THE UNITED REPUBLIC OF TANZANIA
MINISTRY OF ENERGY

NATIONAL RENEWABLE ENERGY STRATEGY

2024–2034

May 2024

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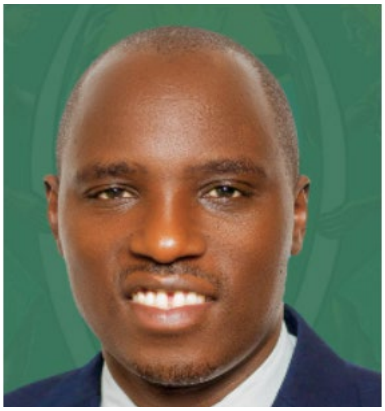
PREFACE



In an era where sustainable development is imperative, Tanzania is fully committed to developing the renewable energy industry and increasing its contribution to the country's overall energy mix. This commitment is driven by the urgent need to secure the nation's energy future, enhance economic competitiveness, and address climate change challenges while ensuring access to sustainable energy and energy security.

Additionally, this commitment aligns with national, regional, and international agendas, including Sustainable Development Goal (SDG) Number 7, which aims to ensure access to affordable, reliable sustainable, and modern energy for all, and Tanzania's Nationally Determined Contributions (NDCs) (2021), which have identified Renewable Energy as one of the priority areas in mitigating the impact of climate change across vital economic sectors.

In alignment with the National Energy Policy 2015, which has significantly emphasised developing renewable energy as a strategic imperative, Tanzania proudly stands as a global ally in various regional and international energy and climate change affiliations. These affiliations include the International Solar Alliance, International Renewable Energy Agency (IRENA), International Energy Agency (IEA), United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement. Through collaborative alliances and partnerships, Tanzania is resolute in championing renewable energy.

The ongoing initiatives, such as the Julius Nyerere Hydropower Project (JNHPP, 2115MW), other hydro projects under development, the Kishapu Shinyanga Solar Project (150 MW), and various geothermal and other planned renewable energy projects, serve as testimony to this determination. Despite the existence of national and global aspirations and project development initiatives to promote renewable energy in the country challenges persist in scaling up its adoption across various sectors, including households, agriculture, health, building, transportation, and tourism. This setback has resulted in a relatively low contribution of renewable energy to our overall energy mix, posing significant challenges to our country's energy security, environment, and economic competitiveness over time.

In light of the prevailing challenges, the Government of the United Republic of Tanzania, through the Ministry of Energy and in collaboration with various stakeholders, has developed the National Renewable Energy Strategy (2024 – 2034) and its implementation road map. This strategy will support the implementation of the National Energy Policy, and serve as a guiding tool in enhancing the coordination and effective integration of renewable energy sources across various sectors. The strategy is expected to ultimately facilitate the scaling up of the contribution and adoption of renewable energy for the country's socioeconomic development.

I call upon all stakeholders—including sectoral ministries, public institutions, government departments, regional administrations, local government authorities, civil society organisations, the private sector, development partners, and the general public—to use this Strategy and actively participate in its implementation.

I am confident that through our collaborative efforts and partnerships, our country will make significant strides in increasing the adoption of renewable energy, improving energy security, mitigating climate change, fostering economic competitiveness and overall country development.

The Government is committed to providing any necessary support throughout the implementation of the Strategy.

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Dr. Doto Mashaka Biteko (MP.)
DEPUTY PRIME MINISTER AND MINISTER FOR ENERGY

ACKNOWLEDGEMENT

The National Renewable Energy Strategy owes its existence to the growing recognition of renewable energy's pivotal role in mitigating climate change, enhancing energy security, and fostering socioeconomic development. The accomplishment of having this strategy in place has been made possible through the collective efforts, cooperation, and dedication of stakeholders and experts from both the public, private sectors and civil society organisations.

I am grateful to all stakeholders, including Ministries, Regional Administrations, Local Government Authorities, Government Departments, Government Agencies, Public Institutions, Organizations, Private Sector entities, Non-Governmental Organizations, and Development Partners for their invaluable contributions to the preparation process of this strategy. While it is impossible to individually mention every person and institution involved, their invaluable financial and technical support has been indispensable.

Furthermore, I sincerely thank the World Bank for their technical and financial support throughout the preparation process.

Lastly, special recognition is due to the team of experts from the Ministry of Energy, whose tireless efforts in initiating and sustaining momentum have greatly informed the formulation and finalisation of this Strategy.

I eagerly anticipate the implementation of the strategy for the betterment of our country

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Eng. Felchesmi Jossen Mramba
PERMANENT SECRETARY
MINISTRY OF ENERGY

LIST OF ACRONYMS AND ABBREVIATIONS

AfDB	African Development Bank
BaU	Business as Usual
BESS	Battery Energy Storage Systems
BGAP	Beyond Grid Access Program
CAMARTEC	Centre for Agricultural Mechanization and Rural Technologies
CBOs	Community-Based Organizations
CO2	Carbon Dioxide
COSTECH	Tanzania Commission for Science and Technology
CRO	Customary Rights of Occupancy
CSP	Corporate Strategic Plan
DNO	Distribution Network Operator
DPs	Development Partners
ESG	Environment, Social, and Governance
ESI	Electricity Supply Industry
ESI-RSR	Electricity Supply Industry Reform Strategy & Roadmap
EWURA	Energy and Water Utilities Regulatory Authority
FDIs	Foreign Direct Investments
FYDP III	Five-Year Development Plan III
GDP	Gross Domestic Product
GHG	Greenhouse Gases
GNI	Gross National Income
GO	Gas Oil
HFO	Heavy Fuel Oil
IDO	Industrial Diesel Oil
IEA	International Energy Agency
IEC	Information, Education and Communication
IMF	International Monetary Fund
IPP	Independent Power Producer
IRENA	International Renewable Energy Agency
JNHPP	Julius Nyerere Hydropower Project
KPIs	Key Performance Indicators
kW	Kilo Watt
LCR	Local Content Requirements
LGA	Local Government Authority
LPG	Liquefied Petroleum Gas
LSSP	Local Suppliers and Service Providers Database.

M&E	Monitoring and Evaluation
MCI	Manufacturing, Construction and Installation
MDAs	Ministries, Departments and Agencies
MEPS	Minimum Energy Performance Standards
MKUKUTA	Mkakati wa Kukuza Uchumi na Kupunguza Umaskini Tanzania
MNRT	Ministry of Natural Resources and Tourism
MoE	Ministry of Energy
MoF	Ministry of Finance
MoIT	Ministry of Communication and Information Technology
MW	Mega Watt
NACTVET	National Council for Technical and Vocational Education and Training
NBS	National Bureau of Statistics
NCCS	National Climate Change Strategy
NDC	Nationally Determined Contribution
NEP	National Energy Policy
NGO	Non-Governmental Organization
NRESC	National Renewable Energy Steering Committee
O&M	Operation & Maintenance
PBPA	Petroleum Bulk Procurement Authority
PMO	Prime Minister's Office
PPA	Power Purchase Agreement
PPP	Public-Private Partnership
PSMP	Power System Master Plan
PURA	Petroleum Upstream Regulatory Authority
PV	Photovoltaic
RCT	Renewable Energy Coordination Team
RE	Renewable Energy
REA	Rural Energy Agency
REB	Rural Energy Board
REF	Rural Energy Fund
REI4P	Renewable Energy Independent Power Producer Procurement Program
REIF	Renewable Energy Investment Facility
REMP	Rural Energy Master Plan
RES	Renewable Energy Sources
RETs	Renewable Energy Technologies
SADC	Southern African Development Community

SAPP	South African Power Pool
SDG	Sustainable Development Goal
SE4ALL	Sustainable Energy for All
SIDO	Small Industries Development Organization
SOs	Strategic Objectives
SPPA	Standardized Power Purchase Agreement
SPPs	Small Power Producers
STEM	Science, Technology, Engineering, and Mathematics
TANESCO	Tanzania Electric Supply Company Limited
TANWATT	Tanganyika Wattle Company
TBS	Tanzania Bureau of Standards
TGDC	Tanzania Geothermal Development Company
TIC	Tanzania Investment Centre
TPDC	Tanzania Petroleum Development Corporation
UDSM	University of Dar-es-Salaam
UNDP	United Nation Development Program
URT	United Republic of Tanzania
VETA	Vocational Education and Training Authority
VRE	Variable Renewable Energy
WRI	World Resource Institute
ZECO	Zanzibar Electricity Corporation

KEY DEFINITIONS

Renewable Energy
Energy comes from resources naturally replenished on a human timescale, such as sunlight, wind, water, tides, waves and geothermal heat.

Appliance
Any technology, equipment or products 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. These include charcoal, firewood, briquettes, pellets, and similar solid biomass.

Clean Cooking Solutions
It is a cooking solution which combines a cook stove and a type of cooking fuel taken together to achieve emission performance measurement of Voluntary Performance Target (VPT) Tier 4 or higher following the ISO/TR 19867-3:2018.

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

Cooking Solutions
Cooking solutions are the combination of cooking appliances and a type of cooking fuel taken together.

Emissions
The release of greenhouse gases and/or their precursors into the atmosphere over a specified area and time

Energy Service
Refers to the end-use applications of an energy delivery system that meet tangible life and livelihood needs and social services (eg. Recreation, lighting, cooking, communication, transportation, heating, etc)

Energy Supply
A useable form of energy that can be provided to an appliance to deliver the required energy service. Examples include solid fuels (such as wood or charcoal), electricity, or mechanical power (such as the rotation of a flour mill).

Feed-in Tariffs
A policy mechanism designed to promote renewable energy development by offering electricity producers a fixed, guaranteed, above-market price for the energy they supply to the grid.

Improved Cook Stove
A thermal-efficient cook stove which achieves emission reduction of at least Voluntary Performance Target (VPT) Tier 3

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

Technology Transfer
Technology transfer is sharing information, knowledge, skills, or technologies from one entity to another to accelerate innovation, enhance productivity, or address societal challenges.

Biomass Energy
Energy consisting of biological materials derived from wood, bio-residues, industries, agriculture, animal and forests could be solid, liquid, and gaseous. Include charcoal, firewood, briquettes, pellets, and similar solid biomass.

e-cooking
It is the short form of “electric cooking,” which refers to using electric-powered cooking appliances and technologies for food preparation.

e-mobility
It stands for the short form of “electric mobility,” which refers to using electric-powered vehicles for transportation purposes instead of vehicles powered by internal combustion engines.

EXECUTIVE SUMMARY

In an era where sustainable development is not just a goal but a necessity, Tanzania stands at the forefront with its ambitious Renewable Energy Strategy for 2024-2034. This strategy represents the Tanzania Government's commitment to harnessing its vast and diverse renewable energy resources: hydro, geothermal, solar, wind, biomass and emerging technologies such as Hydrogen to fuel its development and economic growth. The groundwork for enabling renewable energy's role in development and economic growth was laid out by the National Energy Policy of 2015. Acknowledging the pivotal role of Renewable Energy in achieving its developmental goals, the Government has developed this strategy to improve access to modern and reliable energy services.

The strategy's formulation involved comprehensive desk reviews and consultation with various stakeholders, including government agencies, Non-Governmental Organizations (NGOs), the private sector, and development partners in order to achieve a holistic and inclusive approach.

This strategy is built on four critical analyses conducted between 2022 and 2023: legal, regulatory and institutional review and gap analysis; analysis of possible contractual models and procurement strategies for renewable energy projects; analysis of the local socio-economic benefits of a renewable energy programme in Tanzania; and variable renewable energy integration and location study.

The Renewable Energy Straegy has set out ambitious strategic objectives in the areas of policy, regulatory, and institutional frameworks; project procurement and financing; resource utilisation; and socio-economic benefits, as follows:

1. Increased renewable energy contribution in the power generation mix.
2. Enhanced uptake of renewable energy application technologies in various sectors.
3. Enhanced renewable energy data, information, and monitoring systems.
4. Strengthened policy frameworks for supporting renewable energy value chain development.
5. Strengthened legal and regulatory frameworks for attracting and supporting investments in renewable energy.
6. Strengthened institutional coordination and governance on renewable energy.
7. Increased socio-economic benefits in the renewable energy value chain.
8. Strengthened renewable energy procurement and financing mechanisms.

Carefully selected strategies and targets are provided for each strategic objective. Moreover, a separate roadmap that supports the strategy's implementation, monitoring, and follow-up has been developed. The roadmap emphasises the need for collaborative efforts among government agencies, the private sector, development partners, and Non-Governmental Organizations (NGOs). This collective approach is crucial for realising the strategy's objectives and transforming Tanzania's energy landscape.

INTRODUCTION

1.1 Country Profile

The United Republic of Tanzania is located in Eastern Africa between latitudes 1º South and 12º South and between longitudes 29º East and 41º East. It is bordered by Kenya and Uganda to the North, Rwanda, Burundi and the Democratic Republic of Congo to the West and Zambia, Malawi and Mozambique to the South. The country's eastern border lies in the Indian Ocean, with a coastline of 1,424 kilometres (km). Zanzibar is part of the United Republic of Tanzania and consists of two main islands, Unguja and Pemba, and several small islands. The Islands are located 40 km off the mainland coast of East Africa in the Indian Ocean. The two main islands are 40 km apart.

Tanzania has a total area of 945,087 square kilometres (km), including 61,000 square km of inland water. The total surface area of Zanzibar is 2,654 square km. Unguja, the largest of the two islands, has an area of 1,666 square km, while Pemba has an area of 988 square km.

