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Tanzania Report

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Executive Summary

Tanzania stands at a pivotal moment in its energy transition and its green industrialisation. Rapid population growth, industrialisation and rising electricity demand are reshaping its energy needs, while the global drive to phase out fossil fuels and scale up modern renewables is gathering pace and rewriting the path to sustainable development.

Tanzania is well positioned to seize these generational opportunities. The East African nation possesses abundant renewable energy potential that could underpin a thriving green economy. Technical studies estimate over 2,700 GW of practical solar PV potential, more than 230 GW of grid-adjacent wind potential, sizeable geothermal resources along the Rift Valley, and untapped hydro and wave resources far exceeding projected domestic power demand up to the middle of the century (Teske et al., 2025).

Alongside this, Tanzania could also become a regional leader in clean energy and green industry. It's central location in East African gives its access to two continental power pools, the EAPP and SAPP, while the port of Dar Es Salaam could become an export hub for green technologies. Tanzania also has some of the largest and highest quality reserves of critical minerals, such as graphite and nickel, on earth. Unlocking these potentials is highly dependent on policy choices, investment mobilisation, and implementation over the coming decade.

The current energy system planning remains misaligned with the goal of building a clean energy system and using that as a springboard for green industrialisation. The Power System Master Plan (PSMP) 2024 projects that by 2040 nearly 60% of generation capacity will come from fossil fuels - largely through expanded gas and new coal capacity - while solar, wind and geothermal are expected to account for just 12 to 13% of future capacity. Not only does this trajectory risk locking in expensive, emissions-intensive infrastructure, it will also miss the vast economic opportunities associated with renewable energy and green industrialisation.

This report argues that aligning Tanzania's power system planning with its broader development and climate objectives will require a strategic reorientation built around five priorities:

- **Revising the Power System Master Plan** to remove new coal, constrain gas expansion, and significantly scale targets for solar, wind and geothermal.

- **Modernising the grid and deepening national and regional integration** to on board a higher share of renewable energy sources and unlock electricity export potential.

- **Reforming the regulatory environment of energy** to streamline permitting, enable competitive renewable auctions, and improve independent power producers (IPP) frameworks. Predictable and transparent regulation remains essential to scaling investment.
- **Move rapidly from resource endowment to industry development.** Tanzania should finalise and operationalise its Critical Minerals Strategy, underpinned by clear frameworks for exploration, licensing, and value addition. To avoid fragmentation, government should establish a dedicated, high-level implementation unit with the authority to coordinate across ministries and agencies and to engage directly with investors and international partners.
- **Anchor the Critical Minerals Strategy in early processing capacity of critical minerals.** Priority should be given to scaling domestic processing, beginning with the Kabanga nickel refinery and the establishment of initial graphite purification facilities. These anchor projects can support the broader industrial ecosystem, demonstrate feasibility, and crowd in further investment.

- **Targeted support for domestic innovation and technology capability.** Tanzania should invest in developing domestic innovation capacity across critical minerals processing technologies, reducing long-term dependence on imported technology and know-how.

- **Mobilising development, climate and private finance** to reduce the cost of capital and accelerate investment. Achieving Tanzania's renewable and universal access ambitions will require scaled investment and engagement with multilateral development banks, sovereign funds, and climate finance vehicles. Concessional capital, guarantees, and risk-sharing facilities can reduce the cost of capital, mitigate currency risks, and help attract private investors.

- **Linking the energy transition to green industrialisation and a just transition**, positioning domestic firms and communities to benefit from emerging green industries. Renewables deployment should be integrated into industrial policy, skills development, manufacturing and local content strategies to maximise socio-economic value. Establishing supply chain capabilities for solar, wind, storage and clean cooking technologies can support job creation, enhance technological upgrading and reduce import dependence. A just transition lens ensures that benefits, such as jobs, energy access, affordability and industrial opportunities, reach communities and protect vulnerable groups and regions from exclusion or disadvantage.

If pursued at sufficient speed and scale, these measures could enable Tanzania to achieve universal access to affordable, clean energy by 2040, build the foundations of a competitive green industrial base, and position the country as a regional leader in renewable energy deployment and green industrialisation.

