



GOVERNMENT OF MALAWI
Ministry of Natural Resources, Energy and Mining

MALAWI SUSTAINABLE ENERGY INVESTMENT STUDY

SUMMARY FOR DECISION MAKERS



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ABOUT THE DEPARTMENT OF ENERGY AFFAIRS

The Department of Energy Affairs (DoEA) is one of the constituent departments of Malawi's Ministry of Natural Resources, Energy and Mining. The department coordinates formulation of energy policies, planning, and ICT; the provision of rural electrification services; and the provision of alternative energy and energy conservation services.

ABOUT UN-OHRLLS

The United Nations Office of the High Representative for Least Developed Countries, Landlocked Developing Countries and Small Island Developing States (UN-OHRLLS) helps coordinate and implement programmes of action which assist vulnerable countries in areas including economic growth, poverty reduction and meeting targets laid out in the SDG.

ABOUT ROCKY MOUNTAIN INSTITUTE

Rocky Mountain Institute (RMI)—an independent nonprofit founded in 1982—transforms global energy use to create a clean, prosperous, and secure low-carbon future. It engages businesses, communities, institutions, and entrepreneurs to accelerate the adoption of market-based solutions that cost-effectively shift from fossil fuels to efficiency and renewables. RMI has offices in Basalt and Boulder, Colorado; New York City; the San Francisco Bay Area; Washington, D.C.; and Beijing.



FOREWORD

Malawi has committed to achieving “Sustainable Energy for All,” as enshrined in Sustainable Development Goal (SDG) number 7. Energy is a means to an end; it provides a platform for social and economic development, and a pathway for achieving many of the other SDGs. The third Malawian Growth and Development Strategy (MGDS III) recognizes this central role of energy, citing it as “the lifeblood of the economy” and laying out a goal to “provide sufficient sustainable energy for industrial and socio-economic development.” Improved access to reliable and sustainable energy supply is one of the core outcomes the MGDS III seeks to achieve.

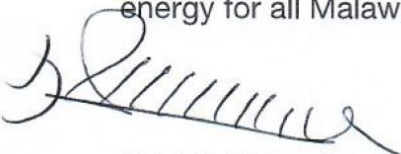
In response to these commitments, the Ministry of Natural Resources, Energy and Mining, acting through the Department of Energy Affairs (DoEA) and Malawi Energy Regulatory Authority (MERA), has worked to put in place policies, regulations, and a framework that will allow increased investment and rapid growth in the power sector. The National Energy Policy (2018) and the Malawi Renewable Energy Strategy (2017) build on the targets laid out in the Sustainable Energy for All Action Agenda (2017) and provide high-level policy direction, complemented by detailed technical analysis made available in the most recent Integrated Resource Plan (2017).

To translate these goals into reality, the Ministry will rely on clear plans to move key investments forward, based on transparent funding arrangements that aim to provide reliable and sustainable energy for Malawians at the lowest possible cost. In this context, this Malawi Sustainable Energy Investment Study—a partnership between DoEA; the United Nations Office of the High Representative for Least Developed Countries, Landlocked Developing Countries and Small Island Developing States (UN-OHRLLS); and Rocky Mountain Institute (RMI)—is timely and essential.

This document outlines a clear vision of what is needed and how, together, we can make it happen. The way forward for Malawi represents a significant investment over the coming decades of up to \$3 billion, but this investment will create enormous benefits for the country.

The study will help the government, development partners, investors, and the private sector converge on a shared agenda. Concentrating on a clear set of short-term actions, the study’s recommendations can unlock investment and help the sector grow rapidly, as proven in other countries across Africa.

I call on all actors in the energy space to work alongside the government as we look to implement the recommendations of this study and accelerate progress toward sustainable energy for all Malawians.



Patrick Matanda

Secretary for Natural Resources, Energy and Mining



OVERVIEW

Malawi is a landlocked country in Southeastern Africa; it is a “least developed” country by United Nations (U.N.) classification and faces a range of economic and social challenges.

These challenges are exacerbated by the country’s poor access to energy. Currently only 11% of the population has access to electricity. With a population of 18 million people, of whom 83% live in rural areas, Malawi had a gross domestic product of \$5.4 billion in 2016, making it one of the poorest countries in the world. There is an urgent need for energy sector development to underpin social, economic, and environmental development goals. Energy access remains a major challenge; it has a direct impact on poverty eradication, climate change, health, water, and economic transformation. Malawi has an abundance of resources with which a sustainable energy sector could thrive. Ending energy poverty and ensuring that no country or person is left behind must become a priority for all stakeholders to achieve the 2030 Agenda for Sustainable Development (ASD).