Tanzania has a tropical climate type, divided into four main climatic zones: the hot, humid coastal plain, the semi-arid zone of the central plateau, the high-moist lake regions, and the temperate highland areas. In the highlands, temperatures range between 10ºC and 20ºC during cold and hot seasons, respectively. The rest of the country has temperatures usually falling below 20ºC. The hottest period spreads between November and February (25ºC - 31ºC), whereas the coldest is often between May and August (15ºC - 20ºC).

According to the 2022 Tanzania census report, Tanzania has a total population of 61,741,120, of which 30,053,130 are male and 31,687,990 are female. As the census indicates, most people reside in rural areas, with 40,196,497 rural residents compared to the urban population of 21,544,623.

1.2 Energy Sector Profile

Energy for cooking: Over 80% of the population in Tanzania rely on traditional cooking technologies and fuels; firewood accounts for 58.6%, charcoal 27.1%, kerosene 1.2%, Liquefied Petroleum Gas (LPG) 9.2%, and electricity 2.5%. This disparity is led by limited applications of clean cooking technologies, including lack of awareness of clean cooking fuels and technologies, limited availability of efficient cook stoves, affordability, and lack of knowledge on the management of clean cooking technologies. The Government has launched a National Clean Cooking Strategy, which will complement the Renewable Energy Strategy and spearhead applications of clean cooking technologies, fuels and solutions.

Electricity generation mix: As of March 2024, the installed capacity of power plants connected to the National Grid system was 2,129.84MW of which 836.60MW (39.28%) came from hydropower, 1,198.82MW (56.29%) from natural gas, 83.92MW (3.94%) from diesel and heavy fuel oil, and 10.50MW (0.49%) from biomass.

According to EWURA's electricity sub-sector performance report 2020, the installed capacity for non-connected grid plants has reached 39.30MW. This includes Tanzania Electric Supply Company Limited (TANESCO) owned plants capable of generating 34.30MW and 5MW of solar power from private producer, NextGenSolawazi. If combined with the national grid, the country's total capacity of power generation plants is 2,169.14MW.

Electricity demand: The demand for electricity in the National Grid system continued to grow and reached 1,431.59 MW in May 2023 compared to 1,340.68 MW in 2021/22, equivalent to an increase of 6.8%.

Electricity transmission lines: The country's electricity transmission network consists of 6,363.27km transmission lines owned and operated by TANESCO. The main transmission lines include 670km of 400kV, 3,384.70km of 220kV, 1,672.57km of 132kV and 543km of 66kV.

Electricity distribution: The network comprises 168,548.36Km, connecting 4,319,258 customers nationwide. Compared to the year ending May 2022, there was an increase in distribution networks by 9.5%. The rural electrification initiatives under the Rural Energy Agency (REA) have significantly contributed to expanding the distribution network for TANESCO.

Electricity access and connectivity rates: According to the National Bureau of Statistics (NBS) report of 2020 on Energy Access and Use Situation Survey II, the overall household connectivity rate for Tanzania Mainland is 37.7%, of which 73.2% accounted for urban areas while 24.5% is for rural areas. The overall access to electricity for Tanzania's Mainland is 78.4%, of which 99.6% is for urban areas and 69.8% for rural areas.

1.3 Renewable Energy Potential

Tanzania has enormous and diverse renewable energy, including hydro, geothermal, solar, wind, and biomass.

Hydropower: Tanzania has a large hydropower potential of around 4,700 MW, of which only 837.77MW have been exploited.

Solar: Tanzania has a solar energy potential ranging from solar irradiation levels of 1800 to 2400 kWh per square meter per year. Approximately 25 and 30 MW of solar PV have been installed in Tanzania, mostly in off-grid areas and mini-grids.

Wind energy: Tanzania has wind energy potential areas with average speeds of over 8 m/s. The variable renewable energy analysis conducted in 2023 shows that the central and western regions have good wind resources, with some areas experiencing wind speeds of more than 10 m/s.

Geothermal: Assessment studies on geothermal resources indicate an estimated potential of over 5,000 megawatts (MW) for direct and indirect uses. Despite this substantial potential, it has remained untapped.

Biomass: Tanzania is endowed with abundant biomass energy resources. Biomass energy accounts for over 80% of the total energy consumption in Tanzania. Charcoal and firewood are the widely used bio-energy sources for cooking in Tanzania. Charcoal consumption, mainly in urban areas, has nearly doubled over the past ten years, and it is projected that demand for charcoal, without supply and demand-side interventions, will double by 2030.

Tidal and wave energy: Tanzania has access to an ocean coastline that can easily be exploited for tidal and wave energy. Although Tanzania has some locations with sufficient ocean water current speeds, this resource has not been exploited for energy purposes because there haven't been comprehensive studies to ascertain its viability.

Hydrogen for energy: Hydrogen technology is relatively new in Tanzania. Neither the National Energy Policy of 2015 nor the Power System Master Plan (PSMP) 2020 has provisions for exploiting hydrogen fuel in energy production.

1.4. Drivers for Renewable Energy Development

The following critical factors drive the need for the development of the renewable energy industry in Tanzania:

Mitigating the effects of climate change and protecting the environment: Developing and deploying renewable energy will help Tanzania reduce its overdependence on fossil fuels for power supply and reduce carbon emissions.

Improving the security of energy supply: Inadequate power supply has been noted as one of the main constraints to socioeconomic transformation, especially the attainment of the goals stipulated in the Tanzania Development Vision. Deploying renewable energy technologies will thus increase sustainable energy supply and improve energy security.

Scaling up access to electricity: According to the energy access and use situation survey conducted in 2020, approximately 37.7% of Tanzanian households were connected to electricity, 73.2% and 24.5% in urban and rural areas, respectively. Most of the rural population, which accounts for more than 65% of the national population, is still scantily covered. The deployment of renewable energy technologies has the potential to increase access to the modern energy supply necessary to help the country achieve the universal access to modern energy goal by 2030.

Socio-economic development: Renewable energy creates many green jobs and improves the country's competitiveness in the export economy while offering the potential to address gender inequalities in the labour force.

Diversifying the energy mix: Variable Renewable energy's contribution to the power generation mix is minimal. There is enormous potential to explore variable renewable energy sources to diversify the energy mix to meet the growing demand.

Reducing overdependence on traditional biomass energy: According to the Energy Policy of 2015, traditional biomass (charcoal and firewood) represents 85% of total energy consumption. The charcoal production has led to a loss of forest cover and forest-land degradation. Clean cooking solutions such as Electric cooking on the national grid, with increasing input from renewable energy generation and off-grid energy sources, will provide an opportunity for reducing biomass consumption.

1.5 Rationale for the National Renewable Energy Strategy, 2024 - 2034

The National Energy Policy (2015) recognises and prioritises the development of the renewable energy industry. The policy articulates the need for the country to unlock its untapped renewable energy potential and ensure access to sufficient and reliable energy. Despite the policy's recognition, the government didn't have the implementation strategy to optimise applications of renewable energy technologies.

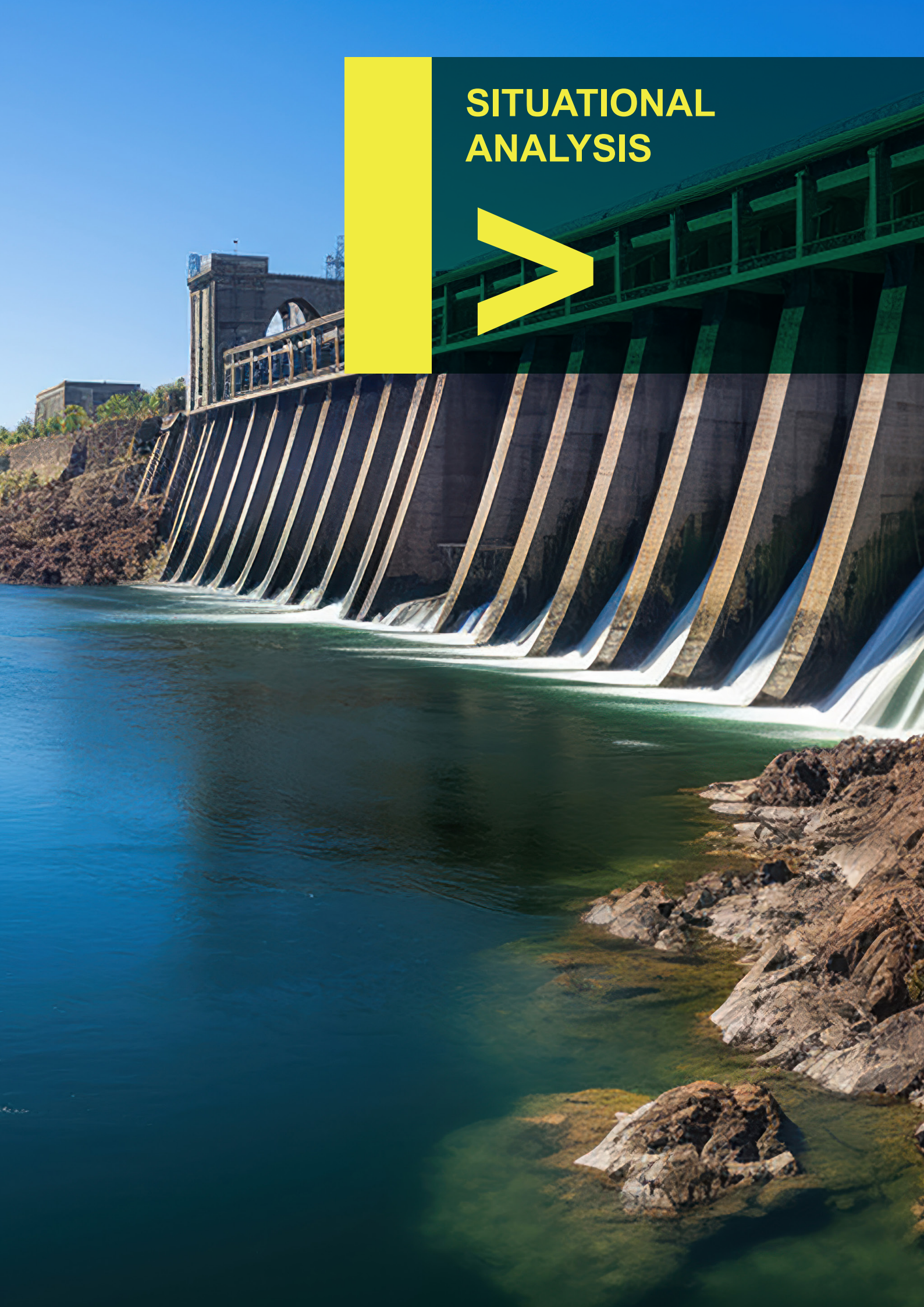
Tanzania Development Vision 2025 recognises the importance of energy in achieving its development goals and aims to improve access to modern and reliable energy services. In reaching this goal, the government intends to promote renewable energy to accelerate increased access to modern energy services. Significant investments have been made to assess the potential of wind, solar, mini-hydro, bio-energy, and geothermal resources across the country to achieve this goal.

The renewable energy strategy is crucial for capitalising on the country's global advancements towards clean energy and climate change mitigation. Integrating renewable energy development as a response measure within the recently adopted national climate change response strategy is a key envisaged intervention. By prioritizing renewable energy, Tanzania can contribute to global efforts to mitigate greenhouse gas emissions and adapt to climate change's adverse impacts, aligning with the Nationally Determined Contributions (NDCs) commitments.

Additionally, regional and global developments in renewable energy and the environmental agenda necessitate the application of clean energy technologies, whereby renewable energy significantly contributes to reducing Greenhouse Gases (GHG).

The NDCs for climate change mitigation necessitate a clear renewable energy roadmap to align with regional and international strategies. The strategy and its associated roadmap will help the country to align with the existing regional policies within the Regional Economic Communities (RECs) - East African Community (EAC) and the Southern African Development Community (SADC), of which Tanzania is a Member State. Tanzania can leverage regional cooperation, sources, and expertise by developing and pursuing its renewable energy strategy, contributing to regional sustainability, and positioning itself as a renewable energy sub-sector leader.

SITUATIONAL ANALYSIS



2.1 Renewable Energy Initiatives and Development Outlook

2.1.1 Introduction

Tanzania has a wide range of renewable energy resources in abundance, which are not yet fully exploited. These include biomass, hydropower (large and small), wind, geothermal, solar, ocean tidal and waves. The only resource exploited to some extent is hydropower. The government has strived to mobilize substantial financial and technical resources to increase the applications of renewable energy technologies in various economic activities, including contributions to the country's power generation mix.

2.1.2 Renewable energy potential and utilization

Despite Tanzania being endowed with substantial renewable energy resources, the extent to which each energy source is harnessed and utilized differs due to various factors underpinning that type of resource:

i. Hydropower

Large hydropower potential is estimated at 4,700 MW, of which only 837.77MW has been exploited for power generation. The potential of small hydro is estimated at 331MW, with only xxMw exploited for power generation to date.

ii. Solar energy

Solar energy potential ranges from irradiation levels of 1800 to 2400 kWh per square meter per year (VRE Location Study, 2023). Despite the enormous solar potential, only 25 MW to 30 MW of solar PV has been installed, most of which are located in off-grid areas and operate as mini-grids. A few reasons are cited for this limited potential, including land acquisition processes and the intermittency nature of solar energy, which pose technological and financial barriers. Additionally, inadequate awareness among potential end-users of sub-standard products in the market contributes to barriers to developing small projects and stand-alone home systems. Across the sector, solar energy is also faced with limited technology and an inadequate skilled workforce to enable local content to benefit from the entire cycle of large-scale projects

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iii. Wind energy

Tanzania is endowed with potential areas for wind energy generation with an average speed of over 8m/s. The VRE Location Study (2023) shows that the central and western regions have good wind resources. Despite its potential, wind energy has not been exploited to contribute to the power generation mix[1] given the land acquisition challenges due its scale, and processes for wind power projects and the intermittency nature of wind energy that poses technological and financial barriers. In addition, there is an inadequate local skilled workforce to serve the full cycle of large-scale wind projects.

iv. Geothermal

Studies indicate that geothermal energy has an estimated potential of more than 5,000MW for indirect and direct uses. However, geothermal is currently not contributing in either power generation mix, industrial ,agricultural heating or drying processes. Geothermal energy in Tanzania faces multiple challenges, including high exploration risks, inadequate data, and the absence of a specific legal and regulatory framework for utilization and governance. Despite the challenges, several geothermal prospect projects are underway across the country.