Introduction

Tanzania is one of the fastest-growing economies in East Africa, with sustained population growth and structural transformation driving steady increases in energy demand (World Bank, 2024). The country's current energy mix remains dominated by natural gas and large hydropower plants, with renewables such as solar and wind contributing less than 1% of electricity supply (Ministry of Energy, 2024a; TANESCO, 2023). More than half of Tanzanians still lack access to electricity, while approximately 85% of households rely on traditional biomass for cooking - constraining economic development, human health, and environmental outcomes (World Bank, 2025). Primary energy consumption remains dominated by biomass, primarily firewood and charcoal, while commercial energy use is split between petroleum fuels and electricity (IRENA, 2017). Expanding access to affordable, reliable and sustainable energy is therefore central to national development priorities, including industrialisation, poverty reduction and inclusive growth (URT, 2024a).

The Government of Tanzania has set out an ambitious policy programme to realise its potential through Vision 2050 and a suite of new planning instruments, including the Power System Master Plan (PSMP) 2024, the National Renewable Energy Strategy (2024–2034), the National Compact and the National Energy Efficiency and Clean Cooking Strategies (2024–2034). These frameworks commit to achieving 75% renewable electricity by 2030, universal electricity access by 2030, and 80% clean cooking access by 2034. Internationally, Tanzania's updated NDC aims to cut emissions 30–35% below business-as-usual by 2030 and envisions a fossil-free power sector by 2050.

In recognition of these imperatives, the Government of Tanzania has articulated a set of strategic frameworks to help guide the energy transition:

- **National Energy Compact (2024/2025)** operationalises Tanzania's commitment to universal, reliable and sustainable energy access by 2030. It complements Vision 2050, the PSMP 2024, the National Clean Cooking Strategy (2024–2034), the National Energy Efficiency Strategy (2024–2034), the Rural Energy Master Plan (REMP) and the National Renewable Energy Strategy (2024–2034). The Compact targets electricity connectivity of 75% and clean cooking access of 80% by 2034 and raises the renewable share of electricity from 61.8% to 75% through new solar,

wind, hydro and geothermal investments. It also aims to mobilise US$ 12.9 billion, including US$ 4 billion in private investment, to strengthen infrastructure, improve grid reliability and scale data-driven planning (Ministry of Energy, 2024b).

- **Power System Master Plan (PSMP 2024)** sets the least-cost pathway for electricity generation, transmission and distribution expansion through to 2040 (Ministry of Energy, 2024a). Launched in 2008, the PSMP is the country's long-term power planning instrument, establishing demand forecasts, capacity additions, grid build-out, and strategic guidance for the power sector.

- **National Renewable Energy Strategy (NRES 2024–2034)** translates national energy policy into actionable programs for scaling up solar, wind, hydro, geothermal, and biomass energy. It targets increasing renewables to 75% of electricity generation by 2033 and achieving universal access by 2034, while linking the energy transition to job creation, local industrialization, and climate resilience in line with Tanzania's NDCs and Vision 2050. Despite Tanzania's significant renewables potential, the strategy notes that less than 15% of potential renewable capacity is currently utilised (URT, 2024a).

- **National Clean Cooking Strategy (NCCS 2024–2034)** sets a ten-year roadmap to ensure 80% of households use clean cooking solutions by 2034. The strategy identifies continued reliance on biomass (>80%) as a key driver of deforestation and respiratory illness, and outlines pillars including awareness, cost reduction, and innovation (URT, 2024b).

- **National Energy Efficiency Strategy (NEES 2024–2034)** positions energy efficiency as a driver of economic growth, security, and climate mitigation by reducing technical losses and improving efficiency in industry, buildings, and transport. It includes targets to cut system losses by 2028, expand energy audits, and establish minimum-performance standards. (URT, 2024c).

- **Nationally Determined Contribution (NDC)** sets out Tanzania's commitment to reducing economy-wide emissions by 30% to 35% below business-as-usual by 2030, highlighting the expanded use of renewable energy and energy efficiency as key mitigation measures (URT, 2021). Achieving 100% renewable electricity by 2050 is recognized as requiring substantial investment and strong policy support. Tanzania's leadership has also expressed an aspiration consistent with global ambitions for net-zero emissions by mid-century (URT, 2021; World Bank, 2024).

