
Natural Gas	Onshore and Offshore deposit - full potential not known but a few discoveries indicate there is a potential gas reservoir both onshore and offshore	About 57.54 trillion cubic feet (tcf) of natural gas has been discovered, currently, 1,198.82 MW used for power generation for industries, transport, and some commercial and domestic applications
Small hydro	500 MW	5 per cent harnessed for power generation

Biomass	Woodland and agricultural residues	Electricity generation from biomass in the country is more than 35 MW, some of which is grid-fed. Approximately 82 per cent of the primary energy used in the country comes from biomass. For cooking purposes, it is estimated that around 90 per cent of households in the country rely on wood and charcoal as their primary cooking energy, with wood accounting for 63.5 per cent and charcoal for 26.2 per cent of usage
Solar	Insolation 4.5 – 6.3 kWh/m² /day The potential regions like Dodoma, Singida, Shinyanga, Iringa, Katavi, Rukwa, Tabora and Mara which are suitable for solar power generation have solar insolation ranging from 4.5 to 6.0 kWh per square meter per day about 10 hours from 0800 hours to 1700 hours.	> 6 MW electricity installed capacity, 150 MWp electricity under construction in Kishapu-Shinyanga.
Wind	Speed: 3 – 10 m/s potential of wind, which can generate more than 1,000 MW of power. The average wind speed in a day which can generate power ranges from 3 to 10 m/s – Singida (Kititimo) has the highest Average Wind Speed at 10 m (m/s) of 8.2 while the Average Wind Speed at 30 m (m/s) of 9.4t	2.4 MW of electricity installed at Mwenga Mufindi Small Wind turbines rated (1-3) kW exist in the Market.
Geothermal	More than 5,000 MW	Direct use and Indirect use for power generation, 215 MW is planned to be installed from Geothermal Source by 2034
Coal	1.2 – 5 billion tonnes	About 635,609.47 t/year (STAMICO Report, 2023)
Nuclear	Uranium deposits exist Namtumbo (Mkuju), Bahi, Galapo, Minjingu, Mbulu, Simanjiro, Lake Natron, Manyoni, Songea, Tunduru, Madaba and Nachingwea	58,500 tU ⁱ
Tidal/waves	Significant	7.5KW/mii
Hydrogen	Significant	11,334.57 TWh/yriii

i&ii Uranium Mining In The United Republic Of Tanzania: Current Status, Challenges And Opportunities (E.Kimaro and S.Mdoe)

ii Tidal Power Potential in the Submerged Channels of Dar es Salaam Coastal Waters (Alfonse M. Dubi 2006)

H2 Atlas Africa (2003)

2.3 The Profile of the Energy Sector in Tanzania

As of 2023, Tanzania's total per capita energy consumption was around 0.45 ktoe (2023), more than a third lower than the average for Sub-Saharan Africa. On the other hand, the per capita electricity consumption was 136 kWh in 2023. The residential sector is the largest contributor to energy consumption in the country, accounting for 72 per cent in 2024, mainly due to the large amounts of biomass consumed for heating, lighting, and cooking. Further development of the national electricity grid, which would improve household electricity services, could significantly reduce this consumption. Small-scale energy efficiency projects have been conducted in the country, such as aggregated purchasing schemes for energy-efficient electrical equipment; however, no governmental projects are currently underway in the sector. Energy efficiency initiatives in the country are often hindered by limited capacity in strategic planning at the ministerial levels, a lack of awareness, insufficient financial resources for investing in efficient equipment, a shortage of technical capacity to disseminate the skills and adaptation of the technologies, and other issues.

Although, to date, the country has no comprehensive policy, instrument or strategy targeting Energy Efficiency, the Government of Tanzania has begun to address this issue through the implementation of programmes and projects at an institutional level and in cooperation with several Development Partners. For instance, the Implementation of the Tanzania Energy Efficiency Action Plan Project which is being implemented by the United Nations Development Programme, is funded by the European Union, and the Embassy of Ireland. Targets to improve transmission and distribution efficiency in the power sector,

petroleum consumption and electricity consumption in manufacturing industries and households, were set in the MEM Strategic Plan 2011/12-2015/16.

Moreover, power system losses in Tanzania were at 16.4 per cent in 2021. TANESCO has put in place a Loss Reduction Programme, which is currently being implemented. Related to that but on demand side management, TANESCO has established a dedicated unit which aims at targeting large power consumers. The objective is to persuade consumers to shift their load from peak periods by implementing awareness-raising campaigns that encourage the installation of power system correction systems. These systems will help improve power factor problems and simultaneously contribute to improve TANESCO's transmission and distribution losses.

On the formulation of policies, strategies and plans targeting EE, the Government of Tanzania working with several Development Partners - developed an Energy Efficiency Report, which became the basis for the development and implementation of the current National Energy Efficiency Programme (Netherlands Enterprise Agency, 2023). Through this programme, the Government of Tanzania is establishing: an Energy Efficiency Strategy with concrete goals and targets to develop a National Energy Efficiency Action Plan; developing a framework targeting energy managers and auditors; developing Energy Efficiency Standards and Labelling; developing standards and regulations to address EE in buildings; address industrial energy management and efficient biomass utilisation. Moreover, the programme also includes several capacity-building components on EE directed at the public and private sectors.

2.3.1 Electricity Supply System

2.3.1.1 Energy Mix

As of July 2024, the installed capacity of power plants connected to the National Grid system was 2,607.96 MW of which 1,306.27 MW (50.08 per cent) comes from hydropower, 1,198.82 MW (45.96 per cent) comes from natural gas, 92.37 MW (3.54 per cent)

comes from diesel and HFO, and 10.50 MW (0.42 per cent) of electricity generated from biomass. Figure 3 illustrates the installed capacity by energy source (MoE 2024).

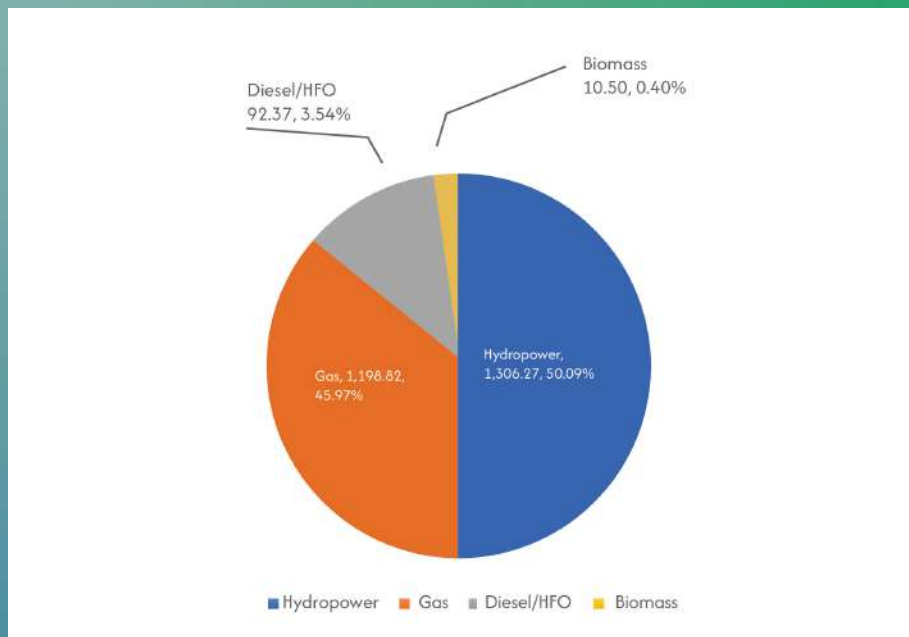


Figure 3: National Installed Capacity by Energy Source (MoE, 2024)

According to EWURA's electricity sub-sector performance report 2022/23, the installed capacity for non-connected grid plants has reached 37.122 MW. This includes Tanzania Electric Supply Company Limited (TANESCO)- owned plants capable of generating 27,692 MW and 7.4 MW from SPP and 2.03

MW from VSPP owned by private entities.

Despite the presence of generation power plants, there is no reliable data for power generation losses in Tanzania. This Strategy will emplace strategies to identify losses associated with generation.

2.3.1.2 Electricity Demand

The demand for electricity in the National Grid system continued to grow and reached 1,683.57 MW on 15th

July 2024 compared to 1,470.50 MW on 12th June 2023 equivalent to an increase of 14.4 per cent.

2.3.1.3 Electricity Transmission Lines

The country's electricity transmission network is comprised of 7,745.38 km of transmission lines owned and operated by TANESCO. The main transmission

lines include 1,244.75 km of 400 kV, 4,095.62 km of 220 kV, 1,825.01 km of 132 kV and 580 km of 66 kV.

2.3.1.4 Electricity Distribution

The electricity distribution network comprises 176,750.88 km, connecting 4,957,278 customers across the country as of 30 June 2024. Compared to the year ending May 2022, there was an increase

in distribution networks by 4.8 per cent. The rural electrification initiatives under the Rural Energy Agency have significantly contributed to expanding the TANESCO distribution network.

2.3.1.5 Electricity Access and Connectivity Rates

According to the Ministry of Energy, the overall household connectivity rate for Tanzania's Mainland is 46 per cent, of which 73.9 per cent accounted for urban areas, and 36 per cent accounted for rural areas. The overall access to electricity for Tanzania's Mainland is

79.5 per cent, of which 99.6 per cent is for urban areas and 69.8 per cent for rural areas according to the Impact of Access to Sustainable Energy Survey (IASSES 2021/22).

2.3.1.6 Electrical Power Infrastructure and Grid Capacity

Electricity infrastructures are mainly set up and managed by TANESCO which covers by far the largest share of production. Other producers can be Independent Power Producers (IPP), Small Power Producers (SPP) or Very Small Power Producers

(VSPP). It is to be noted that only IPP, SONGAS, sells its production to TANESCO and is not involved in distribution to the final consumer.

TANESCO is the only institution that deals with power

transmission lines and stations. Concerning distribution, other actors are licensed (i.e., above, or equal to 1MW production), like Mwanga, or registered (below 1MW) like Andoya and 6 other SPPs (EWURA, 2023).

In 2022, the power infrastructure in Tanzania covered 6,110.28 km of transmission lines and 96.540 km of low-voltage lines. During the financial year 2021/2022, 63.036 km of medium voltage (33 kV/11 kW) distribution lines have been added to the network. The network also includes 68 primary distribution substations, 61 substations and 28,245 distribution transformers (TANESCO, 2023).

Part of the energy generated is lost or degraded in transmission and distribution, which causes an energy performance problem and financial shortfalls for consumers and TANESCO. The country's electrical infrastructures are rather old and poorly maintained. The current distribution and transmission systems suffer from unplanned outages, particularly in the distribution substations, the number of which is becoming insufficient with Tanzania's growing electrification.

In 2020 - 2021, electricity energy losses for TANESCO were estimated at 15.16 per cent, of which 5.89 per cent was for the transmission system and 9.27 per cent for the distribution system. For other distributors, figures delivered from Mwanga and Andoya indicate respectively, 6 per cent and 3.98 per cent losses on their distribution grid. These losses are derived from technical (inefficient power infrastructure, expired and defective meters) (TANESCO, 2023) or non-technical (like theft) issues. (Ministry of Energy, 2020).

Furthermore, in developing the Power System Master Plan (PSMP) the Ministry of Energy indicated how the transmission and distribution (T/D) loss rates have varied sharply over the years - with losses as high as 26 per cent in 2005 (Centre for Science and Environment, 2018). The PSMP 2012 stated 'reduce energy losses from a level of 20.65 per cent to the acceptable level of 18 per cent by 2015'. In 2015, the country achieved

its previous year's target with losses measured at 17.5 per cent. The PSMP 2016 aimed for T/D losses of 11.4 per cent by the year 2025 based on the loss reduction targets set by TANESCO. The transmission expansion plan (PSMP 2016) formulated by the WASP-IV does not specifically mention about measures adopted or funds allotted to curb these T/D losses.

According to the Ministry of Energy (Ministry of Energy, 2024), the level of losses in June 2023 was 14.59 per cent, split into 5.87 per cent and 8.72 per cent for transmission and distribution losses (technical and non-technical), respectively. The plans to reduce power losses and their treatment in the forecast will affect the overall generation requirements over the forecast period. Compared to power losses in 2015, there is a significant drop in losses due to an increase in the rate of inspecting customers and efforts to replace conventional electricity meters with smart meters (LUKU) and construction of high voltage transmission lines (400 kV) to connect significant load centres (power loads).