Investment is vital for sustainable energy to flourish in Malawi.

This investment study was launched in February 2019 as a collaboration between the Government of Malawi, UN-OHRLLS, and RMI. The purpose of the study is to support Malawi’s efforts in accelerating the country’s progress toward achieving SDG 7: access to affordable, reliable, sustainable, and modern energy for all. The study maps out strategies to increase investment in the sustainable energy sector and consequently improve development outcomes in many other sectors.

The study presents a scenario analysis based on a least-cost approach to energy investment that shows an opportunity to save \$500 million by 2030 compared to previous plans.

Taking advantage of the rapidly reducing costs of renewable energy and energy storage, Malawi can build modular, flexible energy infrastructure that closely tracks demand while providing reliable power and resilience to climate change. Demand-side management can save energy at a lower cost than new generation. This pathway would reduce costs and avoid 20 megatons (Mt) of CO₂ emissions by 2030.

Investment needs to 2030 are \$2.5 billion in the power sector and up to \$600 million for cooking.

On-grid investment needs are split across new generation, transmission, distribution, and new connections. The off-grid solutions of putting light in every household by 2030 and power-productive uses of energy in rural areas complement these needs. A rapid transition to improved cooking solutions will include supply- and demand-side actions and will reduce biomass consumption to sustainable levels.

A clear roadmap, shared by key stakeholders, can raise funding from a range of sources and drive rapid change in the power sector.

Malawi can make rapid progress by adopting a clear plan and building on intensive work across the sector in previous years. Getting a few key projects commissioned—including solar photovoltaic plants, such as those in Salima, Nkhotakota, and Kanengo—will create a positive feedback loop, helping to de-risk the sector and crowd in further funding. Public funding and subsidies will continue to be required for some sectors, while government guarantees and climate finance can leverage funding from commercial sources to reach Malawi’s goals.

This study identifies a few key actions that can unblock the sector and drive rapid development.

Leadership from government, development partners, and investors can drive rapid progress. Improving planning, driving cost reductions, blending finance, de-risking the sector, and strengthening institutional frameworks will unlock further finance, in a self-reinforcing cycle. Following this pathway, Malawi can get on track to achieve national goals and put in place the energy infrastructure for development.



INTRODUCTION

Today, Malawi has one of the lowest electrification rates in the world.

National grid electricity access rates are around 12%, dropping to just 3.9% of people in rural areas. For those who are connected to the grid, insufficient generation capacity and unreliable infrastructure cause regular outages. Malawi is heavily dependent on hydroelectricity, and low rainfall in 2016 and 2017 exacerbated the situation, causing prolonged load shedding across the country.

Increasing the supply of and access to reliable, affordable energy is thus at the core of national development goals.

The National Energy Policy, the Sustainable Energy for All Action Agenda, and Malawi's Growth and Development Strategy are among several documents that demonstrate the government's commitment to rapidly improving the country's energy infrastructure. By 2030, according to national targets, nearly 30% of Malawians will have reliable grid connections, while the remaining population will—as a minimum—have access to solar lighting and charging systems. In parallel, Malawi needs to drastically increase the uptake of improved or alternative cooking solutions, while investing in forestry to provide sustainable biomass supplies and reduce deforestation.

Meeting the country's energy needs represents a step change compared to historic progress.

The volume and speed of investments required in the power sector will require concerted efforts from government agencies, development partners, and investors to mobilize investment of approximately \$2.5 billion for the power sector and \$600 million for cooking and forestry by 2030. This investment represents a tripling generation capacity, to 1,200 megawatts (MW), while adding 1.2 million new on-grid connections, as shown in EXHIBIT 1.