1 Grid Center Report, 2024 and Ewura REPORT on SPP Project Implementation,2023

v. Bio-fuels and waste to energy from biomass

Tanzania is also endowed with abundant biomass energy resources for waste energy and biofuel production. Despite biomass energy accounting for more than 80% of the total energy consumption, the contribution of waste to energy and biofuel production is minimal. Currently, the waste to energy is estimated to contribute only 16.90MW to the power generation mix . The uptake of biomass for waste to energy and biofuel production is further undermined by the lack of guidelines to facilitate the sustainable production of biofuels and conversion of waste to energy.

vi. Ocean tidal

The lack of insufficient data on feasibility - scale and sites - for ocean tidal makes it difficult to determine the status of ocean tidal potential.

viii. Hydrogen energy

Hydrogen energy is a new technology in Tanzania. Hydrogen energy development requires recognition within the national energy policy as one of the green energy sources with the potential to contribute to the country's energy mix.

Across the sources of renewable energy in Tanzania, the situation of their utilisation (and scalability) is characterised by the following key issues:

- Under-utilized hydro potential, solar energy, wind energy, geothermal, and biomass energy potential to diversify the power generation mix and contribute to various economic activities.
- Inadequate data and information on geothermal, ocean tidal and wind resource potential.
- Hydrogen technology is relatively new in Tanzania. The National Energy Policy of 2015 has not recognized the potential of hydrogen as one of the renewable energy resources in Tanzania.
- The Intermittent nature of solar and wind energy requires deploying non-variable renewable energy technologies (hydropower and geothermal) in parallel and energy storage technologies to support grid stability.
- Absence of specific legal and regulatory framework for geothermal utilization and its governance.
- Complex land acquisition processes for wind potential areas could have been avoided by securing land and registering in the land bank.
- No clear guidelines to facilitate the sustainable production of biofuels and the conversion of waste to energy.
- Procurement of renewable energy projects and financing issues/challenges.

Other issues include the institutional structure (e.g., mechanisms to fast-track and facilitate private sector investments and PPP); readness of local industries and job market (education system) to fully absorb and participate in Renewable Energy industry from feasibility to decommissioning.

2.1.3 Renewable Energy Initiatives

(i). Key ongoing initiatives

Generation Project

The construction of the Julius Nyerere hydropower with an installed capacity of 2,115Mw is at advanced stage with few turbines have been commissioned. The construction of the Rusumo hydropower project with an installed capacity of 80 MW is also in its final stage. Tanzania, Burundi, and Rwanda jointly develop the Rusumo project, and each country will have a share of 27 MW. Other utility-scale projects under development include Kakono (80 MW), Malagarasi (49.5 MW) and Kishapu Solar PV (150 MW). The latter has its first phase of 50 MW under construction, and the remaining capacity will be completed in phase two.

Other power generation projects from renewable energy are at various stages of preparation, including exploration, resource confirmation, feasibility studies and financing mobilisation. These include Ruhudji 358MW (hydro), Rumakali 222MW (hydro), Kikonge 321MW (hydro), Ngozi II Mbeya 70MW (Geothermal), Songwe 5MW (geothermal), Kiejo-Mbaka in Mbeya 60

MW (geothermal), Natron in Arusha 60 MW (geothermal), and Luhoi (Coast) 5MW (MoE, 2023a).
Similarly, several mini-grids have been developed nationwide through the existing Small Power Projects (SPP) framework. The SPP framework includes rules and guidelines for grid interconnection, the Small Power Purchase Agreement (SPPA), and the Standardised Small Power Projects Tariff (SPPT), which aims to attract the private sector to develop small renewable energy projects. As of March 2024, 36.67 MW was generated from small solar, hydro and waste-to-energy biomass projects[2])

These ongoing initiatives indicate the readiness and strong commitment of the government and private sector to implement sizable renewable energy projects. However, the lack of a short- to long-term strategic implementation plan remained a constraint to enabling the full realisation of all initiatives to match the growing demand.

Results Based Financing (RBF)

Through a result-based financing (RBF) system, REA supports small renewable energy mini-grids. The RBF program mainly focuses on solar and small hydro technologies. Payment to developers depends on the progress made by the key performance indicators. Depending on the nature of the project, performance indicators include the number of customer connections established, distribution lines built, and others.

The RBF modality has demonstrated itself as a favourable financing approach for supporting renewable energy developers, particularly ensuring high commitment from the developers due to the performance based payment modality. Nonetheless, developers utilising this approach continue implementing activities that encounter obstacles in securing equity to support implementing activities to achieve the performance indicator(s). Delays in obtaining equity impede the implementation process and result in delays for developers accessing funds tied to results to be achieved.

Credit Facility Support

REA allocates funds through the Tanzania Investment Bank (TIB) to assist small renewable energy developers. Developers who have signed a Small Power Purchase Agreement (SPPA) with TANESCO can approach TIB to seek investment loans. Under this capacity, TIB takes on the role of fund manager to implement REA's funding. Issues such as the debt-to-equity ratio and repayment period often lead developers to delay reaching financial agreements with many banks. To tackle these challenges, REA's credit facility alleviates the debt-to-equity ratio and ensures more favourable repayment periods than other commercial banks. Given the success of this approach, there is a call to replicate this model with other local banks and to enhance loan conditions further to attract increased investment in renewable energy.

Projects Preparation Support Facility (PPSF)

A significant obstacle hindering the development of small renewable energy projects is the absence of essential technical documents, such as feasibility studies, environmental and social impact assessments (ESIA), and business plans. To address this challenge, the Project Preparation Support Facility (PPSF) at REA was established to assist developers in completing project development and achieving financial closure. The PPSF provides grants to developers for conducting feasibility studies and other pre-construction consulting services. Rather than directly disbursing funds to developers, REA pays consultants who support developers conducting pre-investment studies.

Once these study reports are finalized, the project's potential becomes apparent and serves as the basis for TANESCO and the developer to enter into SPPA. With SPPA, developers can then seek investment loans from financial institutions. Through the PPSF program, developers have reached a conclusion and an SPPA discussion with TANESCO in a shorter period than before.

Solar lantern support

Through Sustainable Solar Market Package II (SSMP II), REA promoted applications of solar lanterns to provide light for fishing in Lake Victoria and light for students to study at night. REA provided solar lanterns for students and fishermen to promote the transition to clean energy.

Through REA's support, many people from rural and urban areas have widely adopted solar lanterns for various lighting applications. This underscores the need to continue promoting solar lanterns for other lighting applications, including discouraging the use of candles and kerosene lamps, which pose fire hazards in households.

(ii) Key previous initiatives

Scaling up Access to Biogas: In collaboration with development partners and the private sector, the Ministry of Energy has spearheaded the Government's drive to increase access to biogas energy. The Biogas journey commenced in 1975 when the Small Industries Development Organization (SIDO) forged alliances with NGOs fortified by the support of the Centre for Agricultural Mechanization and Rural Technologies (CAMARTEC).

The initiatives mainly focused on livestock farmers leveraging abundant animal manure and other organic residues as primary feedstock for anaerobic digestion plants. The focal regions for biogas development were Arusha, Kilimanjaro, Manyara, Dodoma, Mbeya, and Pwani regions, which are known for their significant cattle-rearing households.

Tanzania Domestic Biogas Programme: This program was implemented by REA with financial support from the government of Norway. The program aimed to improve the well-being of women by providing them with access to clean cooking, which helps to reduce indoor air pollution workload and frees up time for other productive activities.

The program targeted building biogas plants in 25 regions of Mainland Tanzania by offering investment subsidies. Technical expertise was required at various stages, including designing, installing, managing the biogas production process and repairing and maintaining the system.
Through this program, beneficiaries had to pay 80% upfront, while 20% was subsidized. According to the 2023 end-review and forward-looking assessment on the subsidy support, out of 10,000 biogas plants planned to be constructed in two years, only 7.25% were constructed. The main challenges emerged from societal perceptions to investment costs and operational inefficiencies. Furthermore, the program required technical expertise, which the local customers didn't have, and the workload of collecting sufficient animal dung to run the biogas plant.

The Solar PV Market Transformation Project: In collaboration with UNDP, the Ministry responsible for energy implemented a pilot project to transform Tanzania's rural photovoltaic (PV) market. The project supported policy and institutional strengthening, awareness raising, private sector capacity strengthening, financing mechanisms, and learning and replicating the experience.

The Local Government Authority (LGA) was pivotal in the project's implementation and success. The pilot project started in Mwanza and was later expanded to Kagera, Mara, and Shinyanga. The expansion increased the use of PV systems and enhanced the PV retail value chain in these areas.

The project was followed by a similar project implemented by the Ministry responsible for energy in collaboration with Sida. Various innovative concepts were tested nationwide, paving the way for PV adoption in rural areas and the introduction of tax exemptions on solar PV components. The pilot project highlighted the crucial role of financial institutions in supporting the development of the solar PV industry.

The key lessons learnt include the need for scaling up the application of solar PV systems for productive uses country-wide in promoting and improving rural income, the need for scaling up the application of solar PV systems in supporting the delivery of social services such as health and education, need for supporting vocational training centres and technical colleges to introduce renewable energy courses for artisans, technicians and engineers, as well as the need for supporting the local government authorities to spearhead the uptake of the renewable energy technologies.

Lighting Rural Tanzania (LRT) Grant

The objective of the LRT grant was to foster the creation of sustainable business models aimed at delivering efficient, clean, and affordable lighting services to Tanzanians. However, customers connected to mini-grids, which serve as anchor points, faced several challenges.

These included restrictions on the duration of electricity usage and limitations on the amount of load that could be connected to the system. Additionally, the electricity tariff charged by mini-grid developers to consumers was significantly higher than the tariff which TANESCO would have charged.

Consequently, some residents in rural off-grid areas were reluctant to connect through mini-grids. Furthermore, the arrival of the grid network in areas already served by mini-grids posed challenges for TANESCO regarding raising funds to acquire and operate these mini-grid systems.

2.1.4 Renewable energy development outlook for power generation

Tanzania is committed to reducing its GHG emissions by 30% to 35% by 2030 compared to the Business as Usual (BaU) scenario stated in the NDCs of 2021. This will be contributed by doubling the share of renewable energy in its energy mix. The zero-emission technologies considered in the generation expansion plan are hydropower, solar PV, wind power, and geothermal power.

The current generation mix primarily consists of hydro and gas-fired power plants across various sources: hydropower (39.28%), natural gas (56.29%), diesel and heavy fuel oil (3.94%), and biomass (0.49%) in the national grid installed capacity. (Grid centre, March 2024).

Tanzania's power system is on track for a significant shift, positioning itself among the world's lowest emission grids. About 85% of the electricity will be produced by zero-emission electricity sources once the JNHPP is fully commissioned. This will increase space for developing more variable renewable energy (VRE) power plants.

The PSMP 2020 envisages a demand growth from a peak demand of 1,120 MW in the year 2019 to 17,611 MW in 2044. The country requires a total installed generation capacity of 3,971 MW in the short term, 12,256 MW in the medium term and 20,201 MW in the long term from different sources, including renewable energy, to meet the forecasted demand.

In the period up to 2030, the least cost generation and location analysis in the VRE study recommend deploying more solar and wind in the energy mix than was foreseen in the PSMP 2020.

In the period up to the year 2038, the VRE location study of 2023 recommends the deployment of 6,130 MW generation capacities from renewable energy resources. This is an opportunity for the deployment of more renewable energy in comparison with the generation capacity of 5,873 MW foreseen by the PSMP 2020 for the same period.

To achieve the generation capacity of 6,130 MW from renewable energy, about 1,340 MW has to come from solar power, 1,150 MW from wind energy, 480 MW from geothermal and 3,160 MW from hydro by 2038. The table below shows a breakdown of generation capacity addition up to 2038 from the generation expansion plan.

Table 1: Breakdown of generation capacity addition from the expansion plan

	Breakdown of generation capacity additions (MW)				TOTAL (MW)
	2024 - 2027	2028 - 2031	2032 - 2035	2036 - 2038	
Solar	150	0	400	790	1,340
Wind	75	395	440	240	1,150
Geothermal	0	290	0	190	480
Large hydro	2,142	432	502	84	3,160
TOTAL	**2,367**	**1,117**	**1,342**	**1,304**	**6,130**

Source: VRE Location Study, 2023.

2.1.5 Uptake of renewable energy technologies in various sectors

Clean cooking

Clean cooking technologies refer to modern, efficient, and environmentally friendly cooking methods that reduce the negative impacts associated with traditional cooking practices, particularly those using solid fuels like wood, coal, or biomass. Adopting clean cooking technologies is essential for addressing traditional cooking methods' health, environmental, and socio-economic challenges. The clean cooking technologies linked to renewable energy sources include improved cook stoves, biogas stoves, solar heaters, solar cookers, and bio-ethanol stoves. In addition, modern electric cooking appliances such as electric pressure cookers and air fryers are highly efficient. They can be powered by renewable electricity through on or off-grid means (and on-grid electric cooking will become increasingly renewable as the planned renewable generation is completed). The adoption of clean cooking technologies has numerous benefits, including improved indoor air quality, reduced deforestation, lower greenhouse gas emissions, and positive impacts on health and gender equality. The key constraint to its adoption is the minimal application of renewable energy technologies for clean cooking and other thermal uses. The limited uptake is partly driven by cultural preference for cooking methods and the affordability of the available technologies across rural and urban populations.