The system losses decreased from 17.47 per cent in 2015 to 14.46 per cent in 2024 due to the reinforcement of distribution and transmission systems (TANESCO, 2024) as shown in Table 2. Although transmission and distribution losses are in an internationally acceptable range which is 11.6 per cent - 20.7 per cent of the total electricity generated for developing countries (according to IEA ETSAP - Technology Brief E12 - April 2014), the government's target is to reduce the total power system losses to as low as 12 per cent by 2034, onward. The PSMP 2024 adopted the Government target of attaining 12 per cent of system losses from 2026 through the projection period.

The current Power System Master Plan indicates that Renewable energy is expected to contribute 8,200 MW (40.58 per cent) in the electricity generation mix with hydro 28.15 per cent, wind 3.96 per cent, solar 3.54 per cent and Geothermal 4.93 per cent while power from natural gas is projected to be 6,700 MW (33 per cent) by 2044.

Table 2 The Actual and Projected Power System Losses in Percentage

Year	2015	2019	2020	2021	2022	2023	2024	2025	2026	2044
Transmission	6.20	5.88	5.89	5.88	5.88	5.87	5.84	4.10	4.00	4.00
Distribution	11.27	10.31	9.41	9.18	8.60	8.72	8.63	8.20	8.00	8.00
Total	17.47	16.19	15.30	15.06	14.60	14.59	14.46	12.30	12.00	12.00

Source: PSMP, 2020

Power factor is another measure of energy efficiency in powersystems. Particularly, low power factor is reported on the grid and is the indicator of low-quality current and an important ingredient contributing to energy losses. A high-power factor reduces the current flow through electrical systems, which minimises resistive losses (I^2R losses) in conductors. Lower losses mean that less energy is wasted as heat, improving overall energy efficiency. The power factor given by TANESCO is around 0.85. The power factor in the context of grid networks can be largely contributed by industrial and Commercial sectors such as manufacturing plants, and large commercial buildings. These environments typically use large motors, heavy machinery, and other inductive loads, which can result in a low power factor.

It is of high relevance and necessary to operate such facilities with power factor correction equipment and try to keep its power factor above 0.95 to comply with grid connection codes. The technical solution employed is as simple as installing capacitor banks in these industrial facilities to improve the same. The best solutions are more difficult to achieve and consist of assessing the main electrical current signal and renewing the ones with the lower power factor. This necessitates the development of specialised technical energy audits conducted by trained engineers and technicians. To achieve good, intended results, most of the utility companies including TANESCO apply a penalty to energy-consuming facilities with a low power factor. This leads them to take action to enhance their power factor performance.



Figure 4 : The National Grid System up to 2022. (source: TANESCO, 2024)

An inefficient and degraded electrical infrastructure affects both consumers and the main power company. Losses and inadequately maintained power infrastructure cause low power reliability curbing electricity demand growth. Some customers prefer investing in expensive but more reliable independent diesel generators, instead of connecting to the main grid. These phenomena and non-payments from large consumers, represent an important financial shortfall for TANESCO - hindering its ability to develop and maintain the network properly. Maintenance is also a major factor in preserving the energy performance of systems and preventing any deterioration in their efficiency. Indeed, temperature-regulating ventilation systems are delicate and frequently nonfunctional. Without regular maintenance, dust accumulation and overheating result in decreased performance and a shortened equipment lifespan.

Moreover, the main power utility companies have a key role to play in promoting energy efficiency in Tanzania, particularly in the context of electrification.

As electricity access is an indicator to measure the country's development, the companies' performance relies on the number of electricity users. Supporting client's efforts to lower their consumption will benefit new users. The less users consume; the more energy is available for new uses. Power utility companies' vision can encourage less power per use to allow more power uses. It means reducing individual consumption per use, to multiply users or energy uses.

The growth of electricity supply, which comprises generation, transmission, and distribution, almost doubled to 10 per cent, due to an increase in capacity utilisation of gas-fired power plants. According to the Annual Report (Bank of Tanzania, 2022), the share of electricity generated from gas-fired power plants rose to 61.7 per cent of the total generation in 2021 from 57.3 per cent in 2020. Electricity distributed for consumption increased to 8,690.1 GWh from 7,862.9 GWh, of which 1.5 per cent was imported from Uganda and Zambia. Figure 4 shows the National Grid System up to 2022 (TANESCO, 2022).

2.4 Clean Cooking Solutions

According to the National Charcoal Strategy (2021–2031) and National Clean Cooking Strategy (2024 – 2034), fuels and technologies used for cooking in the country include animal dung and plant residues,

firewood, charcoal, kerosene, briquettes, bioethanol, LPG, natural gas, biogas, electricity, improved cookstoves and solar energy cookstoves (MNRT, 2022) and (MoE, 2024.)

Table 3 Different Energy Cooking Resources and Technologies

SN	Cooking Fuel/ Stove	Availability	Distribution	Comments
1	Animal Dung	From drying dung in livestock/ pastoral communities/ households	Locally and site-specific	Used in charcoal or wood-fired stoves in households
2	Plant Residues	Collected from nearby fields	Locally and site-specific	Used in charcoal or wood-fired stoves in households, industries, and institutions. Used also in charcoal and firewood briquettes/ pellets
3	Firewood	Collected from natural/ planted forests	Transported, distributed, and stored	Household Budget Survey of 2017/18, about 84.8 per cent of households in rural areas rely on firewood and 17.4 per cent in urban areas.
4	Charcoal	Produced from natural/ planted forests and widely available	Transported, distributed, and stored	According to the Cooking Energy Action Plan of 2022, approximately 10 to 12 tons of logs are burned to produce 1 ton of charcoal and over 50 per cent of the charcoal produced in the country is used in Dar es Salaam. Despite efforts to promote alternative cooking solutions like LPG, electricity, and bioethanol, economic and non-economic barriers hinder their adoption, making charcoal a persistent choice.
5	Kerosene	Its availability depends on the availability of petroleum products.	Related to petroleum products and hence its distribution	Emits odour and smoke when burned, which can affect the indoor air quality in households or kitchens. The smoke from kerosene contains chemicals which can lead to respiratory diseases, cardiovascular diseases, and lung cancer.
6	Briquettes (Carbonised and Non-Carbonised)	They are produced from residues including materials such as paper, sawdust, wood shavings, bagasse, dry leaves and rice husks.	Distributed like charcoal and can stored. However, awareness of the resources and markets hinders its distribution.	The use of these residues not only produces energy but also helps to preserve the environment and natural forests.

7	Bioethanol	Bioethanol is obtained from carbohydrates of sugar or starchy crops via alcoholic fermentation.	The UNIDO project in collaboration with the Government supports the distribution and promotion of technology	The adoption of bioethanol technology in the country has not spread extensively due to challenges in obtaining raw materials and limited awareness among users.
8	LPG	It is a fuel stored in cylinders and is derived from the refining of crude oil, and natural gas with a propane and butane content exceeding 15per cent.	It is imported via ports of Dar es Salaam and Tanga and distributed	The imported LPG in 2022 was 250,200 metric tons, of which 160,610 metric tons were used within the country and 89,590 metric tons were exported to neighbouring countries.
9	Natural gas	Currently, the estimated volume of natural gas discovered in the country is approximately 57.54 trillion cubic feet (tcf).	Natural gas is distributed via pipelines for cooking purposes in Lindi, Mtwara and Dar es Salaam regions. Currently, 13 Institutions, 1,511 households have been connected to natural gas with 425 households in Mtwara, 209 households in Lindi and 877 households in Dar es Salaam.	Currently, natural gas is primarily utilised in regions close to the distribution infrastructure. The challenge lies in expanding access to areas beyond the reach of this network

10	Biogas	Biogas is a mixture of various gases, including methane produced from the processing of animal and human waste, food waste or plant remains in an anaerobic environment.	It is estimated by CAMARTEC, 2017 that 12,000 biogas systems were installed in the household in Tanzania. The systems are built in households and institutions.	Installation costs are pointedly higher than the costs of installation thus limiting affordability by users of firewood and charcoal.
11	Electricity	The sources of electricity generation in the country include natural gas, hydropower, crude oil, solar, wind and biomass. The installed capacity within the National Grid system has increased to 2,738 MW as of July 2024.	Electricity is distributed in rural and urban areas. More than 10,000 villages out of about 12000 are already connected. Electricity is predominantly used in urban areas for cooking compared to rural areas because the residents can afford to buy electric stoves.	Reducing negative perceptions about the cost of cooking with electricity can also help in increasing the adoption rate of e-cooking.
12	Improved Cookstoves (ICS)	The stoves utilise efficient technology to reduce the emission of toxic smoke and the amount of biomass used in cooking and its availability is limited.	Local workshops and retailers in marketplaces store and sell the improved cook stoves. There are no established dealer networks for improved cookstoves.	Insufficient research in this area has led to the use of technologies that do not meet quality standards. The lack of easy access to improved cookstoves in many parts of the country, particularly in rural areas, has resulted in low adoption rates
13	Solar Cookstoves	These stoves harness solar radiation and convert it into heat, which is then stored and used for cooking.	There is limited distribution of solar cooking technologies	Solar-powered cookstoves cannot often store energy for future use, requiring immediate consumption of the generated energy or storage in separate batteries. This poses a challenge in areas with prolonged sunlight scarcity or when energy demands exceed production

2.5 The Analysis of Energy-Intensive Subsectors

2.5.1 Transport and Mobility

Tanzanian strategic geographical location and topography explain the importance of people mobility and goods transport. In 2020, according to the IEA, transport consumed the equivalent of 25,566 GWh (more than 10 per cent of the total national energy consumption). The transport sector includes air, marine, railway and road goods transport and people mobility (Transport and Meteorology Sector Statistics, 2021).

The air infrastructure comprises 368 airports including airstrips serving domestic and international traffic. Tanzania Airports Authority (TAA) operates 59, three of which are international: Julius Nyerere, Kilimanjaro, and Abed Amani Karume. From July 2023 to March 2024, there were 205,968 flights compared to 109,308 flights at the same time in 2022/23, equivalent to an increase of 88.43 per cent. In addition, transported cargo increased by 19.33 per cent to 27,533 tons in July 2023 to March 2024 compared to 23,070.3 tons at the same time in 2022/23 (Ministry of Transport, 2024).

Maritime transport involves the transit of goods. The three main coastal ports are based in Dar es Salaam, Mtwara and Tanga. Lake ports are also used for freight and people mobility. From July 2023 to March 2024 20.72 million tons of freight were handled compared to the 14.56 million tons handled at the same time in 2022/23 an increase of 42.31 per cent (Ministry of Transport, 2024). Marine transport and fishing vessels consume petroleum fuels. The technologies of using less-polluting sources of energy are in place. E-motor boats should be encouraged for fishing while green hydrogen can be adopted for large marine transport vessels.

The railway networks consist of 2,706 Km operated by Tanzania Railways Corporation (TRC) and 1,860 km operated by Tanzania-Zambia Railway Authority (TAZARA). The new electric railway line of Standard Gauge (SGR) 2,706 km to be operated by Tanzania Railway Corporation is under development (Ministry

of Transport, 2024). The line of 722 km of SGR from Dar es Salaam to Makutupora is complete. The electric passenger trains started operating on the 14th of June 2024. From Jul 2023 to March 2024 total of 497,703 tons of cargo was transported by the trains compared to the 545,952 tons of the same period for 2022/23. The total number of passengers who travelled by train from July 2023 to March 2024 was 5,037,433 compared to the same period of 2022/23 which had 4,628,893 passengers registering an increase of 8.83 per cent. Among the passengers who used trains from July 2023 to March 2024, 75.82 per cent were urban commuters and 70.46 per cent for the same period in 2022/23 showing an increase of 5.36 per cent (Ministry of Transport, 2024).

This rising tendency to use the train within and between major cities, both for people mobility and for goods transportation, should be encouraged. When optimally filled, not only for energy efficiency reasons the train is the most efficient but also the most environmentally friendly and safe transportation means. With the increasing availability and reliability of electricity supply, electric trains have a great opportunity.

The total road network is 181,190 km, divided into National Road (36,760 km) and District Roads (144,429 km) (Ministry of Finance, 2023). Some of the vehicles, commercially licensed in the year 2022/23 are as follows: public service vehicles 50,221; goods carrying vehicles 169,942; motorcycles 31,937; tricycles 25,512; taxi cabs 2,305; ride-hailing 3,523; and special hire 718 (LATRA, 2023). The increased quality of roads offers the opportunity of transiting to efficient and clean transport and mobility like electrical and less polluting fuels like CNG, Compressed Biogas and Bioethanol blended petrol.