Table 1. Tanzania's Energy Compact Targets

Focus Area	Status	Ambition	Financing Required
Electricity Access	14% in 2011 78.4% in 2020	100% access by 2030	
Electricity Connectivity	39.9% by 2020 46% by 2022	75% of population connected by 2030	US $12.9 billion total (US $4.0 billion private)
Clean Cooking Access	6.9% in 2021	75% by 2030 80% by 2034	US $1.7 billion (2024–2034)
Renewables Energy Share	61.8% (2,011 MW of 3,404 MW) as of December 2024	75% by 2030 (adding about 1,973 MW from renewables)	Built via 1,973 MW new RE (880 MW hydro, 463 MW solar, 500 MW wind, 130 MW geo)

Table 2: National and Climate Targets versus Tanzania Energy Compact Progress

Category	National / Global Target	Compact Ambition	Current Status	Alignment
Electricity Access	100% access by 2030 (FYDP III)	75% connectivity by 2030 (100% access)	46% (2022)	On Track (steep scale-up needed)
Clean Cooking	NCCS 80% by 2034	75% (2030) 80% (2034)	6.9% (2021)	Lagging (severe finance gap)
Renewable Energy Share	NRES 75% by 2030	75% by 2030	61.8% (2024)	Aligned & Accelerating
Fossil-Fuel Phase-out	No formal target (gas retained)	Reduce gas share to approximately 25% by 2030	Ongoing gas projects continue	Partial (dependence remains)
NDC (30–35% GHG cut by 2030)	GHG reduction via energy & LULUCF	Clean cooking + Renewable Energy expansion	Implementation phase	Moderate mitigation alignment

Despite this enabling policy environment, implementation gaps remain. Electricity access remains below 50% nationally, clean cooking access is below 10%, and the grid continues to rely heavily on fossil fuels and hydro (World Bank, 2025). These gaps point to a disconnect between ambitious national targets and the slower pace of infrastructure deployment, investment mobilisation, and regulatory reform on the ground.

Bridging the gap between policy intentions and real-world outcomes will require tackling several structural challenges simultaneously. First, electricity access expansion has disproportionately favoured urban and peri-urban areas, while rural communities continue to rely on traditional biomass and diesel generators, highlighting the risks and inequities at the heart of uneven energy transitions. Second, clean cooking remains largely unaddressed through energy sector planning, meaning the benefits of increasing renewable electricity have not yet translated into reductions in biomass dependence or household air pollution. Third, current power system planning continues to prioritise fossil fuel infrastructures, even as national strategies publicly commit to a long-term pivot toward renewables and net-zero pathways.

Unlocking progress will therefore requires more robust government action to shape the future of Tanzania's energy system. The country possesses vast solar, wind, geothermal and hydro potential that could serve both domestic demand and regional export markets, but realising that potential will depend on aligning policies, planning, finance, and grid development with the overarching goals of universal access, industrialisation, and climate compatibility.

Tanzania's Current Energy Landscape

Tanzania's power system is in transition. The commissioning of the 2,115 MW Julius Nyerere Hydropower Project (JNHPP) on the Rufiji River has nearly doubled national hydro capacity and substantially expanded overall generation capacity (Minja, 2025; TANESCO, 2023). As of 2025, total installed grid capacity is around 4,031 MW.

Electricity demand has been growing at roughly 8–10% per year, with peak demand reaching approximately 1,890 MW in late 2024 (Ministry of Energy, 2024a). Per capita electricity consumption remains low relative to regional peers, reflecting limited access and industrial uptake (World Bank, 2024).

Table 3. Energy Mix and Installed Capacity

Source	Capacity
Hydropower	About 2,700 MW (around two-thirds of capacity), including JNHPP, Kidatu, Kihansi, Mtera, Pangani, and other plants (TANESCO, 2023).
Natural gas	About 1,198 MW (around one-third of capacity), mainly from the Ubungo and Kinyerezi plants using gas from Songo Songo and Mnazi Bay (Ministry of Energy, 2024a).
Diesel and heavy fuel oil	Around 80–100 MW of capacity, used for peaking and in isolated mini-grids.
Modern renewables (solar, small hydro, biomass)	Less than 1% of capacity, although off-grid solar home systems and mini-grids are growing (Mokgonyana, 2024; TANESCO, 2023).

Despite major investments, electricity access is uneven. In 2022, roughly 46% of the population had electricity access - 73% in urban areas and roughly 30% in rural areas (World Bank, 2025). The government targets 75% population connectivity by 2030 and universal access shortly thereafter (Ministry of Energy, 2024b). Though the national grid has been extended to all districts and almost all villages, last-mile connections and reliability issues remain critical constraints.