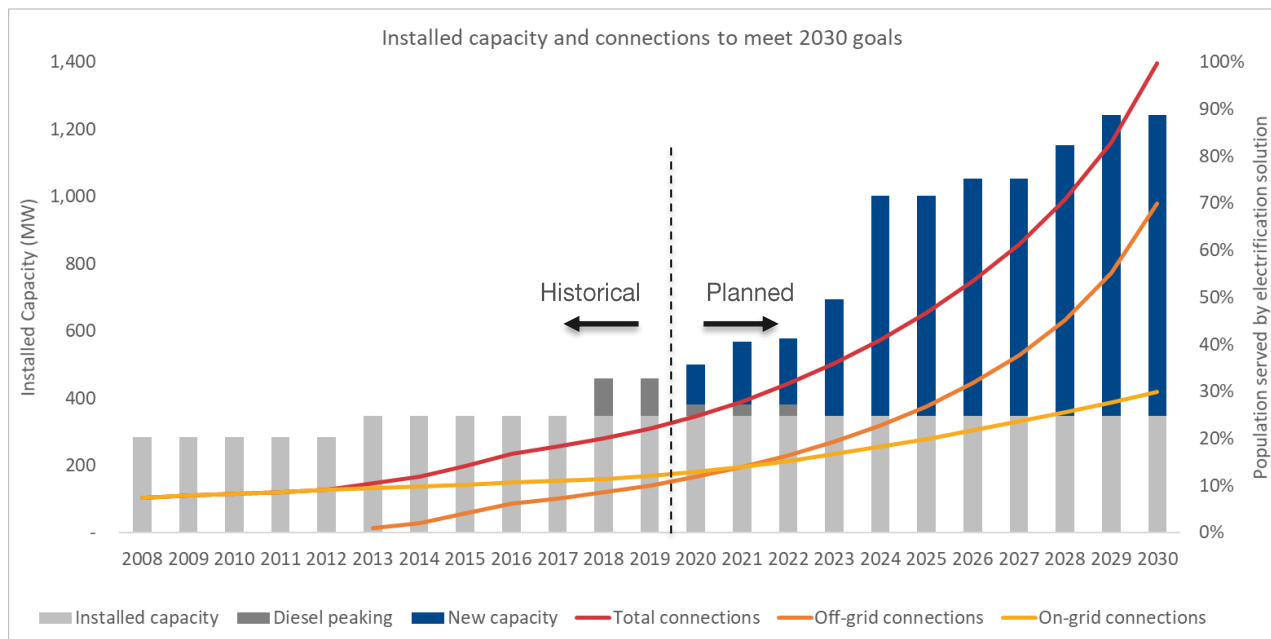


EXHIBIT 1: HISTORICAL AND PLANNED INSTALLED GENERATION CAPACITY AND NUMBER OF CONNECTIONS

Building the right projects, in the right order, can unlock investment and help scale rapidly.

This report lays out the processes for selecting and prioritizing projects, estimates the total investment needs, and proposes sources of finance for these investments to define a set of key recommendations and next steps.



PROJECT PRIORITIZATION

Capital requirements of \$3.1 billion by 2030 are spread across Malawi's power and clean-cooking sectors.

The on-grid power sector accounts for the bulk of this investment, as shown in Exhibit 2. Off-grid lighting and some minigrids for powering productive uses of energy are also crucial for Malawi to meet electrification goals and support economic development in deep rural areas. Cooking solutions must consider both supply and demand of biomass and alternative cooking fuels.