Electric and hybrid (gas-petrol and electric-petrol) vehicles demonstrate higher efficiency and superior performance compared to traditional thermal vehicles, considering the usage. In 2022/23, 4,500 classic vehicles had been converted to Compressed

1 The electricity access refers to the percentage of the population who has a relatively simple, stable, access to electricity and/or who lives within 600 meters from a distribution transformer.

2 Households connected to electricity refer to the households whose source of electricity is either TANESCO/REA, or local private entity.

Natural Gas compared to 3,100 vehicles in 2021/22 an increase of 45.16 per cent. Eight garages are involved in retrofitting petroleum engines to CNG in Dar es Salaam (Ministry of Energy, 2024). Electric two and three-wheelers are being adopted and increasing in number. It is important to create an enabling environment for quick uptake of electric two and

three-wheelers.

To control the efficiency of imported vehicles and spare parts in Tanzania, the Tanzania Revenue Authority (TRA, 2024) implements the Excise Duty on Motor Vehicles – which is charged based on cylinder capacity and age.

2.5.2 Buildings Subsector

With 13,916,924 households in Tanzania's Mainland, hosting an average of 4.3 people (Ministry of Finance, 2023), the residential sector is the largest energy-consuming sector in the country. In 2020, the final energy consumption of the residential sector amounted approximately to 168,628 GWh. Specifically, electricity consumption reached 2,924 GWh (International Energy Agency, 2023). According to the IEA 2020 report, Tanzania's residential electricity consumption has been growing at an annual average rate of 13 per cent since 2010, driven by rapid urbanisation and economic growth. In July 2020, while almost 80 per cent of Tanzanians had access to electricity, (78.4 per cent)¹ approximately 40 per cent (37.7 per cent) of Tanzanian households were effectively connected to electricity² (MOE, NBS and REA, April 2020). The main energy uses in the residential sector are cooking, followed by lighting, air conditioning and household appliances. Traditional cooking with harvested firewood in rural areas, or charcoal in urban areas, takes a heavy toll on the environment, contributing to deforestation, and health, causing indoor pollution. The preservation of biomass through energy-efficient equipment and practices is necessary. The cooking or heating practice is then more efficient with gas or electricity rather than biomass.

Energy consumption in residential areas is also impacted by the thermal quality of the building itself, particularly when it comes to the use of heating and/or air conditioning. In Tanzania, in hot and humid climatic zones and coastal areas, the use of air conditioning will certainly develop in the years to come. It is therefore necessary to address the thermal quality of buildings related to air conditioning usage. This involves considering various factors, such as managing air circulation through cross-ventilation and ensuring optimal thermal insulation. Embracing a bioclimatic approach to the design of housing offers the opportunity to enhance thermal comfort without the necessity of relying on air conditioning. This is achieved through strategies such as thoughtful aerodynamic design for natural cooling, and effective solar

protection measures to reduce heat infiltration into the structure. It is important to acknowledge that a bioclimatic building design does not align with the use of air conditioning. In cases where air conditioning is employed, the key focus should be on reinforcing overall thermal insulation for elements like walls, ceilings, and openings, alongside enhancing solar protection measures. The foremost priority should always be on occupant comfort while minimising energy consumption.

Addressing the thermal quality of existing buildings presents a great challenge. The installation of heating or air conditioning systems in buildings with poor thermal efficiency can lead to substantial energy wastage. Effective actions need to be developed to tackle this problem, such as implementing comprehensive performance requirements for buildings before allowing the installation of air conditioning systems.

The public subsector in Tanzania includes national public administration and local governments. Field observations identified that these structures generally have poor thermal performance of their envelope (including walls, roofs, and openings). In instances where air conditioning is employed, which occasionally occurs, these buildings tend to highly become energy intensive. Similarly, existing, or new public-owned service buildings such as schools, universities and hospitals can cope with the same energy-efficiency practices. The administration has a direct power of action on these buildings. Consequently, it is intriguing to use this lever to (i) use public-owned buildings to set an example in terms of energy efficiency practices, and (ii) generate energy savings and therefore financial savings, which will directly impact the national budget.

On the other hand, the private subsector in this context refers to all tertiary activities of which the most common are health, retail outlets, commerce, tourism, private education institutions, and administration. Most services in this subsector have both general and unique needs. Buildings and people's comfort, whether

they are there for business or pleasure, are common necessities. There is limited information available on energy consumption in commercial buildings in Tanzania, but it is generally understood that energy consumption in these buildings is significant, particularly given the country's hot and humid climate, which may cause increased energy use for cooling and ventilation. According to the International Energy Agency (IEA), commercial and public services accounted for around 29 per cent of total electricity consumption in Tanzania in 2020. Building code and close collaboration with private actors for the implementation of a building energy management system will heighten the adoption of energy efficiency features in this subsector.

Within the private service sector, the tourism industry is noteworthy since it is also a flagship economic subsector and a showcase for Tanzania at the international level. In 2022, there were 1,454,920 international tourist arrivals compared to 922,692 foreign tourists in 2021, equivalent to an increase of 57.7 per cent. Moreover, hotels are similarly heavy energy consumers because

most of their building features are not suited to the country's climate condition and requires energy-consuming equipment to ensure guests' comfort. Although there is no data on energy consumption in this subsector, everything suggests that the Tanzanian hotel industry is no exception. For all these reasons, proposing pilot actions in hotel environments would make it possible to tackle significant energy consumers, while having an impact on tourism and the international reputation of Tanzania.

Concerning the private sector in general, it is important to note that one of the objectives would be the emergence of an energy efficiency market: which means a demand for energy efficiency services (e.g., demand for energy audits) matching the supply of services and energy efficiency technologies in the country. The emergence of an energy efficiency market will therefore be done gradually by working on demand via communication and awareness-raising to obtain high-performance technologies and by supporting the rising skills of local consulting services.

2.5.3 Manufacturing

In 2020, the industry consumed 23,403 GWh which represents 9.47 per cent of the country's total energy consumption and the same industry sector is

responsible for 1,620 GWh of electricity consumption. (International Energy Agency, 2023).

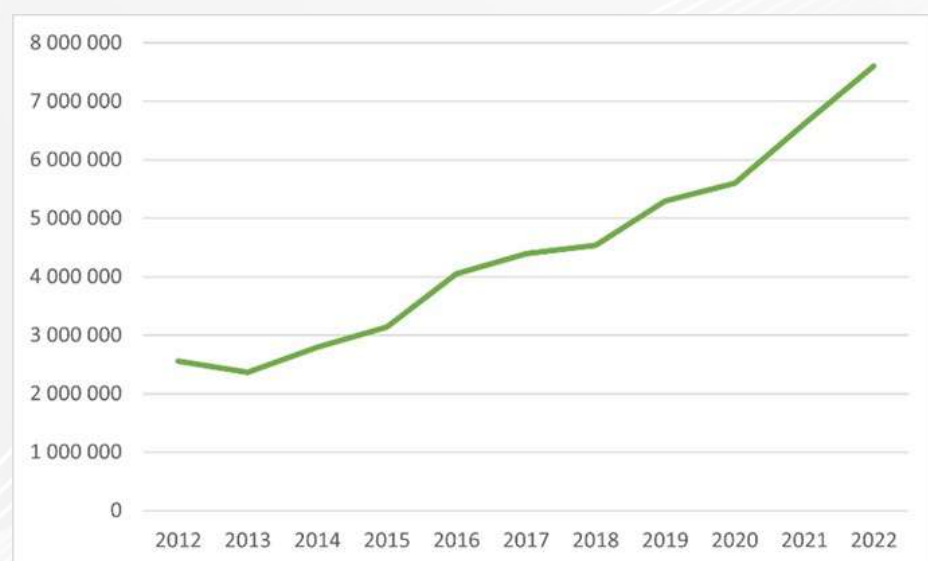


Figure 5 Production of industrial products (2012-2022)

Most of the manufacturing activities are dedicated to producing such as food, beverages, tobacco, textiles, chemicals (including paint), plastics, wood, cement, and steel products (Ministry of Industry and Trade,

2023) as shown in Table 4. The construction sector is also a leading sub-sector thanks to infrastructure demand and population growth.

Table 4 Production of selected industrial products

Industrial Product	Scale	2018	2019	2020	2021	2022	per cent age
Biscuits and Spaghetti	Tons	16.911	18.113	22.430	30.154	29.653	-1.7
Wheat Flour	Tons	662.967	680.393	767.476	737.652	684.708	-7.2
Konyagi	000 Litre	29.335	32.366	33.287	22.066	22.489	1.9
Beer	000 Litre	412.555	391.299	385.851	380.464	456.035	19.9
Chibuku	000 Litre	20.819	20.350	21.712	22.256	24.366	9.5
Cigarettes	Million	7.9721	8.369	7.320	7.021	12.201	73.8
Textiles	000 M2	52.613	45.415	53.067	65.365	48.504	-25.8
Sisal Fibres	Tons	8.148	9.287	8.187	8.583	6.171	-28.1
Fishing Nets	Tons	228	254	261	273	461	68.9
Wood Clusters	M2	37.849	42.563	34.237	29.867	25.305	-15.3
Pyrethrum Products	Tons	139	145	154	152	173	13.8
Paints	000 Litre	47.928	58.024	48.261	62.785	64.028	2.0
Cement	000 tons	4.766	6.514	6.496	6.531	7.598	16.3
Steel	Tons	275.267	266.314	277.785	293.797	311.781	6.1
Tin	Tons	84.132	100.963	107.836	119.844	129.038	7.7
Battery	Million	115	120	132	-	-	-

In these manufacturing sectors, there are what are known as transverse uses of energy and specific uses of energy. Transverse uses, also called utilities, deliver services to the main production process. These are mainly known as compressed air, ventilation, pumping, steam, refrigeration, and air conditioning. Their production, transport and use usually represent a big share of the energy consumption in industry and the less efficient ones as well. This is why in every country it has been assumed to tackle first these targets when organising energy efficiency actions in the industry.

Targeting the utilities is also the best pathway to develop energy efficiency auditors' capacities as they would work on outlying technical items from the production process considered central and very sensitive.

Consequently, it is of high relevance to orientate energy efficiency support towards auditors and industry manager training actions. Furthermore, local, and international support is needed to develop a sustainable energy efficiency market. The companies need to be convinced and trained to resort to technical consulting while auditors need to improve their capacity to answer the highest energy efficiency questions.

Energy efficiency knowledge, skills and equipment would strengthen visions, currently focused on immediate profitability. Industries could benefit from training and skills transfer actions by international experts on energy management and audits. Monitoring production and energy costs and installing Energy Management Systems (EnMS) are strategic for

industry development.

The absence of energy management practices represents a missed opportunity for businesses. Energy management can provide significant benefits to companies, such as cost savings, improved operational efficiency, regulatory compliance, enhanced brand

reputation, and reduced environmental impact. Therefore, energy management and EnMS should be promoted among companies and industries in the country. This necessitates the presence of well-trained and skilled individuals. Training programs can be devised to align with ISO 50001 standards.

2.5.4 Mining and Quarrying

Tanzania is abundant in minerals and natural resources, such as gold, diamonds, salt, coal, gypsum, and natural gas (NBS, 2023). As of 2021, nearly 500 active licenses explored over 40 types of minerals in the country (Bank of Tanzania, 2022). Mining and quarrying

accounted for roughly seven per cent of the Tanzanian GDP in 2020. The sector employed more than 310,000 Tanzanians, while the country's earnings with mineral exports surpassed US\$ 3.6 billion, representing a significant share of the country's export revenues.