Clean cooking remains a significant challenge. Over 80% of households rely primarily on biomass, notably wood and charcoal, which contributes to deforestation and serious health impacts from indoor air pollution (URT, 2024b). The NCCS aims for 80% of households to adopt clean cooking solutions by 2034 through a combination of LPG, electricity, biogas, and improved stoves (URT, 2024b). Achieving this will require scaled investment, accessible consumer finance, and public awareness campaigns.

Tanzania is endowed with abundant renewable energy resources. Studies estimate that combined solar, wind, hydro, geothermal, biomass, and ocean energy potentials far exceed projected electricity demand through 2040 and beyond (Aly et al., 2017; IRENA, 2017; Teske et al., 2025). One study further estimates that the solar and onshore wind potential exceeds projected 2050 electricity demand, providing a strategic advantage to pursue a clean, sustainable, and secure energy system leveraging domestic resources rather than imported fossil fuels (Teske et al., 2025).

Tanzania has excellent solar resources, averaging 4–7 kWh/m²/day across most regions (Aly et al., 2017). One study estimates a technical solar PV potential of 10,878 GW and a practical potential of about 2,732 GW when limited to sites within 10 km of existing grid lines (Teske et al., 2025). By comparison, peak electricity demand in 2023 stood at 1,872 MW.

Central and southern regions such as Singida, Dodoma, Shinyanga, and Mbeya are particularly promising for solar. Current grid-connected solar remains limited to a few megawatts, though off-grid solar home systems and mini-grids have scaled under the Rural Energy Agency (Mokgonyana, 2024). Expanding utility-scale solar could provide tens of gigawatts of cost-effective, low-carbon electricity by mid-century.

Wind assessments also indicate significant potential along the central plateau, Rift Valley highlands, and southern coast. At 100 metre hub height, average wind speeds of 8–10 m/s have been recorded in Singida, Dodoma, and the Makambako Highlands (Teske et al., 2025). Utility-scale viability typically requires 5.8 m/s or higher (Faraz, 2024; Asamoah et al., 2023; Dayal et al., 2021; Çetinay, Kuipers, & Guven, 2017).

Technical onshore wind potential is estimated at 789 GW, with 232 GW practical near existing transmission lines. Offshore wind along the Indian Ocean coast could contribute 1–2 GW. No large grid-scale wind farms are yet operational, though projects are proposed in Singida and elsewhere, and regional experience in Kenya and Ethiopia demonstrates the potential for Tanzania (Mokgonyana, 2024).

Hydropower remains a cornerstone of Tanzania's energy system. Economically viable potential is approximately 4,700 MW, primarily in the Rufiji, Kagera, Great Ruaha, and Pangani basins (TANESCO, 2023). totals roughly 2,700 MW, representing only 15–20% of potential. Upcoming projects, such as Rumakali and Ruhudji, will expand capacity further (Ministry of Energy, 2024a). However, climate variability and recurrent droughts highlight risks associated with over-reliance on large hydropower, reinforcing the need for diversification and climate-resilient planning (World Bank, 2024).

Geothermal could provide a substantial baseload to Tanzania's energy system. Located along the East African Rift System, Tanzania hosts around 50 geothermal sites across 16 regions, with technical potential of up to 5,000 MW (URT, 2024c; The Guardian, 2025). Priority fields include Ngozi and Songwe in Mbeya region, Kiejo-Mbaka, Luhoi in Coast region, and Natron in Arusha region (URT, 2024c). The Tanzania Geothermal Development Company (TGDC) is advancing projects including Ngozi (70 MW), Kiejo-Mbaka (60 MW), Songwe (38 MW), Luhoi (5 MW), and Natron (60 MW). Fully developed geothermal could provide reliable baseload electricity complementing variable solar and wind (URT, 2024c).

Tanzania could also tap into emergent wave energy technologies. Tanzania's 1,424 km coastline offers wave energy potential. Theoretical estimates are ~94 TWh/year, with practical exploitable potential of ~5 TWh/year (~590.39 MW) (Wave Enery, 2021). While still technologically nascent and without operational projects, this resource could contribute to the energy mix in the medium to long term.

Tanzania's Green Industrial Potential

Tanzania possesses exceptional critical minerals endowments that position it as a potential regional and continental leader in the energy transition supply chain. The country holds approximately 18 million tonnes of graphite reserves, giving it the 5th-6th largest reserves globally (ZDZN, 2025), one of the world's largest undeveloped nickel sulphide deposits at Kabanga (Lifezone Metals, 2024), and significant rare earth element resources at Ngualla (Peak Rare Earths, 2024). These assets, combined with emerging lithium, cobalt, and heavy mineral sands discoveries around the country, represent an estimated resource base exceeding $10 billion in potential value (UK Government, 2024).