Agriculture and Food Security

Agriculture is a major employer and contributes significantly to the country's GDP. It is estimated that 65.3% of households are involved in agriculture, mostly in rural areas (URT National Sample Census of Agriculture 2019/2020).

In agriculture, energy demand includes energy consumed in various agricultural activities, such as irrigation and processing agricultural produce, including drying and refrigeration. Despite this potential given agricultural operations in off-grid areas, there is minimal use of renewable energy technologies, especially the most applicable technologies - solar and wind energy. Major challenges constraining the use of solar and wind energy technologies in agriculture include high initial investment cost on the equipment, limited access to financing and limited awareness of applications of renewable energy technologies in the value chain of agriculture activities.

Fisheries

Fishing in Tanzania is primarily conducted through small-scale and artisanal methods, where individuals or households utilize simple fishing gear. Energy is used to power motorized fishing vessels; lighting (lamps and lights) during fishing and on landing sites; and post-harvest activities such as storage, preservation, drying, and transport. The use of motorized and mechanized fishing depends on fossil fuels,

which are unaffordable to the majority of artisanal fisheries, and can contribute to high costs of fish catch across the supply chain. The 2020 Annual Fisheries Statistics Report of the Ministry of Livestock and Fisheries indicates that the sector contributed 1.8% to the country's GDP. Renewable energy-powered devices such as solar lights, refrigerators, and e-mobility can reduce fishing costs and environmental impacts. In Lake Victoria and Lake Tanganyika, the fishery Ministry has developed rules for applying solar energy for lighting during fishing. There is also a growing interest in solar cooling technologies and e-boats to facilitate fishing efforts and post-harvest activities. In this regard, there is a need to scale up the Lake Victoria and Tanganyika initiatives across the country to promote the applications of renewable energy technologies in the fishing industry.

Tourism

The tourism industry can benefit significantly from applying renewable energy, attracting eco-conscious tourists, promoting sustainability and cost savings, increasing global competitiveness, and having a positive environmental impact. In the tourism sector, renewable energy can be applied for many purposes, including solar power for providing electricity in rooms, wind power for remote locations, geothermal energy for heating and cooling, mini-hydropower systems, e-mobility charging, and solar water heaters. Renewable energy is transforming tourism, particularly in remote areas, where they depend on off-grid solutions as the primary electricity source.

Transport

Renewable energy sources are increasingly used in the transport sector to reduce greenhouse gas emissions. Renewable energy can be used to charge Electric Vehicles (EVs) at home and in public charging stations. Bio-fuels, such as ethanol and biodiesel derived from renewable biomass sources such as crops, agricultural residues, or waste materials, can be blended with petrol and diesel. Integrating renewable energy technology applications into the transport sector can reduce emissions, improve air quality, and enhance energy security while promoting sustainable development. Despite Tanzania being one of the countries adopting e-mobility, there are no clear guidelines or standards for e-mobility energy sources. Furthermore, biofuel adoption has stalled, and there is no strategy to integrate biomass to power the transportation sector.

2.1.6 Location of potential sites for variable renewable energy (VRE)

Wind sites: According to the VRE location study 2023, the central and western regions have good wind resources, with some areas experiencing wind speeds of more than 10 m/s. The best sites for wind farms are located in Dodoma (Kisima and Mpwapwa), Manyara (Mbulu and Katesh), Njombe (Makambako), Iringa, Singida, Mbeya (Izumbwe), and Kilimanjaro (Mkomazi). It is estimated that 1 square kilometre can approximately host a wind farm of 10 MW. The estimated total wind potential for these ten sites is approximately 7,629 MW.

The sites of Mkomazi and Katesh have limited areas available for wind power development as they are close to habitat and the biodiversity-protected regions (e.g. game reserves). The sites of Iringa, Singida and Makambako have a vast area of land available, allowing for the installation of large wind farms.

Solar sites: Solar resources in Tanzania have promising potential for power generation, with solar irradiation levels ranging from 1800 to 2400 kWh per square meter per year. Solar resources are particularly strong in the more elevated northern and western parts of the country, which lie at an altitude of around 1000 meters (VRE location Study, 2023).

The best sites for solar PV plants are located in Tabora (Tabora and Igurubi), Shinyanga, Singida, Dodoma, Iringa, Kinesi (Mara), Arusha (Endabash), Rukwa (Sumbawanga), and Njombe (Makambako). It is estimated that 1 square kilometre can approximately host a solar PV plant of 50 MWp. The estimated total solar potential for these ten sites is approximately 52.91 GW.

The process of securing land in the proposed sites for wind farms and solar PV development is important to avoid conflict with other competing land uses. In addition, the VRE location study and PSMP 2020 recommend expanding the capacity of large-scale and small-scale hydropower plants as many provide electricity at a low cost, and large hydro reservoirs are key for integrating large solar and wind power capacities in the system.

2.2 Legal, Regulatory and Institutional Frameworks

2.2.1 Policy frameworks, strategies and plans

(i) National Energy Policy

The first National Energy Policy (NEP) of 1992 introduced the perspective of an energy mix and reduction of the use of fossil fuels. The NEP 2003 introduced market reform mechanisms and recognized the role of the private sector in supporting sustainable energy development. Implementation of NEP 2003 resulted in the establishment of the Energy and Water Utilities Regulatory Authority (EWURA); operationalization of the Rural Energy Agency (REA) and Rural Energy Fund (REF); enactment of Electricity Act 2008 and formulation of the SPP framework; adoption of the Electricity Supply Industry Reform Strategy and Roadmap 2014 – 2025, among other reforms.

Despite the achievements of NEP 2003, the energy sector continued to face several bottlenecks, including low private sector participation in large-scale power generation, over-reliance on few generation sources, and low access to modern energy services. This setback and the need to improve the business environment for the private sector in the energy sector led to the development of the National Energy Policy in 2015. The NEP aims to create a conducive environment to attract more private investments and local/national participation in the energy sector. It also focuses on increasing access to modern energy services, promoting energy conservation and efficiency in all sectors, and improving the share of renewable energy sources and resources in electricity generation and other utilisations to enhance energy security. Furthermore, it aims to strengthen energy-related institutional, legal and regulatory frameworks and accelerate rural electrification to foster equitable socioeconomic transformations.

The NEP 2015 has, to some extent, managed to attract the private sector to develop renewable energy projects. In the period after 2015, the country managed to develop initiatives to fast-track private sector investments in renewable investments. For example, a private 5MW solar plant was installed in Kigoma.

Beyond private sector investment, the Government, through Tanzania Electric Supply Company Limited (TANESCO), is also developing a 150 MW solar power plant in Kishapu, Shinyanga region and has already earmarked, validated and initiated studies in several sites.
In summary, the lesson learnt in implementing the National Energy Policy 2015 is that the policy is ambitious despite its known limitations. As a result, the goals set under NEP 2015 have failed to be fully realised due to the absence of an implementation strategy, inadequate coordination, inadequate finance and lack of monitoring and evaluation systems to track implementation.

(ii) Power System Master Plan 2020 and 2024 updates

The Power System Master Plan (PSMP) integrates key elements of the country's energy policy, development plans, and government policy directives for socioeconomic development. The overall objective of the PSMP is to increase access to modern energy and enhance power supply availability, reliability, and affordability in the country.

The PSMP projects hydropower, solar , wind, and geothermal energy to contribute 8,200 MW in the power generation mix by 2044. This is an opportunity for renewable energy development.
Several projects are scheduled to commence earlier than initially anticipated under the current PSMP, reflecting the shifting in government priorities. Given that the current PSMP was last revised in 2020, updating it to incorporate the recent developments and insights gathered from the VRE location study is imperative

(iii) Rural Energy Master Plan 2022/23 to 2029/30

Rural Energy Master Plan (REMP) is a tool for planning and implementation of rural energy provision in meeting the targets set in the National Energy Policy of 2015, National Strategy for Growth and Poverty Alleviation (MKUKUTA), and Sustainable Energy for All (SE4ALL) goals. The plan also aims to facilitate the exploitation and utilization of renewable energy sources for improved energy supply in the country.

The REMP recognizes renewable energy technologies and has included a dedicated program called Beyond the Grid Access Program (BGAP) as one of the options for rural electrification. According to REMP, 312 locations do not meet the criteria for grid electrification and are thus proposed to be electrified through BGAP by using solar and small hydropower mini-grids. The BGAP promotes the application of renewable energy technologies whereby scattered households that live too far from the grid will be electrified through stand-alone systems such as solar home systems to achieve universal access to electricity as defined by the SE4ALL action agenda.

(iv) Electricity Supply Industry Reform Strategy & Roadmap 2014 - 2024

The Government of Tanzania began restructuring the Electricity Supply Industry (ESI). In 2014, the Government approved the Electricity Supply Industry Reform Strategy & Roadmap (ESI-RSR). The ESI-RSR proposes a rational framework for the reform of the Electricity Sub-Sector.

The ESI-RSR highlights the need for reform and provides a roadmap for the reform of Tanzania's electricity supply industry. It proposes the desired market structure and the roadmap for implementation. Among others, the outcome is to improve the off-taker's financial position, have an unbundled electricity supply through generation, transmission, and distribution, and establish an independent system operator and independent market operator. These reforms are meant to attract private sector participation and encourage Foreign Direct Investment (FDI).

(v) TANESCO's 10-Year Corporate Strategic Plan (CSP) 2024/25 – 2034/35

This TANESCO strategic plan focuses on several areas: enhancing operational efficiency, strengthening customer focus, accelerating digital transformation, fostering a skilled workforce, coherent culture and change management, improving financial sustainability, enhancing Environmental, Social and Governance (ESG) practices, and driving the realisation of the power system master plan. The strategic plan aims to capitalise on existing resources such as hydropower and natural gas while actively pursuing renewable energy sources such as solar, wind, and geothermal. Hydropower and geothermal energy will be vital in maintaining grid stability as both are base loads.

To serve remote and underserved areas where grid extension may be challenging or costly, TANESCO aims to collaborate with the Rural Energy Agency (REA) to provide decentralised energy solutions such as mini/micro-grids. Additionally, TANESCO will partner with financial institutions to offer accessible financing options, enabling low-income households to afford energy-efficient appliances, solar home systems, and other clean energy solutions.

The strategic plan aims to achieve the following interventions for promoting applications of renewable energy:

- Form a separate functional unit with the required expertise to focus on the implementation of renewable energy strategy by 2027;
- Conduct an assessment of renewable energy potential and develop a strategy for TANESCO by 2026;
- Conduct at least two techno-commercial feasibility studies to assess the potential for renewable energy projects each year by 2027;
- Deploy at least 5% of installed generation capacity from renewable energy by 2026, at least 10% by 2029, and at least 15% by 2034, and
- At least two grid-level battery storage projects implemented by 2029.

vi) EWURA Five-Year Strategic Plan 2021/22 – 2025/26

EWURA's five-year strategic plan aims to enhance efforts to protect the environment by promoting alternative energy sources, such as solar and wind. Within the strategic plan's goals, EWURA plans to enhance regulated services' quality, availability, and affordability through innovative regulatory practices. Specifically, the plan aims to facilitate the development of a renewable energy supply.

The space for renewable energy development in the strategic plan is limited to solar and wind technologies only.

2.2.2 Legal and regulatory frameworks

Public Procurement Act Cap. 410 of 2019
The Public Procurement Act generally applies to all procurement and disposal tendering undertaken by public bodies and any other bodies mandated by the Government to undertake public functions, non-government entities for procurement of projects financed by public funds, and public-private partnership projects. The Act requires all procuring entities engaged in procuring goods, works or services to apply competitive tendering. The current act does not allow price adjustment and bidders to compete to lower the price after opening a bid. This restriction discourages innovation and does not protect the off-taker in renewable energy procurement.

Electricity Act, Cap. 131 R.E. 2008: The Act establishes the general framework for governance of the electricity sub-sector. It defines the powers of the Minister responsible for electricity matters and mandates for EWURA concerning tariff-setting, mandates for awarding provisional and permanent licenses, monitoring and enforcement activities, requirements for ministerial plans and strategies for rural electrification, dispute resolution procedures, and a process for determining the possible future reorganisation of the electricity subsector. This Act facilitates and regulates the generation, transmission, transformation, distribution, supply, and use of electric energy and cross-border trade in electricity and rural electrification planning and regulation.

Rural Energy Act No. 8 of 2005 establishes the

Rural Energy Board, Rural Energy Fund (REF) and REA. It is responsible for promoting and improving access to modern energy services in rural areas of mainland Tanzania. REA's main objective is to implement the strategies and decisions of the Board, facilitate the provision of technical assistance, and enhance the capacity of project developers. The Fund, on the other hand, provides grants to qualified projects and developers.

Electricity (Net-Metering) Rules, 2018: These Rules provide the legal framework in net metering that enables customers of the Distribution Network Operator (DNO) to install small generation plants utilizing renewable energy sources at their premises and interconnect with the DNO's system. The framework also provides connectivity procedures for a net metering facility, metering requirements, the billing process for the net metering, interconnection of net metering facilities, and a standard interconnection agreement for net metering generating facilities. Despite the approval of the rules in 2018, the net metering program has failed to be operational.