Table 5 Mineral Production - Ministry of Minerals

Mineral	Unit	2015	2016	2017	2018	2019	2020	2021	2022
Diamonds	Carat	216,491	237,685	304,456	381,302	416,750	147,191	62,545	442,016.26
Gold	Kg	43,293	45,155	43,490	39,304	48,408	55,805	59,638	56,942.98
Raw Tanzanite							51,542	177,144.50	14,487.48
Tanzanite							118,773	120,458	57,864.28
Gemstones	Kg	1,872.915	2,554,932	1,185,697	284,321	1,929,714	23,564,525	7,197,217	12,752,079.67
Salt	Tons	92,158	145,718	100,017	36,392	99,510	83,974	112,995	181,818.07
Phosphate	Tons	222,800	23,658	1,351	-	-	28,376	24,493	26,596.79
Limestone	000 Tons	2,945	4,170	3,301	2,944	5,527	6,788	8,506	7,741,287.64
Tin Ore	Tons	179	138	91	8	24	47	211	538.17
Gypsum	Tons	239,302	213,744	123,645	241,260	256,529	443,926	598,053	604,407.91
Coal	Tons	257,321	276,030	563,053	627,652	712,136	689,959	976,319	2,511,419.40
Pozzolana	Tons	342,628	230,045	79,085	91,645	263,064	160,078	216,934	226,038.26
Kaolin	Tons	1,953	656	13,816	129,383	15,343	98,454	100,950	46,973.44
Silver Ore	Kg	15,569	17,984	10,911	12,041	12,550	13,187	9,324	13,602.43
Copper	Pound	14,252,341	15,762,430	2,933,941	-	-	3,761,086	3,352,630	6,827,930.74
Iron	Tons						28,431	78,190	51,071.14
Bauxite	Tons	204,956	72,779	12,090	7,140	-	25,995	38,142	40,920.96
Quarry products	000 Tons	12,960	15,460	5,601	10,375	20,188	31,892	32,304	37,498.03
Industrial Minerals	-	-	-	-	-	-	2,161	1,037	14,471.17
Other Metallic Minerals	-	-	-	-	-	-	-	-	60,074.75
Copper Concentrates	-	-	-	-	-	-	33,377	-	2,013.26
Copper Ore	-	-	-	-	-	-	1,205	-	6,623.58

The Government plans to have this sector contribute 10 per cent of GDP by 2025 (Tanzania Investment Centre, 2023). Key mineral deposits include coal, copper, diamonds, gold, nickel, silver, and Tanzanite gemstone, which is found nowhere in the world other than Tanzania.

Energy consumption of this sub-sector does not represent a large share of Tanzanian one, however, in big plants, it needs high voltage and power to run crushers and transport belts. If work is in caves or during the night (opencast mines), powerful lights are required. In addition to electricity demand, special lorries and chargers which consume diesel are also

necessary.

Therefore, energy efficiency in this sector is mainly led by technologies such as high-efficiency electric motors and variable frequency drives for crushers and transport belts. Efficient lighting uses LEDs, being careful to get products with the highest efficiency (above 110 lm/W, efficacy) as many inefficient products are on the market. About trucks and chargers, motor efficiency must be checked when new and maintained regularly as well as no alternative solution exists now. Training the drivers to efficient driving is also an energy-efficient solution that can be promoted.

2.5.5 Agriculture, Forestry and Fishing

Agriculture plays a crucial role in Tanzania's economic development and is the main source of income and employment for the population. The agriculture sector comprises crops, livestock, forestry, and fisheries subsectors. According to the Agriculture Statistics Strategic Plan (ASSP II), in 2020 the agriculture sector - crops, livestock, forestry, and fisheries- contributed about 26.9 per cent of the total GDP and grew at an annual rate of 4.9 per cent (Ministry of Agriculture, 2022).

In the same year, the agricultural sector's final energy consumption was estimated to be 15,673

GWh of which 121 GWh was electricity (IEA, 2023). Generally, in agriculture, energy is consumed mainly by water pumping and machines. Some agricultural activities are in general more energy-consuming than others. For example, rice, sugar cane, groundnuts, or sunflower require important water pumping and energy-consuming processes, such as cool and hot air management, air conditioning and oil extracting press. However, the lack of available data on specific energy consumption in the agricultural sector hinders a detailed analysis of its energy intensity during production and along the supply chain.

2.5.6 Water Utilities

EWURA, as the national authority in charge of regulating water supply and sanitation, has currently 85 Water Supply and Sanitation Authorities (WSSAs). These WSSAs provide water supply and sanitation services across all Local Governments.

Water production during the financial year 2021/22 in regional and national projects water utilities was 356 million m³. While water installed capacity amounts to 554 million m³, total water demand stands at 682 million m³. However, there is no data available about the energy consumption of the water supply sector in Tanzania. However, in a water distribution network, energy consumption can occur at various points throughout the system. The main energy consumption points typically include:

- a. **Water Treatment:** Energy is required to treat and pump water from its source, such as a reservoir or a groundwater well, to make it safe for distribution. This includes processes like coagulation, flocculation, sedimentation, filtration, and disinfection.
- b. **Groundwater pumping:** Groundwater pumping is commonly used to access water from underground aquifers. It involves the use of pumps to lift water from the subsurface to the surface, where it can be distributed for its intended use.

Currently in Tanzania, water pumps and motors are often old or damaged due to climate conditions, offering degraded performances. They need maintenance or renewal by efficient technologies, such as high-efficient motors.

Water utilities performances are more efficient when they are driven by variable speed controllers to monitor their energy consumption. Installing this technology in all water pumping stations would facilitate the energy management of national water utilities.

- c. **Water distribution pumping:** Water distribution pumps represent the largest consumption because it involves circulating large quantities of water over thousands of km. This is due to the power consumption of the pumps themselves. Thus, the efficiency of pumping equipment is crucial to the global performance of the network.
- d. **Non-revenue water (NRW):** refers to water that is lost or unaccounted for in a water distribution system and does not generate revenue for the utility. This concept includes both physical losses (leakage from pipes) and commercial losses (unauthorized consumption, meter inaccuracies, and billing errors). NRW is typically expressed as a percentage of the total water input into the distribution system. NRW consumes energy mainly because it increases pumping needs to compensate for the losses. Figure (Source: EWURA, 2024).

Over the past three years, there has been an uneven trend in overall NRW as a percentage of water production. The overall NRW declined by 1.7 per cent in FY 2022/23 compared to an improvement of 2.3 per cent in FY 2021/22 mainly due to dilapidated water supply systems. NRW as a percentage of total water produced for WSSAs is presented in Figure 6.

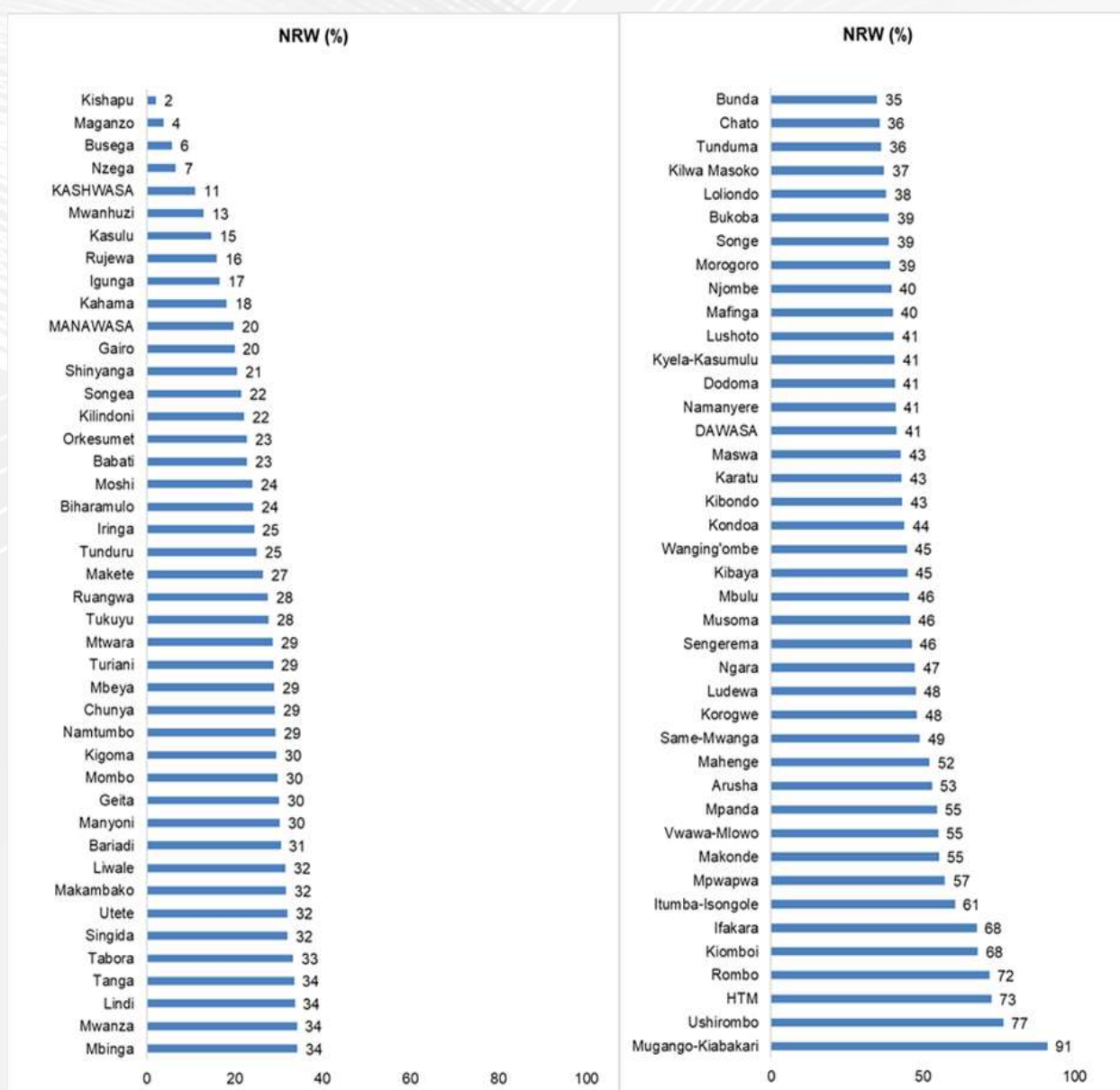


Figure 6 Non-Revenue Water as a Percentage of Water Production.

An improvement of more than 20 per cent for NRW expressed as a percentage of water production was attained by Kilindoni, Ruangwa, Wanging'ombe, and Vwawa-Mlowo.

- e. Pressure Regulation through the distribution pipelines: Energy is needed to maintain pressure in the distribution pipelines to ensure that water reaches consumers at the required pressure levels. Pressure-regulating valves and equipment are often used to maintain optimal pressure in the distribution network. These may require energy to operate, especially in larger and more complex networks.
- f. Water Quality Monitoring: Energy may be consumed by sensors and equipment used to

monitor water quality at various points in the distribution network.

- g. Data and Control Systems: Energy is required to power the control systems, sensors, and communication infrastructure used to monitor and manage the distribution network efficiently.

In conclusion, the major issues on the topic of water supply energy consumption in Tanzania are:

- a. Firstly, water leakages reduction through the improvement of the network.
- b. Secondly, the improvement of pumping equipment and the installation of variable speed drives (VSD).

2.5.7 Implementation of the Tanzania's 1st Energy Efficiency Action Plan

The Ministry of Energy in collaboration with development partners, such as the EU, UNDP, and the Embassy of Ireland, has been implementing an Energy Efficiency project since 2018 contributing to the aim of achieving the overall objective of ensuring access to affordable, reliable, sustainable, and modern energy for all in Tanzania. The key actions under this project include:

- a. Development of Minimum Energy Performance Standards (MEPS) and Labelling.
- b. Development and implementation of a framework for energy performance certification in large buildings.
- c. Enhancement of Energy Consumption Data of Large Energy Consumers.

- d. Development and implementation of a framework for the management of large energy consumers.
- e. Development of professional qualifications and skills in Energy Management and Audit.
- f. Creation of Energy Efficiency Awareness of the Public.

This project aims to strengthen the country's legal, regulatory, and institutional framework to promote energy efficiency for both major consumers and the public, fostering expertise and jobs in the energy sector. This involves improving access to information, fostering stakeholder dialogues, and highlighting the benefits of energy efficiency and renewable energy.

2.5.7.1 State of MEPS & Labelling in Tanzania and the EAC

In Tanzania, there are currently no MEPS and labelling requirements established so far. However, the work has started regionally with Est-Africa and South-Africa regions with the development of MEPS on lighting. The process to transfer this MEPS regulation to Tanzania is ongoing and will be implemented very shortly.

Other countries of the East African Community have already established MEPS and labelling requirements like Rwanda on air conditioning systems and Kenya on

refrigerators, air-conditioners, motors, and lighting.

The Ministry of Energy's MEPS and labels programme is being implemented through the Tanzania Bureau of Standards (TBS). In June 2023, MoE called a stakeholders' meeting to validate the five (5) Minimum Energy Performance Standards to be developed – air conditioners, electric motors, fans, fridges, and televisions.