Current production volumes of graphite tell a sobering story of unrealised potential. Tanzania produced only 6,000-25,000 metric tonnes in 2024, a tiny fraction compared to Madagascar (100,000+ tonnes) and Mozambique (75,000 tonnes) (Next Move Strategy, 2025). This represents merely 0.64% of Africa's total graphite production despite holding 24% of East African reserves collectively with Madagascar and Mozambique (Next Move Strategy, 2025). Three projects are currently operational: Lindi Jumbo (commissioned 2024, 40,000 tonnes/year capacity), GodMwanga Gems (top-10 global producer), and Permanent Minerals in Mirerani (African Mining Market, 2024).

The same is true of nickel, but this story is changing. The Kabanga Nickel Project in northwest Tanzania represents one of the world's largest and highest-grade undeveloped nickel sulphide deposits. More than $435 million has been invested to date through drilling, resource definition, and feasibility studies (Lifezone Metals, 2024). Project advancement has accelerated markedly in 2024-2025. Tanzania's government awarded Tembo Nickel Corporation (84% Lifezone Metals, 16% Government of Tanzania) a Special Mining Licence in April 2023 and a Refinery Licence for the Kahama Multi-Metals Refinery in May 2024 (Mining Weekly, 2024).

Infrastructure constraints repeatedly emerge as pervasive constraints. Tanzania's road network requires substantial upgrading - most graphite, nickel, and rare earth deposits sit 100-300km from ports or rail connections, with the roads inadequate for heavy mining traffic (Mining Review Africa, 2024). The Tanzania-Zambia Railway (TAZARA) and planned Lobito Corridor expansion offer potential solutions for landlocked deposits but require major rehabilitation investments (UK Government, 2024). Port capacity represents another bottleneck. Dar es Salaam handles the majority of Tanzania's trade but faces severe congestion. Mtwara port in the south, closest to Lindi graphite deposits, only offers 1 million tonnes/year capacity, which needs to be expanded if the graphite grows. Port expansion, dedicated minerals handling facilities, and improved customs processing are all essential if Tanzania is to realise its potential in critical minerals (Mining Review Africa, 2024).

The policy environment is emerging, but more action is needed. The launch of the Tanzania Critical and Strategic Minerals Strategy, in February 2024, signals national commitment to moving beyond raw ore exports to develop processing and refining capacity. Yet translating geological endowment into economic development and regional leadership requires coordinated and targeted action across the value chain, as well as supportive governance. Given that critical minerals projects involve longer development timelines and larger capital commitments than other mining operations, such as gold, it is vital to maintain policy stability. One area in which greater ambition is required is regional policy coordination to ensure that Tanzania's efforts are integrated with the industrial strategies of neighbouring states to bolster regional economies.
Tanzania possesses the geological endowments, geographic positioning, and governance stability to become a significant player in global critical minerals supply chains. But Tanzania's trajectory depends ultimately on policy consistency, institutional capacity, and strategic vision. The country faces a generational opportunity as global supply chains reconfigure around energy transition imperatives and green industrialisation becomes a vital route to sustainable

development. Current evidence suggests genuine commitment to value addition, but implementation will be tested as projects encounter inevitable challenges. Success requires maintaining strategic focus through difficulties. The prize of regional leadership in critical minerals processing is substantial for those nations demonstrating long-term commitment.

Energy Plans and Climate Commitments

Planned 2040 Energy Mix (PSMP 2024)

Tanzania energy vision is set out in the the Power System Master Plan (PSMP) The PSMP 2024 sets a long-term roadmap targeting roughly 20,000 MW by 2040. Analysis indicates continued dependence on fossil fuels: 6,700 MW of natural gas (33%), 5,300 MW of coal (26%), 5,690 MW of hydro (28%), 800 MW of wind (4%), 715 MW of solar (3.5%), and 995 MW of geothermal (5%) (Ministry of Energy, 2024a). In total, 59% of capacity remains fossil-fuel-based, with solar, wind, and geothermal together comprising ~12-13%.