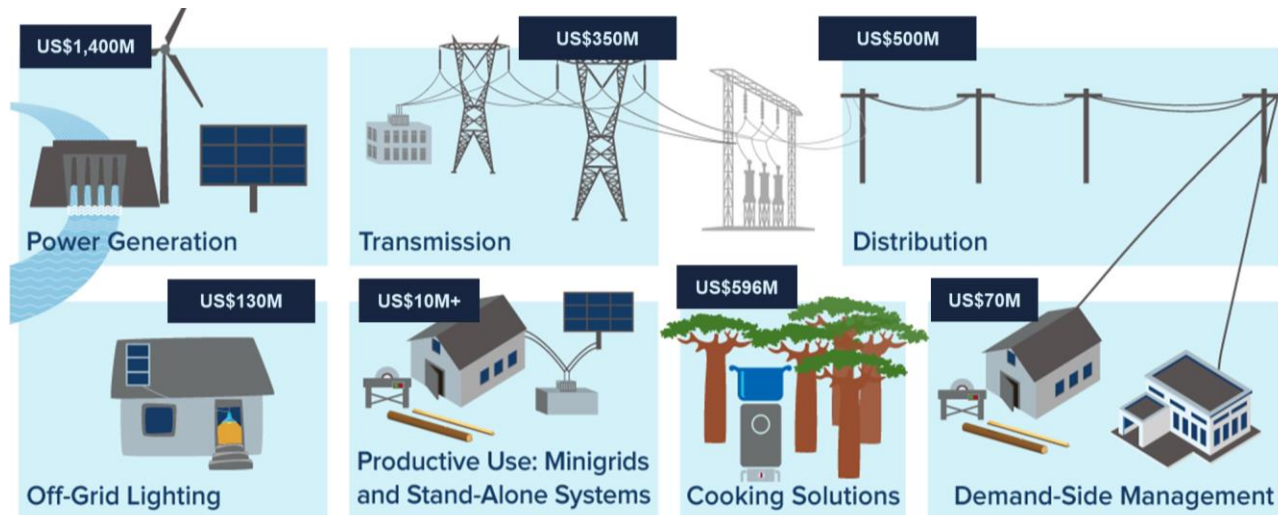


EXHIBIT 2: APPROXIMATE INVESTMENT NEEDS ACROSS KEY SECTORS

Improving energy efficiency and regularly updating demand forecasts are crucial for the sector. National demand forecasting should be regularly updated to ensure that capacity expansion can be planned to minimize costs. Implementing demand-side management programs is often a cheaper alternative to building new supply. A range of low-cost, high-impact energy efficiency programs can be developed, aligning Malawi's activities and standards with neighboring countries and regional trading blocs. Capacity building and public procurement can be used to kick-start the energy efficiency market.

An immediate solution to Malawi's power supply situation depends on solar and the Mozambique interconnector.

Rapid implementation and commissioning of several solar independent power producers (IPPs) will increase generation capacity. For example, projects at Salima, Nkhotakota, and Kanengo are already at advanced stages of preparation. Crucially, they will also demonstrate the viability of Malawi's power sector, helping unlock future projects and increase financial flows. Cross-border trade may supply more expensive power than other solutions but can take the pressure off the Electricity Supply Corporation of Malawi (ESCOM) in the short term and help balance supply with demand in the long term. Ongoing maintenance and renovation of existing hydro infrastructure will continue to play a vital role.

Expanding power generation infrastructure with least-cost, reliable, and diversified solutions can save \$500 million by 2030 and avoid 20 Mt of CO₂ emissions.

Falling costs of renewable energy and battery storage provides Malawi with an opportunity to build the energy grid of the future, while saving 25% by 2030 compared to the 2017 Integrated Resource Plan. Hydro reservoirs proposed on the Shire and Songwe River basins can be supplemented by solar, wind,



and biomass generation, as shown in Exhibit 3, to reach installed capacity of over 1,200 MW by 2030 within Malawi, with additional capacity available from interconnections with regional power pools. Grid-scale battery storage can work with hydroelectric reservoirs to meet reliability criteria. The least-cost planning approach adopted here analyzed a range of scenarios, using a project master-list with inputs from integrated resource plans and utility investment plans. The optimal scenario aims to minimize capital and operational expenditures (including costs of fuel and electricity imports) through 2030, while guaranteeing reliable power supply and some level of resilience to climate change impacts, such as low flow rates in the Shire River.