2.5.7.2 Enhancement of Energy Consumption Data of Large Energy Consumers

The government of Tanzania, through the Ministry of Energy, is implementing a database to provide national statistics on energy ("Energy and Data Statistics" project). This Energy Data and Statistics project, supported by European countries cooperation, aims to contribute to the development of the energy sector in Tanzania through improved energy-related statistical systems. Monitoring the performance of the energy sector with reliable data is an important step toward the socio-economic development of the country, allowing public policy steering. The project is

expected to lead to the reinforcement of the energy sector's knowledge and analysis by stakeholders including private investors, academia, and civil society organisations. It is also an opportunity to focus on specific statistics related to climate and gender issues as an integral part of energy sector development.

This database will support the steering of the present strategy and corresponding action plan, centralising data collection and allowing target updating.

2.5.7.3 Promoting Energy Efficiency in Buildings

In Tanzania, most of the buildings are built with limited considerations of efficient energy use, particularly at the design stage which ultimately affects also efficient use of energy during operation but also limits how far necessary upgrades can be made to accommodate building features which are significant for efficient use of energy. Lack of consideration of energy efficiency in building design, coupled with a limited understanding of the building envelope parameters and features

i.e., thermal comfort, passive building principles, and behavioural approach to energy efficiency has led to energy wastage in the building sector. In Tanzania, no actions have been implemented yet about energy performance certification for large buildings: -

- a. There are building bylaws, which define construction rules and regulations across multiple regions, and these bylaws have

minor differences that help in catering for the requirements of different regions of Tanzania's mainland. The present version of building bylaws has limited or no mention of energy efficiency, and health and safety (of occupants) in clauses related to the building design.

- b. At present, the Building Act is under drafting, which has necessitated the revision of the existing Building Code (BC) to feature in the Energy Efficient Building Code (EEBC) which did not exist before. As a priority area, the Energy Efficient Building Code is to achieve Sustainable Building Design and Construction practices in the country, with the main goal of promoting and improving energy efficiency in buildings. If Tanzania is to achieve the global Sustainable Development goals to cope with the alarming climate change and the problems associated with climate change, it is inevitable that building design and construction be part of the solution. Hence Energy Efficient Building Code emphasises sustainable design and construction practices by providing a guide that highlights techniques that promote energy effectiveness in buildings.

2.5.7.4 Promoting Energy Efficiency for Large Energy Users

Tanzania's consumption of total primary energy and electricity is showing an upward trend, indicating that there may be a potential energy deficit in the future. To address this issue, it is crucial to increase the energy supply significantly and potentially implement demand-side management (DSM) measures. Failure to do so could result in a worsening of the unmet energy demand. Several factors contribute to this situation, including economic growth, price fluctuations, electrification rate, population growth, industrialisation, changes in economic structure, and energy efficiency. The Electricity Act 2008, with its amendments of year 2020, empowers the Energy and Water Utilities Regulatory Authority (EWURA) to be responsible for collecting data of large energy consumers and benchmarking. At the same time, the amendment empowers the Authority to make subsidiary regulatory tools (Rules, Codes, Guidelines, Manuals and Declarations) in respect of all matters considered necessary or desirable to give effect to the Acts.

- a. Since there is a lack of data for this huge sector of large energy consumers in addition to the absence of the regulations and penalties on noncompliance consumers, there is an

- c. Again, Tanzania does not currently practice Energy Performance Certification (EPC) for buildings, which is a key step towards enhancing energy efficiency practices in buildings especially commercial one's that consume significant amount of energy. The practice is a win-win situation for both property owner and tenants with reduced energy expenditures, which is likely to attract more tenants. Recognising the importance of EPC and EEBC as among the key policy instruments that can assist governments in reducing energy consumption in buildings is crucial. The development of both EEBC and EPC schemes is currently underway with a proposed energy performance certification plan and framework for the energy efficiency of both new large and existing buildings that can be mainstreamed into existing relevant regulations.

essential need to formulate and recommend energy efficiency policies and frameworks to deploy energy management in these facilities.

- b. Now, no energy management practices are being put in place and regulated for large energy users as a key milestone in achieving demand side management for energy efficiency. Understanding of energy management practices and challenges in other countries will strategic inform EWURA of the effective and efficient processes in terms of interventions or activities to consider on as far as addressing country energy management challenges through the legal and regulatory framework. The development of the regulatory framework for the management of large energy users is currently underway drafting building from local best practices by borrowing international best practices but also learning from the challenges the industry currently facing, the proposed regulatory framework will be a game changer to both supply and demand side energy management to achieve energy efficiency

2.5.7.5 Development of Professional Qualifications and Skills in Energy Management and Energy Auditing

One of the standout initiatives of this project is the enhancement of professional qualifications and skills in energy management and energy auditing within Tanzania. The Dar es Salaam Institute of Technology (DIT) has been empowered to offer professional training in Energy Efficiency. While DIT currently provides energy efficiency courses, the expanded focus now includes comprehensive professional training in energy management, auditing, Building Energy Performance Certification, and Measurement and Verification.

Through this initiative, numerous capacity-building programs have been implemented, emphasising energy audit and energy management. One of the

2.5.7.6 Creation of Energy Efficiency Awareness

This part of the Energy Efficiency Project focuses on creating public awareness (by engaging different media and communication channels) about the benefits of energy efficiency, which will be achieved through strategic awareness-raising campaigns.

The Ministry of Energy aims to raise the public and stakeholders' awareness of energy efficiency to reduce per-capita energy consumption and carbon emissions. This is being achieved by addressing consumers'

main achievements as of July 2024, was the training and certification of 20 participants from DIT, UNDP, TIRDO, and TANESCO as professional Energy Auditors and Managers by the International Association of Energy Engineers (AEE).

Furthermore, the initiative is dedicated to fostering gender equality in the energy sector. It sponsors 20 Tanzanian women students to pursue a two-year master's degree in Sustainable Energy Engineering at DIT. This effort ensures that women are actively involved in and contribute to the country's energy efficiency initiatives, marking a significant step towards inclusive and sustainable development in Tanzania.

knowledge and motivators that enhance the adoption of energy-efficient behaviours, attitudes, and efficient technology.

Additionally, the implementation of the awareness-raising plan will complement the efforts of the government of Tanzania in achieving the country's developmental targets - as well as global environmental goals and commitments.

2.5.8 Energy Efficiency Challenges in Tanzania

According to the East African Community Energy Efficiency Policy 2024 (EACREEE, 2024), the EAC population's access to modern energy services remains low compared to developed economies with an average electricity access rate of less than 50 per cent and most households relying on traditional forms of cooking. Individual EAC partner States have prioritised access to affordable, reliable, sustainable, and modern energy for all by 2030 in alignment with Sustainable Development Goal 7 of the United Nations and the need to grow the Partner States into middle-income economies.

Therefore, some of the main challenges hindering the implementation of energy efficiency measures in Tanzania, include³:

- Inadequate awareness of the benefits of energy efficiency.
- Inadequate information about improved energy

technologies and efficient practices.

- Inadequate skilled personnel.
- Inadequate financing mechanisms in energy efficiency.
- High cost of energy-efficient equipment.
- Insufficient incentives to introduce fuel/ technology substitution, e.g., substitution of kerosene and wood fuel with electricity, wood fuel with LPG, electric water heaters and wood fuel with solar water heaters, incandescent lamps with LED lamps etc.
- High cost of finance.
- High consultancy costs.
- Energy efficient technologies are not readily available locally.
- Energy Efficiency issues are not prioritised.
- Limited know-how in running new technology-based equipment.
- Energy efficiency is not included in most curricula in educational institutions.

³ The East African Community (EAC) Energy Efficiency Draft Policy (2024).



03

CHAPTER THREE - THE NATIONAL ENERGY EFFICIENCY STRATEGY

3.1 Overview

Vision

A transformed Tanzania into an energy-efficient nation where all sectors of the economy embrace energy efficiency practices.

Mission

To inspire and empower the nation to embrace energy efficiency and conservation measures that maintain productivity and service levels without increasing costs, thereby potentially reducing the operation costs required for additional energy supply.

Goals of the Strategy

Improving access to clean energy: The strategy encourages access to energy services including electrification of rural and remote areas while promoting energy sobriety and economic competitiveness.

Enhancing individual energy security: The goal is to combine renewable energy (RE) and energy efficiency (EE) initiatives to address energy poverty. By integrating clean cooking methods with efficient cooking practices, Tanzania can cope with the issue of energy insecurity in poor households.

Improving Energy Independence: The strategy aims to strengthen domestic energy resources to reduce the country's vulnerability to global market disruptions. It is intended to assist Tanzania in achieving energy self-sufficiency while contributing to global decarbonisation efforts by promoting sustainable energy practices.

Reducing Poverty: Energy efficiency fosters innovation by driving the development of advanced technologies and solutions. It encourages the creation of new industries and job opportunities, stimulating economic growth. By reducing costs and improving productivity, energy efficiency leads to continuous improvement and technological progress. Additionally, it promotes sustainable practices that benefit the environment and enhance quality of life.

Promoting Research, Development, and Innovation:

A broad set of processes covering the flows of know-how, experience, and equipment for mitigating and adapting to climate change amongst different stakeholders such as governments, private sector entities, financial institutions, non-governmental organisations, and research/education institutions.

Promoting shared governance and transparency: The strategy promotes collaboration between multiple stakeholders to collectively shape and implement the Action Plan. This approach enhances accountability, knowledge sharing, and active participation, ultimately leading to a more successful and inclusive energy efficiency strategy.

Mitigating Climate Change: By promoting energy efficiency, Tanzania can reduce its carbon footprint and contribute to global efforts to mitigate climate change effects.

Strengthening the legal and institutional framework:

The strategy stresses the importance of creating robust and ambitious regulatory and institutional arrangements, including enhancing the capacity of the Ministry of Energy to oversee energy efficiency activities in the country. To be effective, it requires a solid understanding of the technical aspects related to energy efficiency challenges and its solutions. By providing the means to enforce regulations efficiently, this framework will enable the government to ensure compliance with energy efficiency measures. Furthermore, it will contribute to fostering investor confidence, driving market transformation, and raising consumer awareness and education regarding energy efficiency.

Reinforcing inclusivity: The strategy will ensure that all communities, regardless of their socio-economic status or location, have equal access to energy efficiency solutions and opportunities in particular women and young people. It ensures equal access to awareness, training, services, and micro-financing as well as increased participation in energy efficiency projects and opportunities.

3.2 Strategic Objectives

The present strategy has been divided into eight strategic objectives. These objectives have a comprehensive scope and address main national challenges connected to energy efficiency, ranging from boosting general skills development to addressing energy-intensive sectors in Tanzania, such as construction and transport. Additionally, these objectives encompass strategic considerations

3.2.1 Increased Knowledge of Energy Efficiency

Issue: Energy efficiency remains a novel concept in Tanzania, therefore, most Tanzanians are unaware of the concept of energy efficiency – hence their practices, behaviours and attitudes are not necessarily in support of energy efficiency practices to a bigger extent. This necessitates a widespread awareness campaign - emphasising the need for education and advocacy to empower informed decisions and actions supporting energy efficiency and sustainable development. Moreover, energy efficiency still has many misconceptions that need to be addressed holistically and comprehensively including the issue of just energy transition while taking into consideration efficiency issues.

Strategic Objective 1: National Awareness of Energy Efficiency Raised.

Rationale: The country's ambitious goals to contribute to the global Sustainable Development Goal No.7 (SDG7) require a general awareness of the benefits and practices of energy efficiency for Tanzanian citizens. By disseminating knowledge and promoting best practices, Tanzanians will be able to make informed decisions and act in support of energy efficiency and sustainable development.

3.2.2 Improved Performance of Electrical Supply Systems

Issue: In the past 20 years, the production and distribution of electricity in Tanzania has faced enormous challenges including capacity shortages, lack of private investments, and low level of reliability of the power supply. Electricity generation from various sources is subjected to losses due to poor practices and technologies. Electricity transmission and distribution systems are subject to losses due to inefficiencies in the energy conversion and distribution process.

Strategic Objective 2: Efficiency in electricity generation, transmission, and distribution is improved.

of which their energy consumption is currently not necessarily high, such as electricity consumption, but which should increase in the coming years with the undergoing electrification. The underlying logic is to leverage the country's socio-economic development as an opportunity to choose a sustainable and efficient path.

Strategy 1.1. Implement a Comprehensive Awareness Campaign

Target 1.1.1 Awareness campaign targeting Tanzanian citizens across diverse demographics, including rural and urban populations launched through various communication channels, such as television, radio, social media, and community outreach programs to disseminate information about energy efficiency and its benefits by September 2025.

Target 1.1.2 Educational institutions, including schools, colleges, and universities, to integrate energy efficiency education into curricula and extracurricular activities by June 2030.