Table 4: Tanzania Energy Mix 2040 (Ministry of Energy, 2024a)

Source	Megawatts	Portion
Natural Gas	6,700	33%
Hydropower	5,690	28%
Coal	5,300	26%
Geothermal	995	5%
Wind	800	4%
Solar PV	715	3.5%

According to this outlook, around 59% of capacity would still be fossil-fuel based (gas and coal), with solar, wind, and geothermal together making up just 12–13% of capacity by 2040 (Ministry of Energy, 2024a). This forecast energy mix starkly contrasts with a scenario in which Tanzania fully exploits its clean energy potential while meeting its climate commitments.

Key misalignments include:

1. **Coal expansion:** 5,300 MW of new coal would dramatically increase emissions in a currently coal-free system, contradicting the requirements set out in the latest climate science (Green et al., 2024; Wolf et al., 2025). Developing such a large coal fleet would dramatically increase Tanzania's carbon emissions and lock-in polluting energy infrastructures for decades to come.

2. **Gas dependence:** Tripling gas capacity risks stranded assets as global decarbonization accelerates (Climate Analytics, 2023). As above, these investments would lock-in high emissions, given the lengthy lifespan of fossil fuel infrastructure.

3. **Underutilization of solar and wind:** Combined 1,515 MW represents less than 8% of planned capacity and half of technical potential, leaving cost-competitive resources untapped (Teske et al., 2025). Given that utility-scale solar and wind are now globally cost-competitive, the underutilization suggests a misalignment in priorities or lack of political will to seize the opportunities presented by renewables.

4. **Climate and hydrology risks:** Heavy reliance on hydro (~28%) exposes the system to climate variability, highlighting the need for diversification (World Bank, 2024). Recent experiences of drought-induced power cuts emphasise the vulnerability of Tanzania's grid.

5. **Energy access versus export dilemmas:** Large-scale fossil generation may prioritize industrial and/or export needs over rural energy access, whereas distributed renewables could address both simultaneously (World Bank, 2024).

Alignment with Climate Goals

Tanzania's international climate commitments provide a framework for the country's energy transition. Yet there is a clear disconnect between these commitments made and current energy plans.

1. **5.2.1 2030 NDC Targets**
   Tanzania's 2021 NDC commits to 30–35% emissions reductions below business-as-usual by 2030 (URT, 2021). The energy sector is expected to increase cleaner fuels and renewable generation, while expanding gas may displace dirtier fuels but still raise absolute emissions. Coal expansion in the 2030s–2040s would undermine mitigation efforts and burden other sectors with additional reductions (Climate Analytics, 2023).

2. **5.2.2 2050 Net-Zero Aspiration**
   Although Tanzania has not formally submitted a Long-Term Low Emission Strategy, leadership has voiced a net-zero 2050 aspiration. Achieving 100% renewable energy by 2050 is estimated to require around $160 billion (URT, 2021). Planned coal and gas capacity by 2040 is incompatible with this pathway, risking stranded assets or compromising net-zero feasibility. Climate Analytics (2023) indicates that 1.5°C-aligned African power systems require rapid renewable deployment (>80–90% by 2030), coal phase-out by around 2034, and gradual gas reduction thereafter.

   There are, however, some positive developments. The National Energy Compact and Renewable Energy Strategy set a target for renewables to account for 75% of electricity generation by 2030, supported by approximately 1,973 MW of new renewable capacity (URT, 2024a; Ministry of Energy, 2024b). If fully implemented and integrated into the PSMP, these initiatives could push the system onto a more climate-aligned pathway.

Key Challenges to a Renewable Transition & Green Industrialisation

There are several crucial barriers that stand in the way of Tanzania fulfilling its potential in renewable energy and green industrialisation.

Institutional and policy frameworks remain a major impediment to renewable energy deployment and green industrial development. Complex approval procedures, fragmented mandates across agencies, and inconsistent policy signals have produced delays in project development and limited market certainty (Ahmed et al., 2019). Unclear licensing rules and the absence of predictable incentives for Independent Power Producers (IPPs) have contributed to a hesitant investment environment. Historical energy planning norms have also favoured large, centrally planned power projects - primarily hydro and gas - over decentralised renewable options, reducing opportunities for diversification and modular growth. Regulatory uncertainty ultimately depresses investor appetite and slows the emergence of domestic green industrial capabilities.