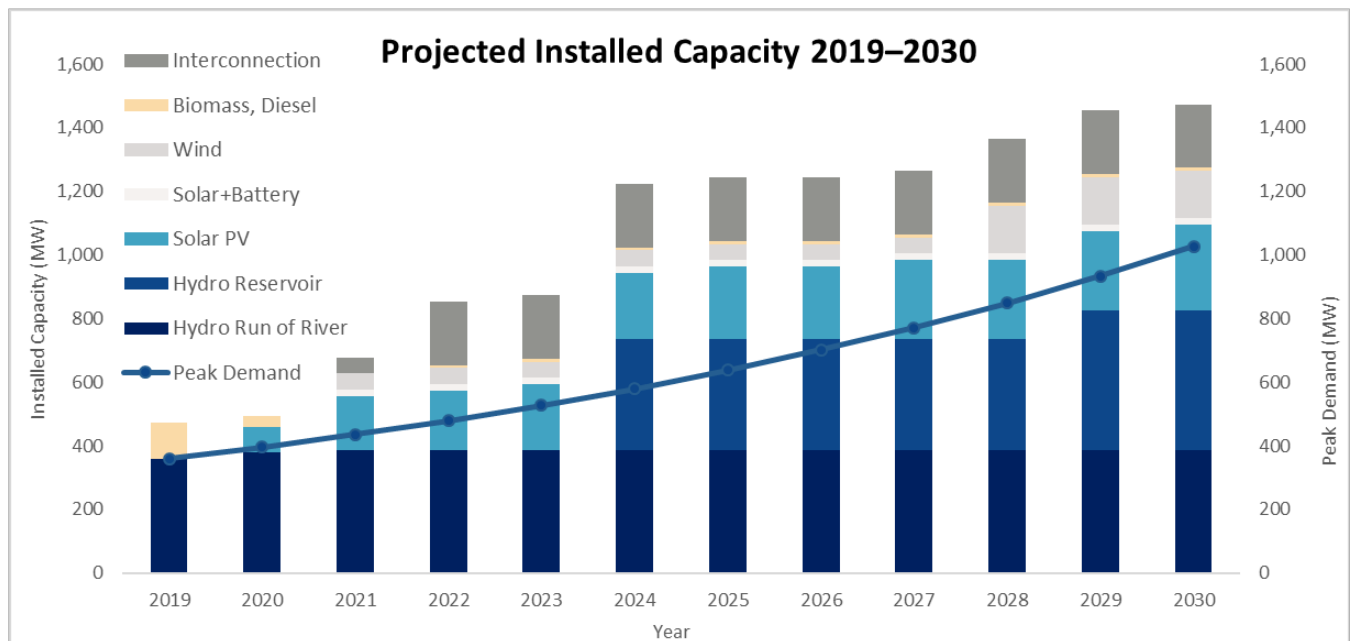


EXHIBIT 3: PROJECTED INSTALLED CAPACITY ON A LEAST-COST DEVELOPMENT PATHWAY. ROR IS RUN OF THE RIVER HYDROELECTRIC GENERATION.

A coordinated transmission system build-out plan is already in place.

ESCOM should continue to balance short-term needs for cross-border interconnectors with long-term capacity expansion and with ongoing maintenance and rehabilitation. Building on major investment by the Millennium Challenge Corporation, significant investment will be required to build the Central to Northern Backbone-Western Transmission Line in coming years.

Least-cost distribution system planning focuses on grid densification to rapidly increase connections.

Over 15 million people (80% of the population) live within 5 kilometers of existing grid infrastructure, the vast majority of which is not grid-connected. Rapid grid build-out is planned and needs to be supported by a scale-up of programs like Ndawala to provide financial support for wiring houses and acquiring appliances. Concerted effort and investment should help reach 30% of the population with grid connections by 2030.

Beyond the main grid, quickly electrifying productive uses can drive economic development.



Minigrids are already a focus area for development in Malawi but are still expensive compared to regional benchmarks and depend on high levels of subsidy. Coupling minigrids with agricultural productive uses can lower the cost of power provision and unlock new value chains for communities. The least-cost electrification plan already identifies 74 sites to serve 18,000 connections by 2030. Electrifying high-potential agricultural value chains could increase this significantly.

Pico-solar solutions can provide off-grid lighting as a least-cost solution to bring some level of access to 3.5 million households by 2030.

Private sector participation in the off-grid solar market can be increased and supported, as the United States Agency for International Development (USAID) Kickstarter program is demonstrating at a small scale. However, a large proportion of Malawi's population cannot afford to pay for even tier 1 to 2 solar systems. Some form of ongoing subsidy, estimated at approximately \$3 million per year, will be required to ensure that all households have electric lighting and phone charging by 2030.

Malawi has an ambitious cookstove strategy that should be expanded to drive rapid sectoral transformation through adoption of alternatives to wood fuel.

Rapid uptake of advanced cookstoves is essential. However, taken alone, it will neither meet health guidelines nor reduce biomass use to below levels of sustainable supply. Instead, it must be complemented by steps to ensure rapid rollout of alternative solutions in urban areas, including electric cooking, liquefied petroleum gas (LPG), biogas, and ethanol, as shown in Exhibit 4.

Investment in biomass supply is also crucial for Malawi's environment and energy sector.

Natural forest management, conservation agriculture, community plantations, and commercial woodlots are all essential to providing the country with sustainable sources of biomass for cooking, especially in rural areas.