Target 1.1.3 Educational institutions, including schools, colleges, and universities to encourage students (young women, girls, youth, and other marginalised groups) with specific intention to pursue science subjects with a focus on energy efficiency by September 2030.

Target 1.1.4 Community leaders, NGOs, faith-based organisations, and civil society organisations are empowered to amplify the reach and impact of Energy efficiency by June 2026.

Target 1.1.5 Local Government Authorities (District Councils, Wards, and Villages) are aware of energy efficiency issues in their development plans by 2030.

Rationale: Adopting good practices in electricity management throughout the grid can reduce losses, improve reliability and customer satisfaction, and prevent unplanned outages. Energy efficiency measures can also help to reduce peak demand, saving costs for utilities and reducing strain on the power grid. Energy efficiency is an important part of any demand-side management policy.

Furthermore, the power supply's quality is under acceptable levels, resulting in energy losses. To curb this, it is needed to enhance current quality, with a particular focus on improving the electricity supply

power factor. Indeed, the low power factor generates power losses, which can be reduced with technical tools and pricing monitoring.

Strategy 2.1 Raise efficiency to Reduce losses in electricity generation, transmission, and distribution systems by June 2028.

Target 2.1.1 Advanced on/off-grid monitoring systems to identify and mitigate energy losses in generation systems, transmission and distribution networks will be in place by June 2028.

Target 2.1.2 Comprehensive energy audits of power substations, institutions, and commercial entities to diagnose inefficiencies and implement targeted improvements conducted by June 2028.

Target 2.1.3 Specialised maintenance training programs for technical staff to optimise equipment performance and minimise downtime established and conducted annually from June 2026.

Target 2.1.4 Robust maintenance schedule for generation, transmission and distribution infrastructure, focusing on preventive measures and rapid response to faults will be established by June 2025.

Target 2.1.5 Demand-side management programs to strategically reduce peak demand, including time-of-use pricing incentives and demand response initiatives are in place by June 2028.

3.2.3 Increased Energy Efficiency in Cooking

Issue: Despite significant strides in electricity access, a large portion of Tanzanian households still rely on harmful biomass fuels for cooking, which is exacerbated by the inefficiency of the majority of cookstove appliances on the market and practices.

Strategic Objective 3: The Uptake of Energy-Efficient Cooking Solutions is Enhanced.

Rationale: Up to 82 per cent of the country's energy consumption comes from biomass which is mainly used for cooking purposes in households. Consequently, enhancing energy efficiency in cooking practices presents a substantial opportunity for improving the nation's overall energy efficiency. Further, the National Clean Cooking Strategy (2024-2034) launched by the President of the Republic of Tanzania envisages 80 per cent of Tanzanians using clean cooking solutions by 2034. To support this transition, it is imperative that clean cooking is also efficient cooking.

Strategy 2.2 Improving electrical power quality.

Target 2.2.1 Power quality assessments for large consumers to implement corrective actions to enhance voltage regulation, reduce harmonics, and improve overall power factor are enforced by June 2028.

Target 2.2.2 Equipment and infrastructure to comply with national standards for power quality, including voltage stability and waveform distortion limits by June 2028.

Strategy 2.3 Review energy policy, legal and regulatory framework to reflect current clean and efficient energy-related issues to enhance coordination of stakeholders in energy efficiency initiatives.

Target 2.3.1 A comprehensive national energy database (Energy Statistic Database) to collect, analyse, and disseminate accurate data on energy consumption, production, and distribution across all sectors in place by June 2026.

Target 2.3.2 Standardised reporting frameworks and protocols for energy stakeholders to ensure consistency and reliability of data collection established by June 2025.

Target 2.3.3 Data analytics and modelling tools to forecast energy demand, inform policy decisions, and identify areas for efficiency improvements in place by June 2026

Strategy 3.1 Promote clean cooking fuels.

Target 3.1.1 A comprehensive assessment of available cooking fuels in Tanzania, including biomass both solid and liquid, LPG, and electric options, to identify opportunities for improving efficiency and sustainability conducted by December 2025.

Target 3.1.2 Policies and incentives to promote the adoption of cleaner fuels and more efficient cooking appliances, such as biomass, LPG, and electric cooking appliances in place by June 2025.

Target 3.1.3 Market for clean cooking fuels and appliances developed to support quick adoption and update of clean cooking fuels and appliances by December 2026.

Target 3.1.4 Carry out an inventory of the existing and appropriate models on the biomass value chain that can be replicated by June 2025.

3.2.4 Enhanced Skills, Research and Development for Innovative Energy Efficiency Solutions

Issue: One of the formidable challenges impeding the widespread adoption of energy-efficient solutions in Tanzania is the inadequacy of skills, energy efficiency research and development focused on innovative energy-efficiency solutions.

Strategic Objective 4: Enhanced Skills and Capacities, and Galvanising Research and Development for Energy Efficiency in Targeted Sectors

Rationale: The advancement of energy efficiency in Tanzania hinges upon bolstering skills and capacities while fostering a dynamic research and development (R&D) landscape. By prioritising both aspects, we lay the foundation for sustainable progress towards a more energy-efficient future

Strategy 4.1 Strengthened skills, practices, and capacities in Energy Efficiency

Target 4.1.1 Comprehensive training programs tailored to energy efficiency practices, targeting professionals, developers, policymakers, and students, to enhance skill sets in the energy supply side, in the transport sector and clean cooking including building energy performance certification measurement and verification by December 2026.

Target 4.1.2 National standards specifications and procedures for energy Audit, management, Building Energy Performance Certification and Measurement and Verification as well as related Acts or Regulation/s to enforce energy management practices, professional training, and certification by 2026.

Target 4.1.3 Establish specialised certification courses and vocational training initiatives to equip artisans, technicians, and engineers with practical skills for implementing energy-efficient technologies and practices by June 2026.

Target 4.1.4 Foster mentorship and knowledge-sharing networks within the energy efficiency ecosystem to facilitate continuous learning and skills development among stakeholders by January 2027.

Strategy 4.2 Enhanced Partnerships for Energy Efficiency Innovation

Target 4.2.1 Establish dedicated Energy Efficiency R&D centres, clubs, chapters or hubs focused on energy efficiency, capacitated and equipped with state-of-the-art facilities and resources, to drive innovation and experimentation in the field at least one hub should be in each zone throughout the country by June 2026.

Target 4.2.2 Partnerships between research and private institutions to facilitate collaborative R&D initiatives focused on clean and efficient energy established by June 2027.

Target 4.2.3 Knowledge exchange and documentation platforms (annual seminars, workshops, and joint research projects) to support innovation in energy efficiency technologies established by January 2026.

Target 4.2.4 Annual energy efficiency innovation challenge conducted in three consecutive years to foster innovation in Energy efficiency by 2025, 2026 and 2027.

Strategy 4.3 Enhanced Capacity in Clean Energy Efficiency R&D.

Target 4.3.1 Vocational training (VETA, FDC, etc.) courses on clean cooking technologies and energy efficiency developed by June 2028.

Target 4.3.2 Higher-learning (short courses, Diploma, and undergraduate) courses on clean energy efficiency to develop a skilled workforce capable of driving R&D initiatives established by June 2025.

Target 4.3.2 Post-graduate (PhD and Masters) programs focused on clean energy efficiency to cultivate expertise and innovation in the field is developed and implemented by June 2026.

Target 4.3.3 Awareness campaign of the benefits and available skills development opportunities in energy efficiency and job creation in this sector conducted to students in schools, universities and colleges, large energy consumers and the public by 2026.

Strategy 4.4 Enhanced Financing Structure for Energy Efficiency R&D Projects.

Target 4.4.1 Dedicated funding mechanism for energy efficiency R&D projects by public and private sectors in place by June 2026.

3.2.5 Established Energy Efficiency Parameters in Building Design & Construction, and Appliance Usage

Issue: The implementation of energy efficiency policies for building design & construction and household electrical appliances faces several challenges, including resource constraints for policy formulation and implementation, low awareness among target groups, high costs of energy-efficient appliances, lack of incentives, absence of standards and labels for household electrical appliances, and behavioural and social issues.

Strategic Objective 5: Enhanced Energy Efficiency in Building Design and Appliance Usage

Rationale: While electricity consumption currently represents a relatively small portion of total energy use in Tanzania, it is crucial to lay the groundwork for a sustainable and efficient electrification strategy. This entails prioritising efficient technologies and practices, particularly in building design and construction, and household appliance usage. Integrating energy efficiency in building design and promoting the use of energy-efficient appliances are essential steps towards reducing energy consumption and mitigating the impacts of climate change.

Strategy 5.1 Established and Implemented Energy Efficiency Building Codes (EEBC) and an Energy Performance Certification (EPC) Scheme.

Target 5.1.1 Comprehensive Energy Efficiency Building Codes (EEBC) to set energy efficiency standards for new construction and renovations in place for approval of building permits for new constructions must consider energy efficiency requirements by June 2025.

Target 5.1.2 A targeted awareness campaign on energy efficiency in buildings, tailored to address local issues and target diverse demographics, launched

within 6 months of the EEBC coming into force

Target 5.1.3 A national program to adapt existing buildings to local climate conditions, improving energy performance and resilience, in place by June 2030.

Target 5.1.4 Implement Energy Performance Certification (EPC) scheme, requiring buildings greater than 2000 m² in the private sector, and above 1000 m² in the public sector to obtain certification indicating their building's energy efficiency level by June 2026.

Target 5.1.5 Smart buildings which embrace clean energy efficiency developed by June 2030.

Strategy 5.2 Implement Minimum Energy Performance Standards (MEPS) and Labelling for Appliances by June 2026.

Target 5.2.1 MEPS and labelling requirements for energy-efficient products (Air conditioners, refrigerators/freezers, electric motors, fans, televisions, clean cooking technologies, charcoal kilns, briquettes,) enforced by June 2025.

Target 5.2.2 Testing capabilities for energy-efficient products to ensure compliance with MEPS and labelling standards in place at the Tanzania Bureau of Standards (TBS) by January 2025. Efficient energy established by June 2027.

Target 5.2.3 Enforcement capabilities for MEPS, including the establishment of a dedicated structure for implementation control, established by June 2025.

Target 5.2.4 Identification of other energy-efficient products/appliances to be covered by MEPS and labelling every three years from June 2026.

Target 5.2.5 Introduce tax exemption mechanisms and incentives for homeowners, businesses, and other organisations that import or invest in energy-efficient technologies and products by September 2026.

3.2.6 Energy-Efficient Solutions are Incorporated across Various Sectors.

Issue: Integration of energy-efficient solutions and practices remains low across various sectors, hindering sustainable development

Strategic Objective 6: Enhanced Integration of Energy-Efficient Solutions Across Various Sectors

Rationale: Despite the potential benefits of energy efficiency in sectors such as transport, water supply, agriculture, fisheries, and tourism, there remains limited adoption due to awareness gaps and inadequate

guidelines. This presents a significant opportunity for sustainability and resource optimisation. Moreover, emerging technologies like e-mobility, smart grids, and efficient appliances offer promising avenues for economic development and emissions reduction.

Strategy 6.1 Developed Sector-Specific Energy Efficiency Action Plans

Target 6.1.1 In collaboration with the relevant Ministries, develop and implement sector-specific

energy efficiency action plans and initiatives for water, clean and efficient cooking, transport, industry, mining, agriculture, fisheries, and tourism sectors by June 2026. These plans should outline clear objectives, strategies, and timelines for improving energy efficiency within each sector.

Target 6.1.2 Partnerships with industry stakeholders, research institutions, and government agencies to facilitate the adoption of energy-efficient practices and technologies across sectors established by June 2027.

Target 6.1.3 Sector-specific awareness campaigns and training programs to educate stakeholders on the benefits and implementation of energy-efficient solutions, addressing local challenges and targeting

diverse demographics within 12 months of strategy implementation are conducted.

Strategy 6.2 Enhanced efficiency practices across mobility solutions

Target 6.2.1 The integration of e-mobility solutions, including electric vehicles and associated infrastructure, into transportation systems, with a focus on reducing emissions and enhancing energy efficiency promoted by June 2028.

Target 6.2.2 Promote the adoption of efficient alternative fuels such as LPG and biofuels in transport infrastructures by June 2030.

3.2.7 Established Institutional Setup for Promoting Energy Efficiency

Issue: Lack of dedicated energy efficiency Unit at MoE; and energy efficiency technical platforms/events to effectively coordinate stakeholders for energy efficiency adoption and implementation initiatives across the country.

Strategic Objective 7: Enhanced coordination of stakeholders in energy efficiency initiatives.