The failure to operationalise the net metering program has valuable lessons. One key issue lies in the requirement for TANESCO, as the DNO, to be responsible for installing, owning, and maintaining the bi-directional meter at its own expense. Furthermore, uncertainties surrounding grid stability and the financial implications for TANESCO upon full implementation of the net metering program have surfaced. Hence, it is imperative to pilot this program, allowing TANESCO to conduct comprehensive assessments of grid stability and cost-benefit analyses before progressing to a full-scale implementation.

Electricity (Procurement of Power Projects and Approval of Power Purchase Agreement) Rules of 2019: The rules provide the process and requirements for solicited and unsolicited procurement of power projects and the approval process for power purchase agreements.

Electricity (Development of Small Power Project) Rules of 2020: The rules regulate the development and procurement of small and very small power projects. Small Power Projects (SPPs) are defined as those with a generating capacity from 100kW to 10 MW from renewable energy or hybrid systems combining renewable and other fuel sources. The very small power projects range between 15 kW and 100 kW generation capacities.

Furthermore, the Rules guide investments for mini-grids and allow DNO to publish strategic areas annually. Despite identifying the strategic areas for grid expansion, the DNO has not reached all identified areas. This limits the scaling up of renewable energy and private sector participation.

2.2.3 Other supporting policies, strategies, plans and legal frameworks

National Climate Change Strategy (NCCRS), 2021: NCCRS aims to enhance the national resilience to the adverse impacts of climate change and enable the country to pursue low-emission climate-resilient development pathways to achieve sustainable development, including through gender-responsive climate change mitigation and adaptation. The strategy promotes sustainable development through low-intensive carbon technologies, including renewable energy technologies and energy efficiency.

Nationally Determined Contribution (NDC), 2021: The NDC framework provides a set of interventions for adaptation and mitigation to build the country's resilience to` the impacts of climate change and contribute to the global effort of reducing greenhouse gas emissions. There is an emphasis on deploying clean technologies, including renewable energy technologies, to reduce greenhouse emissions and climate change's impact. By 2030, the NDC aims to reduce greenhouse emissions by 30% to 35% by applying clean technologies, including renewable energy technologies such as geothermal, wind, hydro, solar, and bio-energy.

The Sustainable Development Goals (SDGs): The United Nations adopted the Sustainable Development Goals (SDGs) in 2015. One of the goals is universal access to affordable, reliable, and modern energy services by 2030 and doubling in the renewable energy share in the global energy mix. Tanzania has mainstreamed the SDGs into its national policy frameworks and national plans.

The Sustainable Energy for All (SE4ALL) Initiative: The initiative promotes universal access to modern energy services, thereby doubling the global rate of improvement in energy efficiency and doubling the share of renewable energy in the energy generation mix by 2030.

The National Irrigation Policy, 2010: The main objective of the policy is to ensure the sustainable availability of irrigation water and its efficient use for enhanced crop production, productivity and profitability that will contribute to food security and poverty reduction. The policy recognizes the potential of renewable energy integration in irrigation and promotes energy-efficient practices.

National Women and Gender Development Policy, 2000: The Policy aims to promote gender equality by emphasizing the integration of gender equality in policies, plans, development strategies, and actions in all sectors and levels of the development process. Energy poverty and climate change affect both men and women differently due to the existing gender inequalities carved in norms, cultures, and traditions. Given the predominance of women's engagement in socio-economic activities, particularly in rural areas, it is therefore important to mainstream gender-responsive energy strategies and actions in deploying renewable energy projects.

National Irrigation Act No. 4 of 2013: The Act was enacted to implement the National Irrigation Policy of 2010. It establishes the National Irrigation Commission, which is responsible for coordination, promotional, and regulatory functions in the development of the irrigation sector. The Act mandates the Commission with powers to invest in irrigation development in any manner as it may deem fit. Furthermore, the Commission is mandated to establish regional irrigation offices headed by regional irrigation engineers who, amongst others, promote renewable energy for irrigation and drainage purposes. The act highlights that one of the functions of irrigation engineers is to promote renewable energy.

The Fisheries Regulations Amendments, 2020: These regulations aim to regulate the use of solar energy in fishing, promoting ecological balance and sustainability, particularly in lakes Tanganyika and Victoria. In Lake Tanganyika, solar light lanterns are allowed, with each bulb not exceeding 10 watts and a maximum of five lanterns per boat for each fishing gear unit. The same wattage limit applies for Lake Victoria, but the number of lanterns per boat for each fishing gear unit increased to nine. The regulations don't mention using solar light lanterns in other lakes or oceanic environments.

Village Land Act Cap. 114 R.E. 2019: Given that most renewable energy sources require large amounts of land, these land laws become important in acquiring land, transferring land, compensation, resettling and creating public rights of way.

The Village Land Act is the principal law governing the holding and tenure disposition of all the land declared to be village land. The village council acts as the trustee of the land, managing it on behalf of the villagers and persons who are the beneficiaries of the land. The Village Land Act restricts ownership of land by foreigners or foreign entities. The allocation of the village land by the person or local entity is done through a customary right of occupancy (CRO). It is granted after consultation and approval of the village assembly.

2.2.4 Institutional structure and responsibilities

Ministry of Energy: The Ministry of Energy provides overall sectoral oversight by developing and articulating policies, plans, strategies, and programs to foster the development of the energy sector. Renewable energy initiatives are coordinated under the Electricity and Renewable Energy Department led by the Commissioner.

The key institutions governed by the Ministry of Energy are TANESCO, EWURA, REA, Tanzania Petroleum Development Corporation (TPDC), Petroleum Upstream Regulatory Authority (PURA) and Petroleum Bulk Procurement Agency (PBPA).

Developing renewable energy technology applications is among the key roles of TANESCO, REA, EWURA, and the Ministry governing the energy sector. Despite the excellent structure of the sector governance and responsibilities, there is still a need to enhance coordination to avoid duplication of efforts.

TANESCO: TANESCO is a Parastatal organization established and responsible for generating, purchasing, transmitting, distributing, and selling electricity to customers in Tanzania Mainland and bulk power to the Zanzibar Electricity Corporation (ZECO). TANESCO owns most of Tanzania's mainland's electricity generation, distribution, and transmission facilities.

Among others, TANESCO is responsible for developing renewable energy projects in the power generation mix. Despite the large potential of renewable energy resources, the utility's capacity to deploy large-scale renewable energy investments from solar, wind and geothermal resources is inadequate.

Rural Energy Agency: REA was established by the Act of Parliament No.8 of 2005 to promote and facilitate investment and access to modern energy services in rural areas of Mainland Tanzania. REA is governed by the Rural Energy Board (REB), entrusted to oversee the administration of the Rural Energy Fund (REF). The development of renewable energy technologies for rural electrification is among the key responsibilities of REA.

EWURA: EWURA is an autonomous multi-sectoral regulatory authority established by the EWURA Act Cap 414 of the laws of Tanzania. It is responsible for technical and economic regulation of Tanzania's electricity, petroleum, natural gas and water sectors.

The functions of EWURA include licensing, tariff review, and monitoring performance and standards concerning quality, safety, health, and the environment. EWURA is also responsible for promoting effective competition and economic efficiency, protecting the interests of consumers and promoting the availability of regulated services to all consumers, including low-income, rural and disadvantaged consumers in the regulated sectors.

Since coming into operation in 2006, EWURA has made significant contributions to Tanzania's socioeconomic transformation. It has registered successes in promoting small power projects by developing the Small Power Projects Framework for promoting the development of small renewable energy projects. EWURA also developed model PPAs for wind energy, solar energy, geothermal and hydropower to accelerate the development of large renewable energy projects.

Key institutional issues for scaling up the renewable energy sub-sector

The main takeaway from institutional arrangements and responsibilities is that renewable energy initiatives lack effective coordination. This leads to duplicated efforts and hampers the scaling up of renewable energy projects. Additionally, key energy institutions lack sufficient processed information and data to assist in planning and implementing projects.

2.3 Procurement Strategies and Financing

2.3.1 Procurement Strategies

Efficient planning, procurement, and negotiations of energy projects, as well as adequate investment programs, are vital in ensuring the availability of adequate, dependable, affordable, sustainable, and environmentally friendly energy supply. The procurement process for energy projects involves solicited and unsolicited models.

Solicited procurement, while competitive and open to all, may face challenges in ensuring fair risk allocation and securing payment guarantees for investors due to its standardized and rigid frameworks. In contrast, unsolicited models, where developers approach off-takers directly, offer flexibility for innovative solutions but may lack transparency and competitive pricing, posing potential risks to the off-taker. One potential solution is the reverse auction model.

The existing challenges in procuring renewable energy power projects include delays caused by lengthy negotiations and issues related to risk allocation between the off-taker and renewable energy project developers. Furthermore, the Public Procurement Act (2023) does not have enough space for competition among developers of renewable energy projects after the price readout.

2.3.2 Financing

Renewable energy projects require significant funding. Most investors in the renewable energy space secure funding from international and local markets for large and small projects, respectively. For large projects, financing depends on the international market due to the limited ability of local financial institutions to structure large transactions to finance large-scale renewable energy projects.

While attracting funding for larger projects has not posed a significant challenge, securing financing for smaller projects has proven to be more difficult. Despite REA's initiatives to establish a credit line financing facility for Small Power Projects (SPPs) through the Tanzania Investment Bank, accessing this facility remains challenging due to limited resources and scope.

For small projects, most developers do not have sufficient equity or collateral to match loans offered by local financial institutions. In addition, there is inadequate understanding in the local banking sector on how to structure loans for renewable energy projects, which can lead to high transaction costs in securing and servicing the loans despite the availability of funds through REA. Furthermore, it is difficult for both investors and financiers to have a long-term, predictable environment in the sector, particularly regarding tariffs, which affect overall risks and payback periods. These challenges contribute to the unfavourable business financing environment for renewable energy projects.

2.4 Socio-Economic Benefits of Renewable Energy Program in Tanzania

The deployment and scale-up of renewable energy projects can create many socio-economic benefits in Tanzania. This can include, for example, domestic firms and labour involvement along the renewable energy value chain, skills development, and technology and technical knowledge transfer. However, the full realization of these benefits is currently limited by various factors, including:

- Limited involvement of domestic firms and labour along the renewable energy value chain
- Inadequate local skills in renewable energy technologies.
- Inadequate participation of communities in the implementation processes of re-

newable energy projects
- Inadequate capacity of local financial institutions to assess renewable energy project risks, preparation, and designing appropriate funding packages for renewable energy projects.
- Limited localization of the manufacturing of renewable energy equipment in Tanzania

Therefore, for Tanzania to fully benefit, it is crucial to invest in developing and growing local skills, including women and marginalized groups, promote community involvement across the project value chain and in the full life cycle, build capacity for local financial institutions, and incentivise local manufacturing. These will enable sustainability, resilience, and inclusivity in the energy sector.

2.5 Cross-Cutting Issues

2.5.1 Environment and Climate Change

Renewable energy is essential for addressing climate change by reducing greenhouse gas emissions. The transition to renewable energy cuts emissions and fosters a low-carbon economy by replacing fossil fuels, enhancing energy efficiency, using clean cooking technologies, and creating green jobs.

Mainstreaming environmental and climate concerns in Tanzania's renewable energy strategy is critical for sustainable development. This entails prioritizing eco-friendly renewable energy sources, integrating climate resilience measures into projects, promoting energy efficiency, and participating in carbon offset initiatives. Tanzania can effectively mitigate greenhouse gas emissions while fostering sustainable development by aligning renewable energy initiatives with environmental and climate objectives.