Financial constraints continue to frustrate ambitions. The high upfront capital costs associated with renewable energy technologies, combined with policy uncertainty and perceived market risk, have limited private investment flows. TANESCO's ongoing financial challenges, the scarcity of long-term local-currency financing, and currency risk exposure for foreign investors compound these constraints (World Bank, 2024). While public finance has been deployed to support energy investments, it has mostly been directed toward mega-projects rather than smaller, scalable renewable assets that could unlock distributed generation and accelerate local industrial participation. As a result, renewable deployment remains capital-constrained and insufficiently diversified.

Weak grid infrastructure presents a further structural barrier. Tanzania's existing transmission and distribution networks are poorly equipped to absorb the volumes of new renewable generation required to meet future demand. Resource-rich regions with high solar or wind potential often lack the transmission capacity needed to connect generation to load centres. At the same time, higher shares of variable renewables will require modern system operations, upgraded grid stability mechanisms, and investments in storage and regional interconnectors (Ministry of Energy, 2024a; URT, 2024a). Without these upgrades, grid congestion and integration bottlenecks will continue to limit renewable penetration and reduce investor confidence.

Policy preferences remain deeply wedded to fossil fuels. Path dependencies continue to shape planning assumptions and market expectations. The notion that "baseload" fossil fuel and large hydro assets are inherently superior to variable renewables remains influential among some policymakers and system operators. While reliability concerns reflect lived experience of past supply constraints and blackouts, they often underestimate gains in forecasting, energy storage, and flexible grid management systems that now enable higher renewable penetration (Breyer et al., 2022). These entrenched preferences slow the normalisation of renewables in planning processes and impede technological upgrading.

Without significant policy ambition and redistributional measures, gains in renewable generation risk bypassing communities. Large-scale renewables deployed primarily for grid supply may reinforce spatial inequalities by prioritising urban and industrial centres while leaving rural communities underserved. Ensuring a just energy transition therefore requires explicit linkages between renewable scale-up, universal access, and affordability - including off-grid and mini-grid solutions for remote regions (Mokgonyana, 2024; World Bank, 2024). Significant gaps remain in financing and commercial scaling models needed to achieve universal access by 2040. Affordability challenges also persist where tariffs or upfront costs for solar home systems are prohibitive for low-income households in the absence of subsidies or pay-as-you-go models.

There is a risk that Tanzania will be pulled into geopolitical power contests. Tanzania's energy future is emerging against an evolving and contentious geopolitical backdrop. Substantial natural gas reserves have attracted international interest, creating incentives to prioritise gas development for export and domestic consumption. Simultaneously, global climate finance regimes and shifting norms against new fossil fuel investments are restructuring capital allocation (Green et al., 2024; Wolf et al., 2025). Tanzania faces a delicate balancing act: exploiting strategic resources, securing new investment, and aligning with emergent global climate standards. Without a coherent positioning strategy, the country risks being pulled between competing external pressures and missing the window for green industrialisation.

Policy Pathways and Recommendations

Achieving a renewable-powered future for Tanzania by 2040 will require concerted and coordinated action on several fronts. To realign Tanzania's energy sector with its renewable potential and climate commitments, this paper sets out the following recommendations:

Revising national planning frameworks is foundational for aligning ambition and implementation. The Power System Master Plan (PSMP) must be updated to reflect the targets and intent of the National Energy Compact and the Renewable Energy Strategy, including explicit renewable generation shares for 2030 and 2040 (URT, 2024a; Ministry of Energy, 2024b). Revision should remove coal from the portfolio and place clear constraints on gas expansion, consistent with achieving a net-zero electricity sector by mid-century. Incorporating updated least-cost modelling assumptions that reflect declining renewable costs and realistic deployment speeds is critical for reshaping technology choices and investor expectations (Way et al., 2021).

Grid modernisation and regional integration will determine the pace and scale of renewable build-out. To complement new generation capacity, Tanzania will need a step-change in transmission and system operation capabilities. Priority should be given to connecting high-potential renewable resource zones with major demand centres and emerging export corridors. Piloting battery storage at solar and wind facilities can support variability management and ancillary services. A more interconnected regional grid can reduce reserve margins, enhance reliability, and improve utilisation rates. Fast-tracking deeper participation in the East African and Southern African Power Pools would enable Tanzania to export surplus renewables and import power during periods of deficit (Ministry of Energy, 2024b).