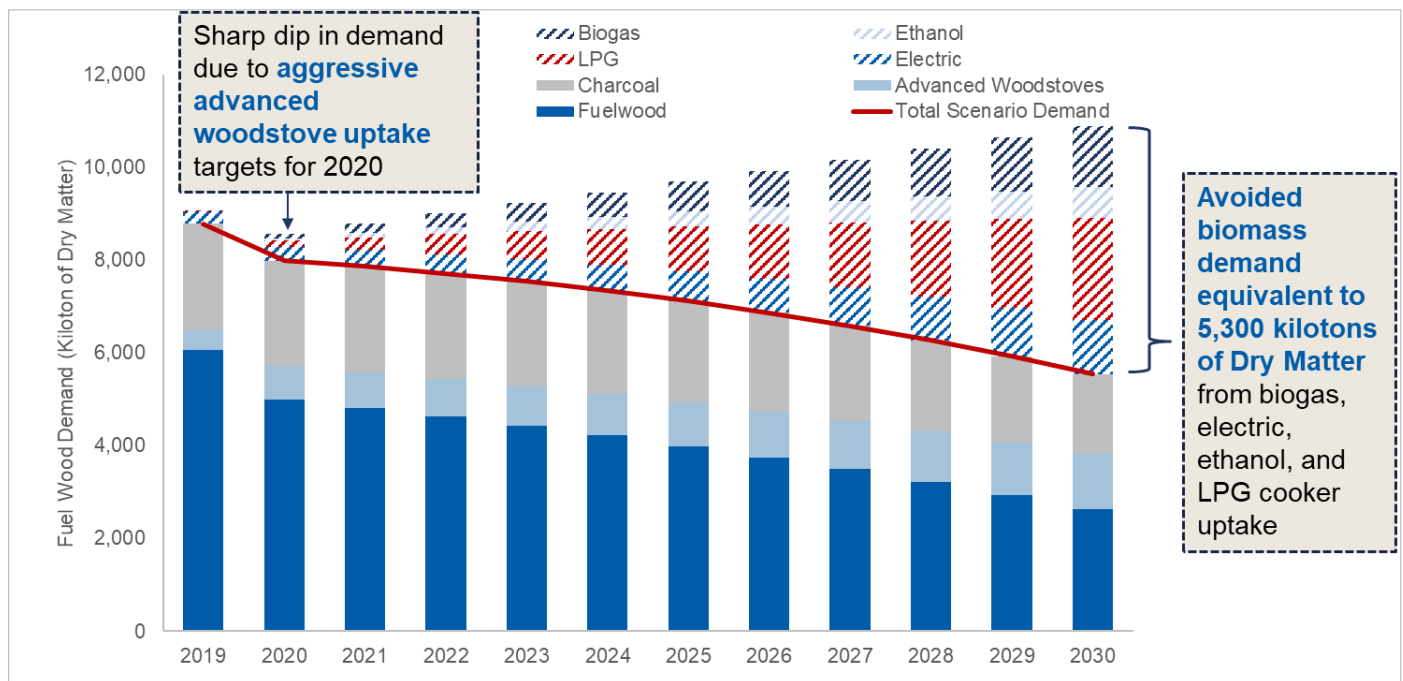


EXHIBIT 4: PROJECTED AND AVOIDED BIOMASS DEMAND THROUGH TO 2030



FINANCE FOR DEVELOPMENT

Malawi already has some funding in place and can work to reduce costs, but the funding gap for the power sector remains large.

Malawi has historically funded its energy sector through budget allocations, concessional finance, and grant funding, but these sources are insufficient to meet upcoming needs. Exhibit 5 shows the funding gap that Malawi still faces.