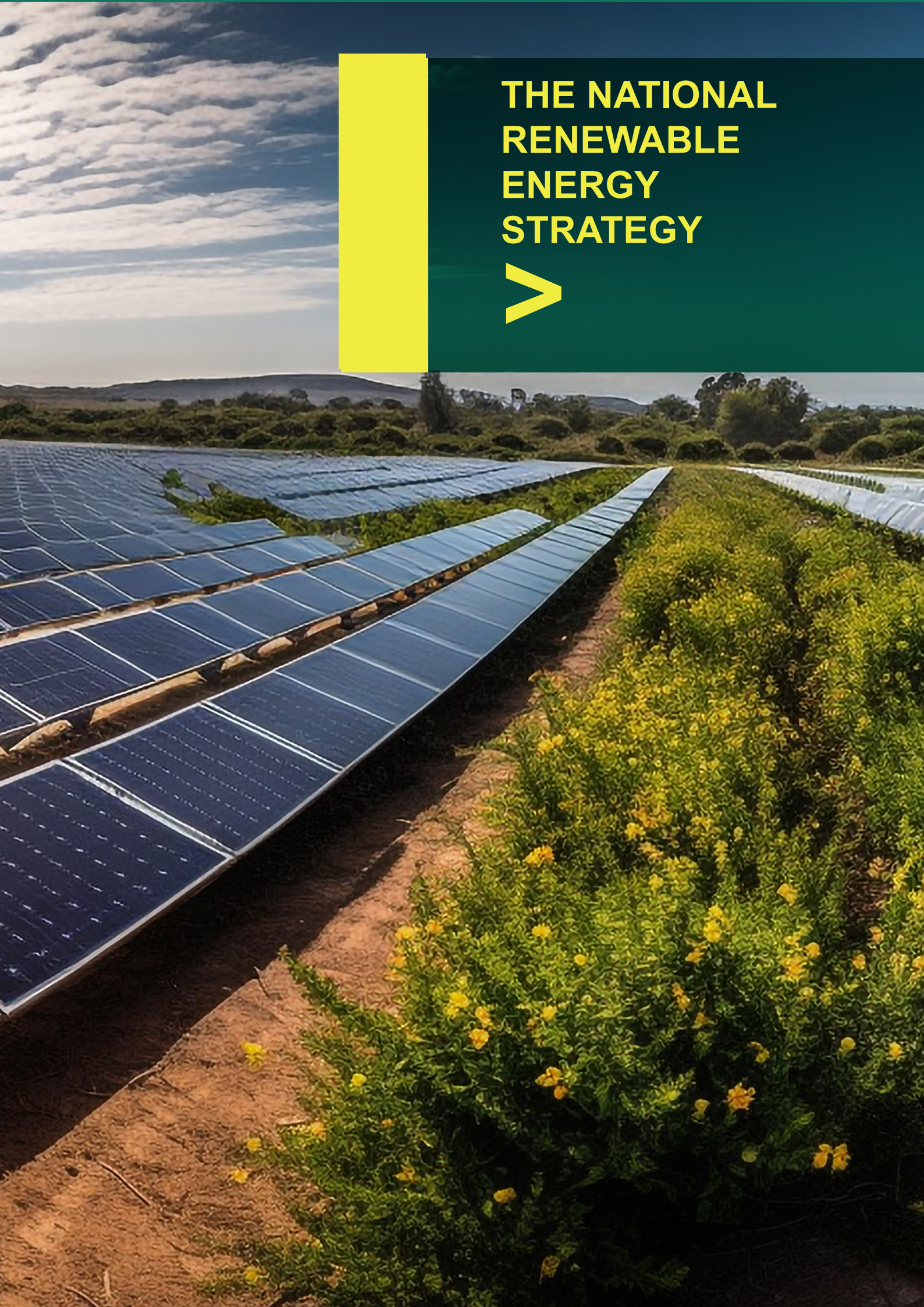
2.5.2 Gender Equality

Promoting gender equality and women's empowerment in the renewable energy strategy is crucial for sustainable development and inclusive growth. Investing in women's education and training unlocks their leadership potential and enhances innovation. Addressing gender disparities in access to renewable energy technologies ensures equitable energy provision, particularly benefiting marginalized communities like women and girls. It is vital for supporting women's active participation and leadership roles. Raising awareness about gender equality in renewable energy strategy is essential for creating a more equitable and sustainable future where women's voices and contributions are fully valued in shaping the renewable energy landscape.

2.5.3 HIV & AIDS

Mainstreaming HIV & AIDS in the renewable energy strategy is crucial for inclusive development. This will be achieved through awareness campaigns while implementing renewable energy projects, providing HIV/AIDS-related services at project sites, and ensuring inclusive employment policies to support individuals affected by HIV/AIDS, thus fostering holistic community health and sustainable energy development

THE NATIONAL RENEWABLE ENERGY STRATEGY



03 THE NATIONAL RENEWABLE ENERGY STRATEGY

3.1 Overview

Vision

Tanzania harnesses abundant renewable energy resources to create a resilient, inclusive, diversified and sustainable energy system.

Mission

To enhance the utilisation of renewable energy resources and contribute to the national energy mix that aligns with national plans.

Principles Governing the Strategy

Table 2: Principles governing the renewable energy strategy

Enabling Frameworks	Thrust in addressing critical legal, regulatory, and institutional barriers/gaps.
Local resources	Leverages the country's abundant labour force, entrepreneur spirt renewable energy resources, including solar, wind, hydro, geothermal, tidal & waves and biomass, to contribute to the national energy mix and utilisation in the various sectors.
Alignment with sectoral plans	Focusing on national and energy sector development priorities. Promotion of coherency and alignment with national plans.
Coordination	Promotion of cross-sectoral planning.
Adaptiveness	Periodic updating of the Strategy- (Roadmap) is based on monitoring and reviews and is in response to the changing environment.
Best practices and scaling	Building on lessons learnt, best practices and scaling what has proven to work.
Innovation	Leveraging new technological developments, innovations and research.
Participatory and empowerment	Relevant stakeholders including women and marginalized groups are informed, consulted, empowered and involved throughout the implementation.

3.2 Renewable Energy Utilization

Issue: Minimal contribution of renewable energy in the power generation mix

Strategic objective 1: Increased renewable energy contribution in the power generation mix.

Rationale: Increasing the renewable energy share in the power generation mix is crucial for addressing current challenges and leveraging future opportunities. The current contribution of renewable energy in the power generation mix is minimal. The intermittency nature of solar and wind resources necessitates the parallel deployment of non-variable renewable energy projects, such as hydropower and geothermal, to ensure grid stability. Furthermore, the inadequate contribution of small renewable energy projects to the generation mix highlights a significant area for growth and development. Addressing these issues by enhancing the role of renewables not only supports a more sustainable, and stable energy future but also leverages the full spectrum of renewable resources available, from large-scale hydro and geothermal projects to smaller, community-based initiatives.

Strategy 1.1: Increase the share of large non-hydropower renewable energy in the generation mix.

Target 1.1.1 Solar energy contributes at least 804 MW in the power generation mix by June 2034

Target 1.1.2 Wind energy contributes at least 750 MW in the power generation mix by June 2034

Target 1.1.3 Geothermal contributes at least 215 MW in the power generation mix by June 2034

Strategy 1.2: Increase the share of large hydropower in the generation mix to support variable renewable energy integration.

Target 1.2.1 Large hydropower contributes at least 3,281.4 MW in the power generation mix by June 2034 to support the integration of variable renewable energy.

Strategy 1.3: Increase the share of renewable energy from Small Power Projects (SPPs) of capacity below or equal to 10 MW in the energy mix.

Target 1.3.1 Mini/ Small hydropower contributes at least 200 MW in the power generation mix by June 2034

Target 1.3.2 Solar energy from SPPs contributes at least 119.8 MW in the power generation mix by June 2034

Target 1.3.3 Waste to energy biomass from SPPs contributes at least 85.042 MW in the power generation mix by June 2034

Issue: Limited application and uptake of renewable energy technologies in various key sectors

Strategic Objective 2: Enhanced uptake of renewable energy application technologies in various sectors.

Rationale: The need to boost renewable energy use is highlighted by its limited application in sectors like cooking, water supply, agriculture, fisheries, health, education, and in tourism for lighting and heating. This shortfall and inadequate guidelines and appetite for adopting innovative technologies like biomass underscore a missed opportunity for sustainability and efficiency. Additionally, leveraging e-mobility and e-cooking presents a viable strategy for economic development and reducing greenhouse gas emissions.

Strategy 2.1: Promote the adoption of renewable energy technologies for clean cooking and other thermal applications.

Target 2.1.1: Application of biogas, biofuels, and solar thermal technologies for cooking, drying, and heating promoted and supported by June 2027.

Target 2.1.2: 30% of grid-connected population aware of e-Cooking feasibility by June 2027

Target 2.1.3: 30% of off-grid renewable energy systems (mini-grids and standalone systems) planned to include eCooking by June 2027

Target 2.2.2: A regulatory framework for e-mobility which includes the application of renewable energy developed by June 2027

Strategy 2.3: Promote the adoption of renewable energy technologies for domestic water supply and agricultural activities

Target 2.3.1 Application of solar and wind powered-irrigation technologies promoted by June 2027

Target 2.3.2 Application of solar, wind, and geothermal technologies for drying agricultural produce promoted by June 2027

Target 2.3.3 Application of solar-powered cold storage facilities for agricultural produce promoted by June 2030

Target 2.3.4 Application of solar pumps and windmills for domestic water supply promoted by June 2027

Strategy 2.4: Promote the adoption of renewable energy technologies in the fishery sector

Target 2.4.1 Application of solar and wind energy technologies in the fishing sector for lighting, drying, and refrigeration promoted and supported by June 2027

Strategy 2.5: Promote the adoption of renewable energy technologies in the tourism sector

Target 2.5.1 Application of solar technologies in the tourism sector for lighting and heating promoted by June 2027

Strategy 2.6: Support and promote the sustainable application of biomass and other emerging renewable energy technologies

Target 2.6.1 Biomass Energy Strategy (BEST) that includes renewable energy technologies developed by June 2027 and implemented

Target 2.6.2 Assessment on the potential of ocean tidal for power generation conducted by June 2027

Target 2.6.3 Assessment of the potential of green hydrogen technologies conducted by June 2030.

3.3 Data, Information and Monitoring Systems

Issue: Inadequate renewable energy data, information, and monitoring systems

Strategic Objective 3: Enhanced renewable energy data, information, and monitoring systems

Rationale: The efficiency and effectiveness of planning and executing renewable energy projects in the country are hindered by the inadequate availability of reliable and accessible data and information. This shortfall is particularly acute in guiding investments in geothermal, ocean tidal, and wind energy sectors. Furthermore, the monitoring of renewable energy initiatives and projects needs to be improved. Otherwise, there is a significant challenge in assessing project progress and impact. This gap in data compromises the ability to make informed decisions and strategize effectively for the development and expansion of renewable energy projects.

Strategy 3.1: Develop a renewable energy database and monitoring systems.

Target 3.1.1: A web-based renewable energy access information system for preliminary resource potential, utilization, and project development established by June 2027

Target 3.1.2: A baseline study for renewable energy resource potential and utilisation undertaken by June 2027

Target 3.1.3: A monitoring, evaluation and learning tool for renewable energy developed and operationalized by June 2027 and updated.

Target 3.1.4: At least 15 feasibility studies for potential renewable energy development sites conducted by June 2027 with ongoing periodic studies.

3.4 Policy, Regulatory and Institutional Framework

Issue: Inadequate Policy frameworks supporting renewable energy value chain development for electricity generation and other applications.

Strategic objective 4: Strengthened policy frameworks for supporting renewable energy value chain development.

Rationale: Strengthening policy frameworks for renewable energy development addresses the current inadequacies in supporting the renewable energy value chain, including incentives. The National Energy Policy 2015 needs to be reviewed to broaden its focus beyond electricity generation, emphasising the application of renewable energy technologies across various sectors and considering emerging renewable energy resources, including hydrogen energy. There are no clear guidelines to facilitate the sustainable production of biofuels and the conversion of waste to energy from biomass sources. Additionally, establishing a dedicated renewable energy policy and planning is crucial to guide and expedite the development of renewable energy initiatives. This will provide sufficient impetus for a diverse energy mix in line with SDGs, NDCs, African Agenda 2063, and SE4ALL and leverage global advancements to bolster national clean energy and climate objectives. Furthermore, it will ensure coherence with wider regional and international efforts for climate mitigation.

Strategy 4.1: Enhance policy frameworks to support renewable energy development

Target 4.1.1: National Energy Policy 2015 reviewed by June 2027 to include application of renewable energy technologies in other sectors and emerging renewable energy technologies.

Target 4.1.2: Renewable energy policy developed by June 2030 to facilitate renewable energy deployment and applications.

Target 4.1.3: Framework for sustainable production of biofuels and conversion of waste to energy from biomass sources developed by June 2027

Issue: Inadequate legal and regulatory frameworks for attracting and supporting investments in renewable energy

Strategic objective 5: Strengthened legal and regulatory frameworks for attracting and supporting investments in renewable energy.

Rationale: Enhancing the current legal and regulatory frameworks is imperative for attracting and supporting renewable energy investments. This requires a comprehensive review of the Renewable Energy Net Metering Rules and the Small Power Projects (SPP) framework to establish cost-reflective tariffs and consider annual inflation. Moreover, there is a need to develop a legal and regulatory framework for geothermal and clean hydrogen technologies, which are pivotal in diversifying the energy mix, reducing carbon emissions, and ensuring sustainable, long-term energy security. Equally important, there is a need to publish strategic areas for SPP investments.

Strategy 5.1: Strengthen distribution generation framework to attract and support investments in renewable energy.

Target 5.1.1: Renewable energy net metering rules 2018 reviewed and operationalized by June 2027.

Target 5.1.2: The SPP framework reviewed by June 2027

Target 5.1.3: The SPP rules reviewed by June 2027 to require TANESCO to submit strategic areas for SPP investments for EWURA to publish annually.

Strategy 5.2: Develop legal and regulatory frameworks for geothermal and green hydrogen technologies.

Target 5.2.1: Geothermal law and regulations guidelines developed d by June 2030

Target 5.2.2: A green hydrogen law, regulations and guidelines established and operationalized by June 2030.

Issue: Inadequate institutional coordination and governance in renewable energy development

Strategic objective 6: Strengthened institutional coordination and governance on renewable energy.

Rationale: Addressing inadequate coordination of initiatives, which results in duplication of efforts, is crucial to streamlining efforts and maximising efficiency in renewable energy development. Strengthening the Renewable Energy Section at the Ministry of Energy into a one-stop centre is essential for consolidating initiatives, reducing duplication, and fostering a coordinated approach to renewable energy development. Moreover, there's a need for a collaborative mechanism among renewable energy sub-sectoral institutions to support the development of energy plans, ensuring water security for the baseload, procurement, and implementation, underscored by effective follow-up and strict adherence to regulatory frameworks.

Strategy 6.1: Strengthen renewable energy institutional coordination and governance.

Target 6.1.1: The Renewable Energy Section at the Ministry of Energy strengthened to be a one-stop centre for renewable energy development by June 2027.

Target 6.1.2: A multi-stakeholder working group to facilitate the development of renewable energy plans, procurement plans, and implementation established by June 2027 and operationalized

3.5 Local Socio-Economic Benefits of Renewable Energy Development

Issue: Inadequate socio-economic benefits in the renewable energy value chain

Strategic objective 7: Increased socio-economic benefits in the renewable energy value chain.