Strengthening regulatory frameworks will enable competitive procurement and deepen market participation. Regulatory reforms should prioritise transparent, rules-based tendering over ad-hoc MoUs, accompanied by clear time-bound permitting processes for renewable projects. Competitive renewable auctions could accelerate price discovery and signal commitment to IPPs. Revising the Small Power Producer (SPP) framework to establish cost-reflective tariffs and standardised PPAs would support smaller-scale and community-based projects (Ahmed et al., 2019; URT, 2024a). As Tanzania moves towards greater regional power trade, regulatory harmonisation—including transmission tariffs—within the EAPP and SAPP will be necessary to fully unlock cross-border market opportunities.

Move rapidly from resource endowment to industry development. Tanzania should urgently operationalise its Critical Minerals Strategy, shifting the focus from resource discovery to structured industrial development. This requires clear and predictable frameworks for exploration, licensing, and value addition, alongside transparent fiscal and regulatory incentives that reward the development of a domestic industrial ecosystem rather than the export of raw concentrates. To avoid fragmented implementation across line ministries and agencies, government should establish a dedicated, high-level implementation unit with a strong political mandate. This unit should have the authority to coordinate policy, infrastructure planning, and investment promotion, and to serve as a single point of engagement for domestic firms, investors, and regional, continental and international partners.

Targeted support for domestic innovation and technology capability. Tanzania should invest in developing domestic innovation capacity across critical minerals processing technologies, reducing long-term dependence on imported technology and know-how. Government can support this by strengthening links with global universities, research institutes, and industry, and by catalysing a dedicated minerals technology start-up ecosystem in Tanzania. Targeted public funding, amongst other sources, can help accelerate innovation, launch pilot projects, and create a pipeline of locally adapted processing solutions.

Mobilising climate finance and private capital is indispensable for implementation. Given the scale of investment required to meet PSMP and Mission 300 objectives, domestic resources will be insufficient to finance an accelerated transition. Engagement with multilateral development banks and climate funds - such as the World Bank, AfDB, and GCF - will be necessary to secure concessional capital and risk-sharing instruments (World Bank, 2024). Tanzania could also explore country-level investment mechanisms analogous to South Africa's Just Energy Transition Partnership. Green bonds, partial risk guarantees, blended finance structures, and targeted de-risking instruments could lower the cost of capital and crowd in private investment. Domestic financial institutions could expand participation under appropriate risk-sharing regimes.

Linking renewable expansion with green industrialisation will maximise socio-economic benefits. Industrial policy alignment is essential to ensure that renewable deployment contributes to job creation, value addition, and technological learning. Opportunities exist to encourage domestic assembly and manufacturing of components across solar, wind, and associated balance-of-system infrastructure. Complementary investments in technical and vocational training - spanning renewable technology installation, system operations, and energy efficiency - would support a more skilled local workforce (Mokgonyana, 2024).

Extending the transition beyond electricity is critical for climate alignment and equity. Tanzania's transition must address cooking and mobility if it is to achieve broad-based decarbonisation and social development objectives. With more than 85% of households still reliant on biomass for cooking, expanded renewable generation offers a pathway to scaling electric cooking and clean fuels by 2040 (URT, 2024b). Early planning for e-mobility -particularly two- and three-wheelers and public transport - would ensure that emerging transport demand is powered by renewables rather than fossil fuels. Cross-sector coordination is essential to link supply-side investment with equitable and climate-aligned energy services.

Conclusion

Tanzania's energy future is still up for grabs. It can double down on fossil fuels and absorb the economic, climate, and stranded asset risks that follow - or it can leverage its exceptional renewable resources to build a modern, inclusive and resilient energy system. The direction of travel is not inevitable. Policy and investment decisions will determine whether Tanzania becomes a leader in green industry or remains tied to legacy technologies.

Our analysis finds that a renewable-heavy power system by 2040 is within reach and offers clear net benefits for cost, access, security, and industrialisation. The solutions are visible: revise the PSMP, modernise transmission, unlock competitive renewable markets, and mobilise climate-aligned capital, while ensuring that the transition expands access and creates local value. But today's plans still favour fossil fuels that risk locking in emissions, eroding competitiveness, and undermining Tanzania's own net-zero vision.

A strategic leap now would secure clean, affordable energy for households and industry alike, reduce exposure to volatile fossil fuel prices, and position Tanzania at the forefront of Africa's energy transition and green industrialisation. The coming decade is a window of opportunity for Tanzania and Africa. But it is a window that will not remain open indefinitely.

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