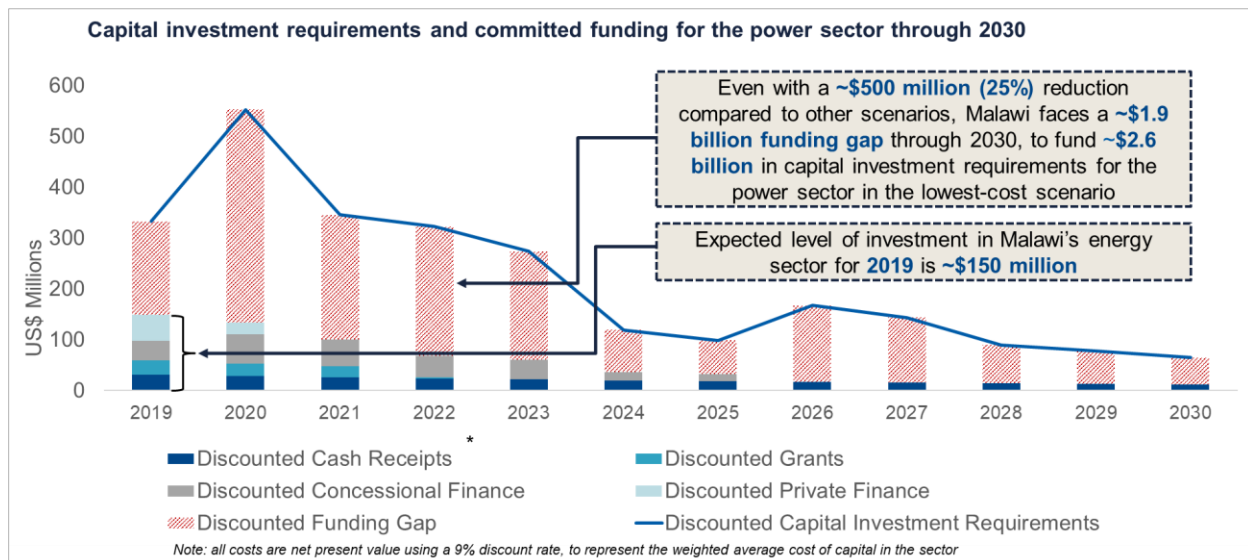


EXHIBIT 5: CAPITAL INVESTMENT REQUIREMENTS FOR THE ELECTRICITY SECTOR THROUGH TO 2030

Blending finance can reduce perceived risks, but development finance will continue to play a large role even as private investment grows.

Commercially viable sectors should aim for market-based financing, although higher risk activities will require guarantees, subordinate capital, and first-loss capital. Some sectors, especially relating to low-income brackets, will continue to require subsidy in the long term. Overall, \$350 million of donor commitments and first-loss capital should expect to leverage \$1 billion in concessional and subordinate capital and \$1.15 billion of market-based financing.

Implementing quick-win generation projects is vital for unlocking further commercial finance.

The government has already published an IPP framework that provides significant protection for investors through foreign exchange guarantees and credit guarantees. By implementing a few projects, Malawi can provide a track record for the off-taker, build internal capacity, and help unlock further commercial financing.

A range of green climate finance sources is available to Malawi today.

Several green climate facilities can provide funding to de-risk commercial sources of finance. With this in place, funding can be unlocked from a wide range of international financial institutions, private investors, and local banks. However, accessing these sources of climate finance can represent a significant administrative burden and require detailed financial expertise. The Ministry of Finance should work to ensure that funding is available from institutions like the Green Climate Fund and Global Environmental Facility, while the Malawi Investment and Trade Commission (MITC) should coordinate outreach to institutional and private investors.



DE-RISKING PROJECTS

There are real and perceived risks that make it more difficult and expensive to access capital for power projects in Malawi.

Great progress has been made in the past few years, as government and development partners have acted to reduce risks through a range of guarantee mechanisms. This includes protection from currency risk through dollar-linked power purchase agreements and credit guarantees on off-taker payments. However, developers, investors, and key stakeholders in the power sector still identify high levels of risk related to the following: (1) contracts and licensing, (2) accessing local finance, and (3) sourcing hardware locally. These risks are estimated to increase the cost of capital by about 3.5%, with a range of additional risks adding a further 1%. The government should continue to address risks in these three areas, as outlined in the following paragraphs.

Streamlining the permitting process and strengthening the solicited bid process can reduce lead times and increase confidence.

The new IPP framework already clarifies processes and is designed to simplify procedures. The government needs to demonstrate commitment to this framework, increase transparency around bid solicitation, and improve communication channels with developers. DoEA should lead coordination among government agencies, and will need to ensure that a lack of alignment across government agencies will not prevent progress on high-priority projects.

Rapidly establishing a fully staffed single buyer unit will improve confidence in the sector.

The separate single buyer unit has already been registered as a legal entity—it must now be adequately staffed and start exercising its functions. Once it is fully operational and has a track record of success, the market will be perceived as more mature and lower risk.