Rationale: Despite its abundant renewable resources, the country has yet to reap substantial socio-economic benefits from the renewable energy value chain due to inadequate awareness, practical skills and community participation. Moreover, there is an issue of limited localisation of renewable energy equipment manufacturing and inadequate capacity within vocational, research, and innovation centres for effective renewable energy knowledge and skills transfer.

Strategy 7.1: Enhance participation of local firms and communities in the renewable energy value chain

Target 7.1.1: At least ten promotional events conducted by June 2034 to promote domestic firms' participation in the renewable energy value chain

Target 7.1.2: At least 10 promotional events conducted by June 2034 to promote the participation of women, youth, and communities in the renewable energy value chain

Target 7.1.3: At least 70 LGAs have dedicated budgets for installing renewable energy technologies in public facilities by June 2034

Strategy 7.2: Enhance local manufacturing of renewable energy equipment

Target 7.2.1: At least 20 local companies facilitated to manufacture or assemble renewable energy equipment by June 2034.

Target 7.2.2: Fiscal and/or policy instruments to stimulate local manufacturing for renewable energy equipment developed by June 2030.

3.6 Renewable Energy Projects Procurement and Financing

Issue: Inadequate renewable energy procurement and financing mechanisms and the Publicl Procurement Act provide limited space for competition.

Strategic Objective 8: Enhanced renewable energy procurement and financing mechanisms.

Rationale: Tanzania faces challenges in integrating renewable energy into the national grid, primarily due to delays caused by lengthy negotiations and issues related to risk allocation between the off-taker and renewable energy project developers. Furthermore, the Public Procurement Act provides limited space for competition among developers of renewable

energy projects after price readout. Additionally, the capacity of local financial institutions to assess and structure renewable energy project financing is limited, and their involvement in funding both small and large-scale renewable energy projects is inadequate. These challenges contribute to the unfavourable business environment for renewable energy development.

Strategy 8.1: Enhance renewable energy procurement mechanisms.

Target 8.1.1: Reversed procurement included in the Public Procurement Act and operationalized by June 2030.

Target 8.1.2 A renewable energy independent power producer procurement programme (**REI4P**) established by June 2027.

Strategy 8.2: Renewable energy financing mechanisms enhanced by 2030.

Target 8.2.1: Capacity of local financial institutions to assess and structure renewable energy projects financing enhanced by June 2027.

Target 8.2.2: Renewable energy project financing guarantee mechanisms adopted and operationalized by June 2027

Target 8.2.3: At least 10 renewable energy project developers accessed project financing guarantee by June 2034.

3.7 Cross-Cutting Issues

Issue: Inadequate efforts to promote environmental sustainability, gender equality, and combat HIV/AIDS.

Strategic objective 9: Enhanced environmental sustainability, gender equality, and efforts to combat HIV/AIDS.

Rationale: The Renewable Energy Strategy emphasizes environmental sustainability, gender equality, and improved health services as key pillars for Tanzania's development. The strategy underscores the Government's commitment to transitioning towards a more sustainable and diversified energy portfolio while fostering socio-economic development, promoting gender inclusivity, protecting the environment, and contributing to global efforts against climate change.
Through this strategy, the country aims to set a precedent for how renewable energy projects can be leveraged as catalysts for broader societal benefits, ensuring that the move towards green energy also advances national goals in poverty reduction and improved health to its people.

Strategy 9.1: Promote environmental sustainability and climate change mitigation

Target 9.1.1 At least three clean new energy resource technologies contribute in the power generation mix by June 2030

Target 9.1.2: At least three carbon offset initiatives to promote deployment of renewable energy technologies enhanced by June 2027

Target 9.1.3: National energy efficiency awareness campaign to reduce energy consumption in households, big buildings and industries launched by June 2027.

Strategy 9.2: Promote gender equality and women empowerment.

Target 9.2.1: At least 100 youth and women trained in appropriate renewable energy technology/ business opportunities annually to increase their participation in the energy sector by June 2027.

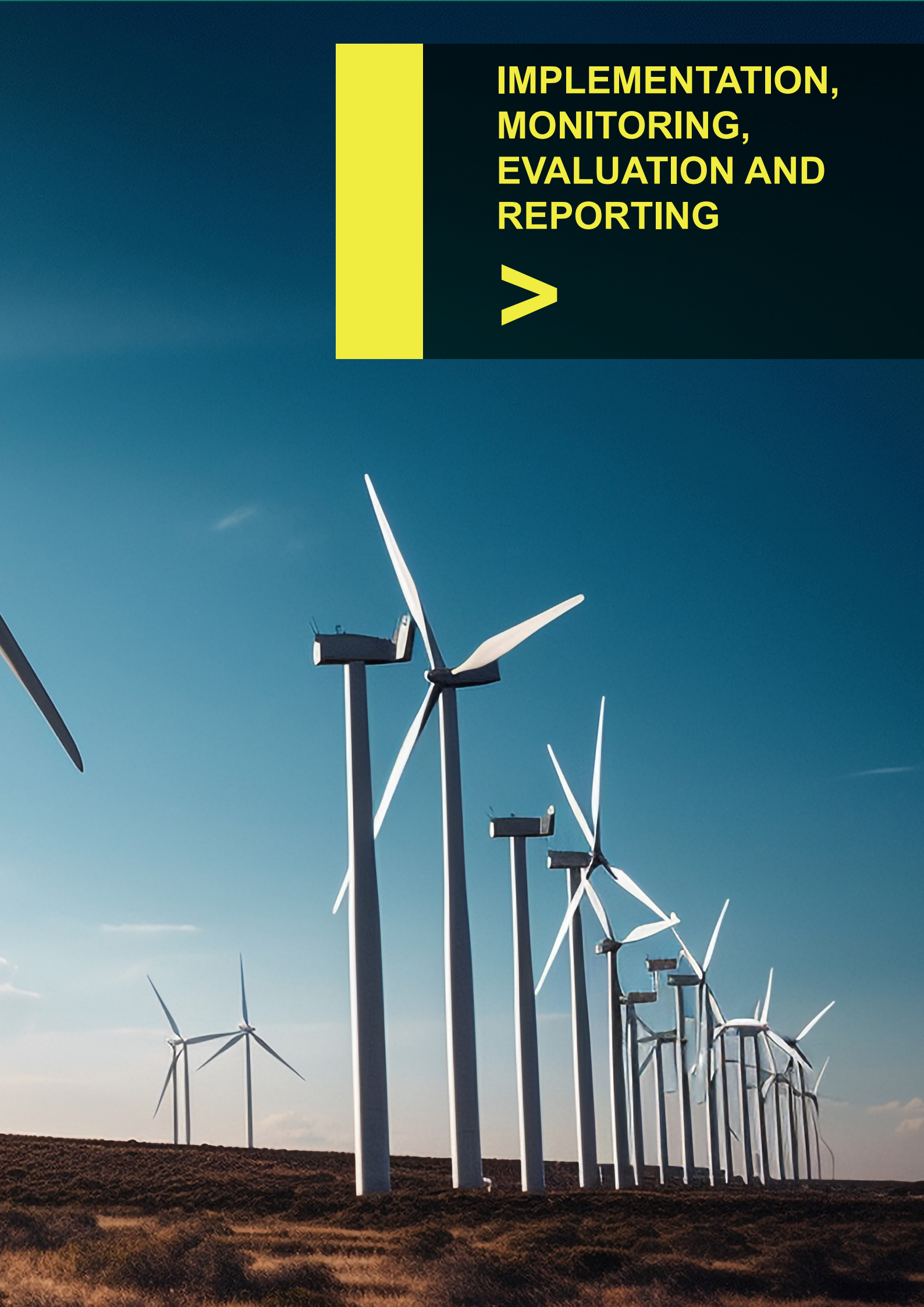
Target 9.2.2: At least two renewable energy technologies tested and disseminated to provide clean cooking solution by June 2030

Target 9.2.3: At least 70% of employed personnels in renewable energy projects represents youth and women by June 2030.

Strategy 9.3: Support to combat HIV/ AIDS and discrimination

Target 9.3.1: HIV/AIDS education and support services integrated in all renewable energy project sites by June 2027.

IMPLEMENTATION, MONITORING, EVALUATION AND REPORTING



04 IMPLEMENTATION, MONITORING, EVALUATION AND REPORTING

4.1 Implementation Arrangement

The Ministry of Energy's Department of Electricity and Renewable Energy will coordinate the implementation of the Renewable Energy Strategy, including coordination with all relevant sectors. The strategy envisages a dedicated section within the department supporting the coordination of renewable energy development.

On the implementation, the Ministry will involve and partner with various Government Ministries, Departments, and Agencies (MDAs), the private sector, Non-Governmental Organizations (NGOs), community institutions and development partners depending on the relevance of their mandates and capacity to support various strategic objectives and constituent targets. The envisaged lead and implementing institutions are outlined in the Renewable Energy Implementation Roadmap, a separrate document.

The Renewable Energy Section will be responsible for planning, coordinating, and facilitating the implementation of Renewable Energy Strategy. Specifically, it will maintain overall responsibility for the management and supervision of the Renewable Energy Strategy, including

i. preparation of the Annual Work Plans and Budgets for approval by the Ministry of Energy,
ii. execution of the approved work plan and budget,
iii. monitoring and reporting;
iv. knowledge management (preparation of reports and other knowledge products related to the RES implementation);
v. strategic resource mobilisation for the RES implementation;
vi. facilitating compliance with environmental, gender and other social safeguards andfacilitate the review and update of the implementation of the National Renewable Energy Implementation Roadmap.

4.2. Results Framework

The results framework matrix facilitates tracking and monitoring the implementation progress of the targets compared to the baseline scenario. Table 3 shows the strategy's results framework matrix.

Table 3: Results Framework Matrix for the Renewable Energy Strategy

Strategic Objective	Strategy	Indicator	Baseline	Target	Means of verification
1. Increased renewable energy contribution in the power generation mix.	**1.1:** Increase the share of large non-hydropower renewable energy in the energy mix	Number of Megawatts from solar energy	0	**1.1.1:** Solar energy contributes at least 804 MW in the power generation mix by June 2034	MOE reports TANESCO reports EWURA website and reports
		Number of Megawatts from wind energy	0	**1.1.2:** Wind energy contributes at least 750 MW in the power generation mix by June 2034	MOE reports TANESCO reports EWURA website and reports
		Number of operational battery storage sites	0	**1.1.3:** Geothermal contributes at least 215 MW in the power generation mix by June 2034	MOE reports TANESCO reports
	1.2: Increase the share of large hydropower in the generation mix to support variable renewable energy integration.	Number of Megawatts from large hydropower	823.00 MW (March, 2024)	**1.2.1:** Large hydropower contributes at least 3,281.4 MW in the power generation mix by June 2034 to support the integration of variable renewable energy	MOE reports TANESCO reports EWURA website and reports
	1.3: Increase the share of renewable energy from Small Power Projects (**SPPs**) of capacity below or equal to 10 MW in the energy mix.	Number of Megawatts from mini/ small hydropower SPPs	14.77 MW (March, 2024)	**1.3.1:** Mini/small hydropower contributes at least 200 MW in the power generation mix by June 2024.	MOE reports TANESCO reports EWURA website and reports
		Number of Megawatts from solar energy SPPs	5 MW (March, 2024)	**1.3.2:** Solar energy from SPPs contributes at least 119.8 MW in the power generation mix by June 2034.	MOE reports TANESCO reports EWURA website and reports
		Number of Megawatts from waste to energy SPPs	16.90 MW (March, 2024)	**1.3.3:** Waste to energy biomass from SPPs contributes at least 85.042 MW in the power generation mix by June 2034.	MOE reports TANESCO reports EWURA website and reports

Strategic Objective	Strategy	Indicator	Baseline	Target	Means of verification
2. Enhanced uptake of renewable energy application technologies in various sectors	**2.1:** Promote the adoption of renewable energy technologies for clean cooking and other thermal applications	Promotional events and IEC materials on application of biogas, biofuels, and solar thermal technologies for clean cooking and thermal uses	Low promotion of biogas, biofuels and solar for thermal applications	**2.1.1:** Application of biogas, biofuels, and solar thermal technologies for cooking, drying, and heating promoted and supported by June 2027	MoE reports REA reports
		Clean Cooking Strategy that includes renewable energy and e-cooking	Draft Clean Cooking Strategy	**2.1.2:** Clean Cooking Strategy which includes the application of renewable energy technologies and e-cooking developed by June 2027 and operationalized.	MoE reports
		% of grid-connected population aware of eCooking feasibility	TBD	**2.1.3** 30% of grid-connected population aware of eCooking feasibility by June 2027	MoE reports
		30% of off-grid renewable energy systems (mini-grids and standalone systems) planned to include eCooking	TBD	**2.1.4** 30% of off-grid renewable energy systems (mini-grids and standalone systems) planned to include eCooking by June 2027.	MoE reports
	2.2: Promote the adoption of renewable energy technologies in the transport sector	Guidelines for biofuels blending. Promotional and IEC materials.	No guidelines for biofuels blending. Low promotion and awareness	**2.2.1:** Application of solar and biofuels (bioethanol and biodiesel) for transportation promoted and supported by June 2030.	MoE reports
		e-mobility regulatory framework	No regulatory framework for e-mobility	**2.2.2:** A regulatory framework for e-mobility which includes the application of renewable energy developed by June 2027	MoE reports EWURA reports