Rationale: The presence of a dedicated Energy Efficiency unit/desk (within the Ministry of Energy) and functional energy efficiency technical platforms and events are of paramount importance in bringing about not only formal structural changes but also changes in attitude and support for reforms by responsible institutions

Strategy 7.1 Develop a dedicated Unit within the Ministry of Energy to oversee the adoption and implementation of energy efficiency initiatives in the country.

Target 7.1.1 Authorisation from the Minister of Energy to formulate an Energy Efficiency Unit/Desk under the Ministry of Energy proposed and obtained by June 2025.

Target 7.1.2 Units at the respective Institution to support the implementation of the whole program on training and certification of professionals are formulated by 2026. The institutions considered are those responsible for certification, accreditation, and

licensing to be implemented by 2026.

Target 7.1.3 Competent staff who specialised in the energy efficiency discipline recruited and trained by December 2025.

Strategy 7.2 Energy efficiency technical platforms and events established by 2026.

Target 7.2.1 A cross-ministerial technical committee under the leadership of the MoE's EE Unit - gathering stakeholders from various technical institutions established and founded by December 2025.

Target 7.2.2 LGA's technical committee under the MoE's EE Unit is established by March 2026. This committee will gather different LGAs – tasked to track progress and barriers and bring up local needs about Energy Efficiency.

Target 7.2.3 Thematic working groups tasked to provide coordination on specific topics (events) by engaging public, private, sectors, trade and professional associations, NGOs, INGOs and other relevant stakeholders etc., by June 2026 Thematic working groups tasked to provide coordination on specific topics engage private actors, trade and professional associations, NGOs, etc., established by June 2026.

Target 7.2.4 Bi-annual events involving the public, private sector, NGOs, INGOs, and other relevant stakeholders introduced and conducted by September 2026.

3.2.8 Developing Financing Mechanism and Incentives for Energy Efficiency Initiatives

Issue: Successful implementation of the energy efficiency strategy requires substantial long-term financial resources. The strategy financing will engage the central Government, local Governments, other decentralised funds, Development Partners, Public-Private Partnerships (PPP) and non-governmental partners.

Strategic Objective 8: Enhance financing mechanisms and incentives to cater for the development of Energy Efficiency in the country.

Rationale: Through the implementation of market-based instruments, green-banking, and energy services companies and the inclusion of incentives such as carbon credits, grants, tax credits, subsidies, self-financing and low-interest loans, each tailored to encourage different sectors to adopt energy-efficient technologies and practices will ultimately reduce the share of international and governmental financing, as well as reducing the financial barriers

and risks associated with implementing energy-saving measures.

Strategy 8.1 Enhance financing and incentive mechanisms for Energy Efficiency from various forms.

Target 8.1.1 Promote private sector financing to acquire green loans/financing and private financing institution services by June 2028.

Target 8.1.2 Enhance financial support of international fund providers and unlock additional international funding opportunities by June 2028.

Target 8.1.3 Promote third party financing to ESCOs that undertakes the financing, design, development, and operation of the EE projects by June 2026.

Target 8.1.4 Promotion of tax incentives or exemptions by the Government to homeowners, businesses, and other organisations that invest in energy-efficient technologies by June 2025.

Target 8.1.5 Promotion of grants and subsidies and other direct investments by June 2026.



04

CHAPTER FOUR - IMPLEMENTATION, MONITORING, EVALUATION AND REPORTING

4.1 Implementation Arrangement

4.1.1 Institutional Arrangements

The implementation of the NEES will be undertaken by a broad range of stakeholders led by the EE Unit (under the overall umbrella of the Ministry of Energy) – with MoE being the custodian of the energy sector in Tanzania.

The Ministry of Energy will be supported by key public

sector institutions, line ministries, and the private sector and financial institutions. Academia, NGOs, local communities, and development partners will majorly support various activities. Effective implementation will require the efforts and close cooperation of these stakeholders.

4.1.2 Governance and Execution

4.1.2.1 Public Sector Entities

Since energy efficiency activities cut across many sectors, several government institutions will be involved in the implementation of sector-specific activities, working in collaboration with other public entities and key stakeholders. The MoE's EE Unit will oversee and coordinate most activities and will be involved in all activities. Similarly, the line Ministries responsible for transport, water supply, agriculture, fisheries, livestock, mining, manufacturing, tourism etc., will also play key roles in the implementation of proposed activities.

On the other hand, the MoE's EE Unit will play a coordinating role and policy support. Similarly, other public entities, such as TANESCO, TBS, EWURA, TIRDO will be actively involved in the development and implementation of the identified interventions.

4.1.2.1 Public Sector Entities

The private sector is increasingly responsible for energy efficiency investments alongside the public sector and plays an important role in delivering energy services using various business models. Most of the activities in this strategy are aimed at enabling private sector investment by removing market barriers that prevent efficient private sector participation. Therefore, the

private sector will be actively involved by providing inputs into the design of the interventions, participating in various platforms such as (EE working groups, events, committees etc.) and actively participating in the implementation of the activities. In addition, the private sector is expected to provide feedback and data to MoE for monitoring and evaluation purposes.

4.1.2.3 Nongovernmental Organisations and Civil Societies

NGOs and Civil Society Organisations (CSOs) play an important role in energy efficiency awareness, training, and promotion. These work closely and directly with communities. They understand community needs and challenges better than other organisations, as they are embedded in communities. Therefore, NGOs/

CSOs will be involved in designing and implementing relevant community interventions. They will provide useful information to track implementation and on-the-ground support for EE projects and programmes across the country.

4.1.2.4 Academia, Research and Development Institutions

Academic and research institutions in the country and other high-learning institutions will play an important role under this strategy in interventions related to capacity building, technology development, innovation and demonstration. Research and Development

institutions will participate in thematic working groups and committees to provide technical inputs and ensure interventions are grounded on sound scientific principles.

4.1.2.5 Development Partners

Development partners have been playing an important role in catalysing EE investment in Tanzania. They will be involved in the design and implementation of the interventions by providing support and resources to

the government to undertake the various activities. This support may be in the form of technical assistance, capacity building and grants.

4.1.2.6 National Thematic Working Groups, Committees and Events

For the effective implementation of the strategy, thematic and activity-specific working groups will need to be established under the coordination of the relevant governmental departments. These working groups will be composed of relevant stakeholders drawn from key government agencies, the private sector, and key thematic experts. Overall coordination of the implementation of the strategy will be under the MoE's designated EE unit.

This unit will provide strategic, policy and institutional guidance for the strategy implementation; guide the national working groups and ensure coordinated implementation of the strategy at a national level. In addition, the unit will be the link with the regional EAC, SADC and COMESA Renewable Energy and Energy Efficiency Strategies and Action Plans.

4.1.3 Legal Framework

The NEES will be implemented within the existing legal framework through the various International Agreements and Initiatives as well as National Legislations/Acts of the Parliament of Tanzania - which govern the resource management and development for the energy sector.

Tanzania's SE4ALL action agenda (2015), and the Paris Agreement (2015).

The pieces of the Legislation include among others: The National Energy Policy (2015); the Rural Energy Act (2005); the Electricity Act (2008); the Forest Act (2002); the Petroleum Act No. 21 of 2015 etc.

The International Agreements and Initiatives include the Sustainable Development Goals (SDGs),

4.1.4 Financial Mechanisms & Incentives

The successful implementation of the energy efficiency strategy in Tanzania will require substantial long-term financial resources. The strategy financing will engage the central Government, local Governments, other decentralised funds, Development Partners, Public-Private Partnerships (PPP) and non-governmental partners.

The objective is to progressively reduce the share of international and governmental financing and to increase through the implementation of market-based instruments, green banking, and energy services companies.

However, a sustainable deployment of these solutions will take time. The strategy therefore foresees that in the first instance, most of the funding will come from grants from IFIs. The work of setting up private financing mechanisms must begin as soon as possible, with the technical support of international and national experts, so that profitable and sustainable private mechanisms can be in place within 10 years

- a. **Grants and subsidies:** Grants and Subsidies, and other direct investments, are non-refundable funds invested directly for energy efficiency actions or services to cover a portion of the capital costs or ongoing operational expenses of a project. Even if the action plan must include increasing private sector investment, the government must anticipate that significant government funding will be required to enable the deployment of an ambitious energy efficiency plan. These funds should be allocated directly to partners, organisations, and the private sector and also through an increase of the operating budget as the implementation of such an action plan requires well-trained public officers. All ministries are concerned and would finance projects, pilot actions and training activities in their respective fields (Finance, Energy, Industry, Cooking, Housing, Commerce, Transport, Health, Agriculture, Environment, and Local Governments).

To streamline and finance activities across

different regions, the government will introduce programmatic block grants in collaboration with Local Government Authorities (LGAs).

Programmatic block grants in energy efficiency refer to government-funded initiatives that provide financial support to local entities, such as municipalities or regions, for implementing comprehensive and coordinated energy efficiency programmes within their jurisdictions. These grants are typically designed to promote energy savings and sustainable practices across all sectors with a clear set of objectives and performance measures. The government will provide guidelines on how the funds must be used, as well as requirements for reporting and accountability.

The country will also be able to count on the financial support of international fund providers. During consultative meetings with AfDB and WB, it was made clear that the Government of Tanzania has great potential to access funding for energy efficiency, given the clear procedures that exist. By properly identifying and emphasising the environmental co-benefits associated with the implementation of energy efficiency measures, Tanzania can unlock additional international funding opportunities, including support from institutions like the Green Climate Fund (GCF), Global Environment Facility (GEF), and various other sources. This will provide vital financial backing to bolster energy efficiency initiatives in the country.

- b. Green loans and private banking:** To involve the private sector in financing energy efficiency, one of the first steps will be to mobilise the banking sector to deploy green credit facilities on a large scale and to systematically consider energy and the environment in the projects they finance. Also, special loans targeting energy-efficiency businesses should be introduced. Today, energy efficiency projects are still considered high-risk and low-cost projects. A dialogue should be initiated with banks which need to be trained to take externalities into account in their view of profitability. In their analysis of projects, banks must learn to consider the investment and operation costs (CAPEX and OPEX). The government may provide, at least at the beginning, financial guarantees for loans. Thus, capacity building and training programmes can

be established to educate financial institutions and their clients on green finance, environmental risk assessment, and sustainable business practices. The country will be able to rely as well on IFIs which deploy numerous green credit lines generally accompanied by technical assistance for the training of banks in green financing.

- c. Tax mechanisms and incentives:** Governments can provide tax incentives or exemptions to homeowners, businesses, and other organisations that invest in energy-efficient technologies, drawing inspiration from European models. For industries, these incentives also can allow deductions and accelerated depreciation of capital expenditure in energy efficiency investments.
- d. Micro-financing:** Microfinance has played an important role in promoting economic growth, reducing poverty, and empowering women in Tanzania. Microfinance institutes that consider environmental or energy efficiency impacts should be encouraged and developed. MFIs can play an important role in promoting energy efficiency by providing financing for energy-efficient technologies, promoting energy-efficient practices, and partnering with energy-efficient businesses. By doing so, they can help their clients to reduce their energy consumption and save money on their energy bills. They should be considered for the distribution of improved stoves or small local entrepreneurial initiatives, for access to green electricity in communities.
- e. ESCOs and Energy Performance Contracting:** Energy Service Companies (ESCOs) are businesses specialising in helping commercial, industrial, and residential customers to reduce their energy consumption and costs. ESCOs provide a range of energy efficiency and renewable energy services, including energy audits, energy-efficient equipment installations, energy management systems, and financing options for energy-saving projects. ESCOs usually operate on a performance-based contract model (EPC), which means that they are paid based on the energy savings achieved. This incentivises them to deliver results and ensures that their clients see a return on investment from their energy-saving projects. The deployment of ESCOs will allow Tanzania to shift some of the financing of energy efficiency measures to the

private sector. However, their implementation requires a strong political impetus and the deployment of an energy-efficiency market.

- f. **Public-Private partnerships (PPP):** The PPP Act (2018) provides for the institutional framework for the implementation of PPP Agreements set rules, guidelines, and procedures. PPPs can be an interesting opportunity for the financing of

expensive projects or the efficient management of public services. The principle is in a partnership, large companies finance the project on behalf of the community and are remunerated through the dividends generated by the operation. PPP can, in some cases, bring together the financial resources, technical expertise, and operational experience of both public and private entities to develop and implement energy efficiency projects.