Improving access to finance may require the addition of new program staff to develop structures and capacity.

The DoEA and Ministry of Finance should collaborate to increase the availability of affordable, flexible long-term financing to de-risk early investment and attract additional sources of commercial financing to Malawi's energy sector. They can do this through developing internal capacity and disseminating results, sharing lessons learned to build investor confidence.

Enforcing consistent and expedited customs clearing for energy project equipment will also require government commitment.

There is an immediate need to expedite hardware importation processes for energy projects. In the medium term, government should work to increase the cost-effective pathways for locally sourcing hardware.



TAKING ACTION

A set of simple actions can unlock the funding Malawi needs in a positive feedback loop that can help the energy sector develop rapidly, sustainably, and at the lowest cost (see Exhibit 6).

Government should take the lead in implementing these actions, coordinating actors, and communicating outcomes to demonstrate that the sector is moving forward.

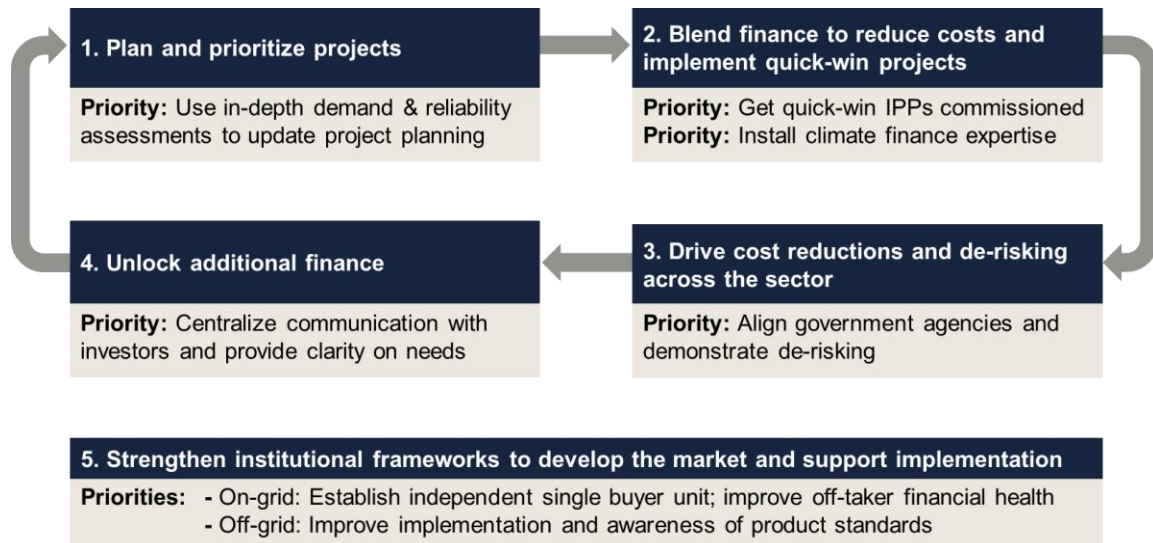


EXHIBIT 6: FIVE ACTION AREAS FOR SCALING UP SUSTAINABLE ENERGY INVESTMENT

DoEA has a remit to lead national energy planning efforts. They must use this position to coordinate activities among government agencies and ministries, including the Ministry of Finance, MERA, Electricity Generation Company of Malawi (EGENCO), ESCOM, Ministry of Lands, Department of Forestry, and others.

DoEA should:

- Help the first solar IPP projects be built and commissioned as quickly as possible, and then publicize their success
- Bring government agencies together to prioritize and implement de-risking actions
- Drive uptake of off-grid products standards in alignment with MERA
- Lead the establishment of the independent single buyer unit

MITC can use this study to improve the communication of needs and opportunities with the investment community.

MITC should act as a single point of contact with investors or developers, clearly communicating needs, priorities, and plans for the power sector.

Investors and the private sector should be responsive to the government's targets, drive cost reductions in their own processes, and build capacity to deliver major projects successfully.

The Development Partners (DPs) Working Group has the capacity to enable this development pathway through the provision of funding, technical assistance, and guarantee mechanisms.

The DPs Working Group should:

- Align the efforts of members to coordinate support to the government to meet national priorities
- Help increase financial flows, supporting the government in accessing climate finance





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