Strategic Objective	Strategy	Indicator	Baseline	Target	Means of verification
	2.3: Promote the adoption of renewable energy technologies for domestic water supply and agricultural activities	Promotional events and **IEC** materials on application of renewable energy technologies for water supply, drying and heating agricultural produces.	Low promotion and awareness materials	**2.3.1:** Application of solar and wind powered-irrigation technologies promoted by June 2027	MoE reports EWURA reports
				2.3.2: Application of solar, wind, and geothermal technologies for drying agricultural produce promoted by June 2027	MoE reports EWURA reports
				2.3.3: Application of solar-powered cold storage facilities for agricultural produce promoted by June 2030	MoE reports EWURA reports
				2.3.4: Application of solar pumps and windmills for domestic water supply promoted by June 2027	MoE reports REA reports MoW Reports Basin Authority Reports
	2.4: Promote the adoption of renewable energy technologies in the fishery sector	Promotional events and **IEC** materials on application of renewable energy technologies in fishing activities	Low promotion and awareness materials	**2.4.1:** Application of solar and wind energy technologies in the fishing sector for lighting, drying, and refrigeration promoted and supported by June 2027	MoE reports EWURA reports
	2.5: Promote the adoption of renewable energy technologies in the tourism sector	Promotional events and IEC materials on application of renewable energy technologies in tourism industry.	Low promotion and awareness materials	**2.5.1:** Application of solar technologies in the tourism sector for lighting and heating promoted by June 2027	MoE reports REA reports Tourism Board reports

Strategic Objective	Strategy	Indicator	Baseline	Target	Means of verification
2. Enhanced uptake of renewable energy application technologies in various sectors	**2.6:** Support and promote the sustainable application of biomass and other emerging renewable energy technologies	Biomass Energy Strategy	Draft Biomass Energy Strategy	**2.6.1:** Biomass Energy Strategy (BEST) that includes renewable energy technologies developed by June 2027 and implemented	MoE reports REA reports
		Assessment Reports on Ocean Tidal	No assessment reports	**2.6.2**: Assessment on the potential of ocean tidal for power generation conducted by June 2027	MoE reports TANESCO reports
		Assessment Reports on green hydrogen	No assessment reports	**2.6.3:** Assessment of the potential of green hydrogen technologies conducted by June 2030.	MoE reports TANESCO reports
3. Enhanced renewable energy data, information, and monitoring systems	**3.1:** Develop a renewable energy database and monitoring systems.	A web-based renewable energy information management system	None	**3.1.1:** A web-based renewable energy information management system for preliminary resource potential, utilization, and project development established by June 2027	MoE reports
		Baseline study reports	None	**3.1.2:** A baseline study for renewable energy resource potential and utilisation undertaken by June 2027	MoE reports REA reports
		Centralized renewable energy database	None	**3.1.3:** A centralized renewable energy database for resource potential, utilisation, project development and progress created by June 2030 and updated periodically	MoE reports REA reports EWURA reports

Strategic Objective	Strategy	Indicator	Baseline	Target	Means of verification
		Monitoring, Evaluation and Learning tool	None	**3.1.4:** A monitoring, evaluation and learning tool for renewable energy developed and operationalized by June 2027 and updated.	MoE reports
		Number of renewable energy feasibility studies conducted from July 2024 to June 2034	None	**3.1.5:** At least 15 feasibility studies for potential renewable energy development sites conducted by June 2027 with ongoing periodic studies	MoE reports REA reports EWURA reports
4. Strengthened policy frameworks for supporting renewable energy value chain development.	**4.1:** Enhance policy frameworks to support renewable energy development	Revised National Energy Policy	National Energy Policy 2015	**4.1.1:** National Energy Policy 2015 reviewed by June 2027 to include application of renewable technologies in other sector and other emerging renewable energy technologies.	MoE reports
		Renewable Energy Policy	None	**4.1.2:** Renewable energy policy developed by June 2030 to facilitate renewable energy deployment and applications.	MoE reports
		Guidelines for sustainable production of biofuels and conversion of waste to energy	Guideline for Biofuel Development 2010	**4.1.3:** Guidelines for sustainable production of biofuels and conversion of waste to energy from biomass sources developed by June 2027	MoE reports

Strategic Objective	Strategy	Indicator	Baseline	Target	Means of verification
5. Strengthened legal and regulatory frameworks for attracting and supporting investments in renewable energy.	**5.1:** Strengthen SPP Distributed Generation Frameworks to attract investment in Renewable Energy	Revised Renewable Energy Net Metering Rules	Renewable Energy Net-Metering Rules 2018	**5.1.1:** Renewable energy net metering rules 2018 reviewed by June 2027 and operationalized	MoE reports EWURA reports
		Reviewed SPP framework Reviewed SPP tariffs	SPP framework 2020 2024 SPP tariffs	**5.1.2:** The SPP framework reviewed by June 2027.	MoE reports EWURA reports
		Reviewed SPP rules TANESCO submits strategic areas to EWURA annually	SPP rules 2020 None	**5.1.3:** The SPP rules reviewed by June 2027 to require TANESCO to submit strategic areas for SPP investments for EWURA to publish annually.	EWURA website and reports TANESCO reports
	5.2: Develop legal and regulatory frameworks for geothermal and green hydrogen technologies.	Geothermal law, regulations, and guidelines	None	**5.2.1:** A geothermal law and regulations developed by June 2030.	MoE reports Government reports
6. Strengthened institutional coordination and governance on renewable energy.	**6.1:** Strengthen renewable energy institutional coordination and governance.	Renewable energy section operates as a one-stop centre	Renewable energy section operating as non-one-stop centre	**6.1.1:** The Renewable Energy Section at the Ministry of Energy strengthened to be a one-stop centre for renewable energy development by June 2027.	MoE reports
		Operational renewable energy multi-stakeholders working group	None	**6.1.2**: A multi-stakeholders working group to facilitate the development of renewable energy plans, procurement plans, and implementation established by June 2027 and operationalized	MoE reports

Strategic Objective	Strategy	Indicator	Baseline	Target	Means of verification
7. Increased socio-economic benefits in the renewable energy value chain.	**7.1:** Enhance participation of local firms and communities in the renewable energy value chain	Number of promotional events targeting domestic firms conducted between July 2024 and June 2034	None	**7.1.1**: At least 10 promotional events conducted by June 2034 to promote domestic firms' participation in the renewable energy value chain	MoE reports REA reports
		Number of promotional events targeting women and youth conducted between July 2024 and June 2034	None	**7.1.2:** At least 10 promotional events conducted by June 2034 to promote participation of women, youth, and communities in the renewable energy value chain	MoE reports REA reports
		Number of LGAs with dedicated budgets for installing renewable energy technologies in public facilities between July 2024 and June 2034	None	**7.1.3**: At least 70 LGAs have dedicated budgets for installing renewable energy technologies in public facilities by June 2034	MoE reports REA reports
	7.2: Enhance local manufacturing of renewable energy equipment	Number of local companies facilitated between July 2024 and June 2034	None	**7.2.1:** At least 100 local companies facilitated to manufacture or assemble renewable energy equipment by June 2034	MoE reports Ministry of Industry and Trade reports TRA reports
		Fiscal and/or policy instruments that stimulate local renewable energy manufacturing	TBD	**7.2.2:** Fiscal and/or policy instruments to stimulate local manufacturing for renewable energy equipment developed by June 2030.	MoE reports MoF reports TRA reports

Strategic Objective	Strategy	Indicator	Baseline	Target	Means of verification
8. Strengthened renewable energy procurement and financing mechanisms.	**8.1:** Enhance renewable energy procurement mechanisms	Revised Public Procurement Act which supports reverse procurement	Public Procurement Act 2023	**8.1.1:** Reversed procurement included in the Public Procurement Act and operationalized by June 2030	MoE reports PPRA reports MoF reports
		Independent Power Produce Programme (REI4P)	None	**8.1.2:** A renewable energy independent power producer procurement programme (REI4P) established by June 2027	MoE reports TANESCO reports EWURA reports
	8.2: Enhance renewable energy financing mechanisms	Number of local financial institutions with dedicated desks for renewable energy financing established between July 2024 and June 2034	None	**8.2.1:** Capacity of local financial institutions to assess and structure renewable energy projects financing enhanced by June 2027.	MoE reports REA reports Financial institutions reports
		Renewable energy projecting financing guarantee mechanisms	None	**8.2.2:** Renewable energy projecting financing guarantee mechanisms adopted and operationalized by June 2027.	MoE reports REA reports TANESCO reports
		Number of renewable energy project guarantee issued between July 2024 and June 2034	None	**8.2.3:** At least 10 renewable energy project developers accessed project financing guarantee by June 2034	MoE reports Government reports
9: Enhanced environmental sustainability, gender equality, and efforts to combat HIV/ AIDS.	**9.1:** Promote environmental sustainability and climate change mitigation	Number of new clean energy resource technologies contributing in the power generation mix between July 2024 and June 2034	0	**9.1.1:** At least three new clean energy resource technologies contribute to the power generation mix by June 2030	MOE reports TANESCO reports
		Number of carbon offset initiatives to promote deployment of renewable energy technologies introduced/improved between July 2024 and June 2034	0	**9.1.2:** At least three carbon offset initiatives to promote deployment of renewable energy technologies enhanced by June 2027	MOE reports TANESCO reports

Strategic Objective	Strategy	Indicator	Baseline	Target	Means of verification
		National energy efficiency awareness campaign launched	0	**9.1.3:** National energy efficiency awareness campaign to reduce energy consumption in households, big buildings and industries launched by June 2027.	
	9.2: Promote gender equality and women empowerment	Number of youth and women trained in appropriate renewable energy technology/ business opportunities annually	0	**9.2.1:** At least 100 youth and women trained in appropriate renewable energy technology/ business opportunities annually to increase their participation in the energy sector by June 2027.	
		Number renewable energy technologies tested and disseminated to provide clean cooking solution	0	**9.2.2:** At least two renewable energy technologies tested and disseminated to provide clean cooking solution by June 2030	

4.3. Implementation of the Strategy

A comprehensive roadmap document has been developed to facilitate the implementation of the strategic objectives outlined in the strategy. This roadmap encompasses a detailed Implementation Plan, which includes specific targets, measurable indicators, established baselines, and key milestones. Additionally, it identifies a lead partner and other implementing partners crucial for executing each target.

4.4 . Implementation Monitoring

Monitoring Plan

The implementation of the Strategy will be based on the Implementation Road, which has set key in indicators and milestones for each target. The means of verification for each indicator are given in Table 3 above.

Planned Reviews

Reviews will be conducted to monitor the milestones (for each target) set in the Implementation Roadmap. The review meetings are outlined in Table 4. Responsible lead institutions will compile reports detailing the attainment of each target's milestones and submit them to the Ministry of Energy to create aggregate performance reports. As required, these quarterly, biannual, and yearly reports will be distributed among stakeholders for documentation and action.

Table 4: Review Meetings

S/N	Type Of Meeting	Frequency	Designation Of Chairperson	Participants
1	Department ivision of Electricity and Renewable Energy	Monthly	Commissioner	Professionals including all in the Renewable Energy Section
2.	Management at the Ministry of Energy	Quarterly	PS	Management members

Monitoring and Evaluation Reports & Reviews

The monitoring, evaluation and review reports of the strategy are outlined in Table 5.

Table 5: Monitoring, Evaluation and Review Reports of Renewable Energy Strategy

Types of reports	Contents	Frequency
Performance reports	Consolidated reports covering progress on the implementation of planned targets in the Renewable Energy Strategy's Implementation Roadmap	Quarterly, semi- and annual reports
Mid-Term Evaluation report	Achievement of the Renewable Energy Strategy objectives, targets, challenges and lessons learnt. Assessment of the Renewable Energy Strategy's effectiveness, efficiency, impact and sustainability of interventions.	In 2028
Various reviews, studies and survey reports	Findings and recommendations on specific issues	As per the needs
Final Evaluation report	Overall achievements of the Renewable Energy Strategy's objectives, results, challenges and lessons learnt.	In 2034

4.5 Communication and Outreach

Key stakeholders will be informed about the Renewable Energy 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 Renewable Energy Strategy. Table 6 summarizes the messages that need to be communicated to specific stakeholders.

Table 6: Communication Plan

Stakeholder	Message	Channel
Government departments	• The need for effective coordination of Renewable Energy initiatives • Recommended improvement to policies, legal, regulatory, and institutional frameworks • The enabling environment required for Renewable Energy development.	• Meetings with key decision makers • Workshops or review meetings
Development partners	• The importance of renewable energy to address climate change issues, energy security, etc. • Private sector participation in the renewable energy development. • Resource mobilization for renewable energy development • The importance of guarantees to support investments in renewable energy	• Development Partners' Group meetings

Stakeholder	Message	Channel
Private sector	• Improvement to policies, legal, regulatory and institutional frameworks • Participation of the government in promoting renewable energy development • Conducive environment for investments on renewable energy	• Cooperative investment promotion with Tanzania Investment Centre (TIC) and Sectorial Associations • Announcements from MoE
Politicians	• Communicating the contents of the Renewable Energy Strategy and Roadmap • Potential of Renewable Energy deployment to transform rural areas • Explaining the impact of Renewable Energy deployment on energy security, access to modern energy, environmental protection, and other applications	• Direct communication
NGOs, CBOs & Faith-Based Organizations	• Raising awareness about the potential benefits of deploying Renewable Energy • Participation in Renewable Energy implementation by relevant actions/projects	• Meetings/conferences • Field demonstrations
General public	• Explaining the government's initiatives to increase Renewable Energy uptake in Tanzania.	• Newspaper, Radio, social media platforms, and Television. • Field demonstrations

4.6 Resource Mobilization for Implementation

The successful implementation of the strategy hinges on the availability of resources, particularly financial ones. These resources will be mobilized through a collaborative partnership approach involving the government, private sector, and development partners. The lead and implementing institutions are tasked with developing the necessary activities for each assigned target. This includes incorporating these activities into their respective plans and budgets and, where necessary, mobilising the required resources accordingly.

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