4.1.5 Monitoring and Evaluation

The implementation of the NEES will be closely monitored to ensure that it is adequately institutionalised in line with its objectives. The monitoring will be done following the Monitoring and Evaluation (M&E) Plan for the energy sector. The monitoring, evaluation and reporting of the plan shall be result-oriented, with result-based indicators attached to each objective to measure results at the outcome level.

The NEES will undergo a midterm review after four years (2028) and a final-term review (2032) after eight years. The midterm assessment will focus on progress made in the implementation of the plan and assess

the appropriateness of the overall strategic direction. Therefore, it will be designed to inform the remaining period of the policy and recommend adjustments where needed. The final evaluation will be undertaken after eight years and will focus on the impact of the implementation of the NEES.

Adequate technical and financial resources will be allocated to the midterm assessment and final evaluation, which will be a participatory process and shall include implementing agencies and other relevant stakeholders from the public, private and civil society sectors.

4.1.5.1 Results Framework Matrix

The Energy Efficiency Strategy's Results Framework Matrix contains the strategic objectives and key indicators as shown in Table 6.

Table 6 The Energy Efficiency Strategy's Results Framework Matrix with Key Indicator Targets

SN	Overall Strategic Objective	(Expected Results) Specific Strategy	Indicator(s)	Means of verification	Frequency	Responsibility
1	National Awareness of Energy Efficiency Raised.	Implement a Comprehensive Awareness Campaign	- Number of people reached by awareness campaigns (area, age, gender, and income) - Number of awareness events conducted. - Percentage increase in knowledge scores from pre- and post-awareness surveys. - Average satisfaction score based on participant feedback. - Percentage reduction in energy consumption.	Reports and Surveys	Annual	MoE, TANESCO, REA, EWURA, Public and Private Stakeholders

2	Efficiency in electricity generation, transmission, and distribution is improved.	Raise efficiency to Reduce losses in electricity generation, transmission, and distribution systems by June 2028.	• Number of stations and substations upgraded. • Percentage reduction in transmission losses. • Percentage reduction in distribution losses. • Percentage improvement in overall system energy efficiency • Percentage of the grid modernised with new technologies. • Increase in the percentage of renewable energy in the total energy mix.	Reports	Annual	MoE, EWURA, TANESCO, REA, public and private stakeholders
		Improving electrical power quality	• Average Number of Outages and Average Outage Duration per Consumer Reduction of daily/ weekly/ monthly load peaks • Percentage Reduction in Daily/Weekly/Monthly Load Peaks • Percentage of Electricity Consumers Transitioned to Time-of-Use Tariffs • Number of high-quality audits conducted • Compliance Rate with Penalty System on Reactive Current Generation • Average Power Factor Compliance Rate on Grids • Number of capacitors installed • Percentage reduction in power quality-related complaints.	Reports	Annual	MoE, EWURA, TANESCO, Public and Private Stakeholders
		Review energy policy, legal and regulation framework to reflect current clean and efficient energy related issues to enhance coordination of stakeholders in energy efficiency initiatives.	• Percentage of energy policies updated to align with international standards. • Number of Revised Policies and Regulations: Count of energy policies and regulations that have been reviewed and updated. • Number of new energy efficiency projects launched following the policy updates. • Percentage reduction in energy consumption per unit of GDP. • Amount of funding allocated to energy efficiency initiatives for policy review.	Reports, Budget speech, published/ revised policies, gu	Annual	MoE and Development Partners

3	The Uptake of Energy-Efficient Cooking Solutions is Enhanced.	Promote clean cooking fuels	- Number of households adopting high-efficiency cooking equipment per year. - Percentage reduction in the use of traditional cooking methods. - Average user satisfaction score (based on affordability, performance, durability, safety etc.) based on surveys. - Percentage reduction in emissions from cooking. - Average cost of high-efficiency cooking equipment as a percentage of average household income.	Reports and Surveys	Annual	MoE, TANESCO, REA, NBS, NGOs, TFS, NEMC, Public and Private Stakeholders.
4	Enhanced Skills and Capacities, and Galvanising Research and Development for Energy Efficiency in Targeted Sectors	Strengthened skills, practices and capacities in Energy Efficiency	- Number of participants in energy efficiency training programs. - Number of certifications or qualifications awarded. - Percentage increase in knowledge scores from pre- and post-training assessments.	Reports and Publications	Annual	MoE, Research Institutes and Academia, Public and Private Stakeholders
		Enhanced Partnerships for Energy Efficiency Innovation	- Number of energy efficiency projects implemented. - Count of New Partnerships - Total number of collaborative research and development projects initiated under the partnerships.	Reports, Publications, Patents, MoUs	Annual	MoE, Research Institutes and Academia, Public and Private Stakeholders
		Enhanced Capacity in Clean Energy Efficiency R&D.	- Amount of energy saved (in kWh or other appropriate units) - The number of financial resources allocated to clean energy efficiency R&D. - The total number of active or completed R&D projects focused on clean energy efficiency.	Reports, Publications, Budget speech	Annual	MoE, Research Institutes and Academia, Public and Private Stakeholders

	Enhanced Financing Structure for Energy Efficiency R&D Projects.	- The total amount of funding allocated annually to energy efficiency R&D projects - The number of different funding sources (e.g., government, private sector, international grants) supporting energy efficiency R&D - The percentage of energy efficiency R&D project proposals that successfully secure funding. - The ratio of grants to loans in the financing mix for energy efficiency R&D projects.	The report, Budget speech,	Annual	MoE, Research Institutes and Academia, Public and Private Stakeholders	
5	Enhanced Energy Efficiency in Building Design and Appliance Usage	Established and Implemented Energy Efficiency Building Codes (EEBC) and an Energy Performance Certification (EPC) Scheme.	- Percentage of buildings that meet the Energy Efficiency Building Codes and have obtained an Energy Performance Certificate. - Number of regions that have adopted the Energy Efficiency Building Codes - Average cost incurred by building owners to comply with EEBC and obtain an EPC. - Total energy savings achieved in buildings that are compliant with EEBC and have received an EPC, compared to non-compliant buildings.	Reports, Surveys and Building Permits	Annual	MoE, MoW, PO-RALG, Public and Private Stakeholders
	Implement Minimum Energy Performance Standards (MEPS) and Labelling for Appliances by June 2026.	- The proportion of appliances that meet the Minimum Energy Performance Standards set by regulations. - The percentage of appliances in the market that are labelled according to the new energy performance labelling standards. - The percentage of consumers who are aware of the new energy performance labels and MEPS - The reduction in energy consumption resulting from the implementation of MEPS and labelling for appliances	Reports, surveys, permits	Annual	MoE, EWURA, MoIT, TBS, TRA, Public and Private Stakeholders	

6	Enhanced Integration of Energy-Efficient Solutions Across Various Sectors	Developed Sector-Specific Energy Efficiency Action Plans	• The number of developed sector-specific action plans • The percentage of developed sector-specific action plans that are in the implementation phase. • Total resources (e.g., budget, personnel) allocated to the development and implementation of sector-specific energy efficiency action plans. • Total number of consultations or meetings with stakeholders during the development of sector-specific energy efficiency action plans. • The assessment results of the impact of sector-specific energy efficiency action plans on energy consumption and efficiency.	Reports, Budget speech	Annual	MoE, PO-RALG, MoIT, MoT, MoW, MoF and Public and Private Stakeholders
		Enhanced efficiency practices across mobility solutions	• The total number of vehicles or mobility solutions that have adopted enhanced efficiency practice. • The percentage of vehicles or mobility solutions that have adopted enhanced efficiency practice. • The percentage reduction in fuel consumption due to the implementation of enhanced efficiency practices in mobility solutions • The total reduction in greenhouse gas emissions resulting from enhanced efficiency practices in mobility solutions	Reports, Surveys	Annual	MoE, MoT, NEMC, TRA, Public and Private Stakeholders

7	Enhanced coordination of stakeholders in energy efficiency initiatives.	Develop a dedicated Unit within the Ministry of Energy to oversee the adoption and implementation of energy efficiency initiatives in the country.	• Energy for overseeing energy efficiency initiatives. • The total number of staff members appointed to the dedicated energy efficiency unit. • The total budget allocated to the dedicated unit for overseeing and implementing energy efficiency initiatives. • The total number of energy efficiency initiatives that are being monitored and managed by the dedicated unit. • The number of training programs or workshops organised by the dedicated unit for capacity building in energy efficiency.	Reports, Budget speech	Annual	MoE
		Energy efficiency technical platforms and events established by 2026.	• The total number of energy efficiency-related technical platforms / events (conferences, workshops, exhibitions, seminars etc.) organised, • The total number of technical papers, research reports, or publications produced as a result of the technical platforms and events • The total number of collaborative projects or initiatives that have been initiated as a result of interactions through the technical platforms.	Reports, Publications, Surveys, MoU	Annual	MoE, Research and Academia, Public and Private Stakeholders.

8	Enhance financing mechanisms and incentives to cater for the development of energy efficiency in the country.	Enhance financing and incentive mechanisms for Energy Efficiency from various forms.	• The total number of new financing mechanisms introduced to support energy efficiency projects. • The total amount of funding secured through new and existing financing mechanisms for energy efficiency projects. • The total amount of tax credits or subsidies provided to support energy efficiency improvements. • The total number of energy efficiency projects that have received financial support or incentives. • The total reduction in energy costs achieved	Reports and Budget Speech	Annual	MoE, MoF, Development Partners, President Office – Planning and Investment, Financial Institutions, Public and Private Stakeholders.
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4.1.5.2 Planned Reviews

Periodic reviews will be conducted to monitor the progress and results of the Energy Efficiency Strategy implementation. The review meetings are outlined in Table 7. Responsible institutions will compile reports detailing the attainment of specified targets and

milestones outlined in the NEEAP/Roadmap and submit them to the Ministry of Energy to create aggregate performance reports. These quarterly, biannual, and yearly reports will be distributed among stakeholders for documentation and action as required.

Table 7 Review Meetings

Type of Meeting	Frequency	Chairperson	Participants
1 Division of Electricity and Renewable Energy and the EE Unit/Desk	Monthly	Responsible Head of Unit/ Department	Professionals in the EE section at MoE
2 Management at the Ministry of Energy	Quarterly	Permanent Secretary	Management team members
3 The Energy Efficiency Working Group	Annually	Chairperson	Group members

4.1.5.3 Monitoring and Evaluation Reports & Reviews

The monitoring, evaluation and review reports of the strategy are outlined in Table 8.

Table 8 Monitoring, Evaluation and Review Reports of Renewable Energy Strategy

Types of Reports	Contents	Frequency
Performance reports	Consolidated reports covering progress on the implementation of activities in the NEES Action plan	Quarterly, semi -, and annual reports
Evaluation reports	Achievement of the NEES objectives, outcomes, challenges, and lessons learnt.	Semi- and annual
Various reviews, studies, and survey reports	Findings and recommendations on specific issues	As per the needs
Final evaluation of the NEES	Overall achievements of the NEES 2034 objectives, results, challenges, and lessons learnt.	

4.1.5.4 Communication and Outreach Plan

Key stakeholders must be well-informed about the energy efficiency strategy to ensure successful implementation. The key stakeholders include government departments, development partners, civil societies, policymakers, the private sector, the

media, and the public. These stakeholders are key to the successful execution and coordination of the NEES. The key messages that need to be communicated to specific stakeholders are summarised in Table 9.

Table 9 Communication Plan

Stakeholder	Message	Channel
Government departments	• The need for effective coordination of EE initiatives • Recommended improvement to policies, legal, regulatory, and institutional frameworks • The enabling environment required for the EE subsector development.	• Meetings with key decision makers • Workshops or strategy review meetings for close collaboration
Development partners	• Their roles are to implement the Strategy and Action Plan. • The financial resources needed to implement the Strategy and Action Plan.	Meetings with the EE Development Partners Group
Private sector	• Major improvement to policies, legal, regulatory, and institutional frameworks • Government initiatives to increase EE uptake	• Cooperative investment promotion with Tanzania Investment Centre (TIC) and Sectorial Associations • Announcements from MoE
Politicians	• Communicating the salient features of the NEES • Potential of Renewable Energy deployment to transform rural areas. • Explaining the impact of Energy Efficiency deployment on energy use and energy-saving opportunities	Direct communication
NGOs, CBOs & Faith-Based Organisations	• Raising awareness about the potential benefits of deploying Renewable Energy • Participation in EE implementation by relevant actions/projects.	Meetings/conferences Field demonstrations
General public	Explaining the government's initiatives to increase EE uptake in Tanzania.	• Newspaper, Radio, social media platforms, and Television. • Field demonstrations

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