



Energy Policy Review

Ethiopia

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Executive summary

Ethiopia is one of Africa's largest and fastest-growing economies, which is reflected in its increasing regional influence and growing global presence. Major infrastructure investments are reinforcing and transforming the national energy landscape. This strong development vision aligns with Ethiopia's rising role as a regional and international leader.

Landmark projects such as the Grand Ethiopian Renaissance Dam (GERD) are not only major engineering achievements but also a step change in generation capacity, energy security and regional co-operation. Ethiopia hosted the Second Africa Climate Summit in 2025 and will host the 32nd Conference of the Parties (COP32) in 2027, placing the country at the centre of global climate negotiations at a time when the international discussion is shifting from target-setting to implementation, including large-scale electrification and investment.

Stronger institutions, better co-ordination and more robust data are essential for advancing Ethiopia's energy agenda. Energy policy often intersects with transport, industry, agriculture and other domains, making policy coherence essential to avoid fragmentation and support the implementation of the government's objectives. A dedicated cross-ministerial co-ordination platform led by the Ministry of Water and Energy (MoWE) could help align priorities and ensure that energy considerations are more systematically integrated into related sectors. Responsibilities for regulation, standards and licensing are spread across institutions, with unclear roles complicating the processes for investors and market participants. Further clarifying and formalising the mandates of ministries, regulators and public institutions could reduce duplication, strengthen accountability and improve decision making. Numerous institutions compile energy data, and the broader system remains fragmented. This weakens the consistency of national energy statistics, particularly

for demand-side data and less well-covered, but crucial areas such as biomass use, off-grid systems and small-scale generation. Strengthening demand-side data collection through existing household and enterprise surveys, alongside a clearer national plan for publishing energy data, would improve transparency, policy tracking and evidence-based decision making.

Ethiopia's power sector is becoming increasingly central to the country's economic and social development. Generation capacity has expanded rapidly in recent years, enabling a growing set of strategies covering electricity access, clean cooking, transport and industrial development. A strong and integrated power system planning framework is essential to ensure that expanding electricity generation delivers reliable, affordable and efficient service to a growing economy. High grid losses and low grid reliability reduce utility revenues and continue to hold back investment potential, as well as the implementation of national plans. Foreign exchange constraints and exchange rate volatility further complicate system planning by creating uncertainty about the cost and availability of the imported equipment, spare parts and technologies needed for grid expansion, maintenance and new generation projects.

Ethiopia's energy security depends on diversifying its energy mix, deepening regional integration and broadening its response to rising demand. With a fast-growing economy and population projected to reach 225 million by 2050, energy demand is expected to rise sharply, especially in buildings and transport, making secure and reliable energy supply increasingly critical. Traditional biomass still dominates total energy supply, while reliance on imported petroleum products creates fuel import risks, and a hydropower-dominated electricity system leaves the country exposed to hydrological and climate risks. Accelerating the deployment of solar, wind and geothermal while exploring the prudent use of domestic natural gas would help build a more balanced and resilient system. Ethiopia's growing role in regional electricity trade, including through the Eastern Africa Power Pool, offers an opportunity to improve flexibility and reliability, increase export revenues, and reinforce its position as a regional energy hub.

Ethiopia has made substantial progress in electricity access over the past two decades. The national electricity access rate increased from around 12% in the early 2000s to about 35% in 2024. This progress accelerated after 2015 as policy shifted from grid expansion alone towards last-mile connections and a stronger mix of on-grid and off-grid solutions. Despite these gains, around 85 million people still lack access to electricity under the IEA's basic service definition, and access remains highly

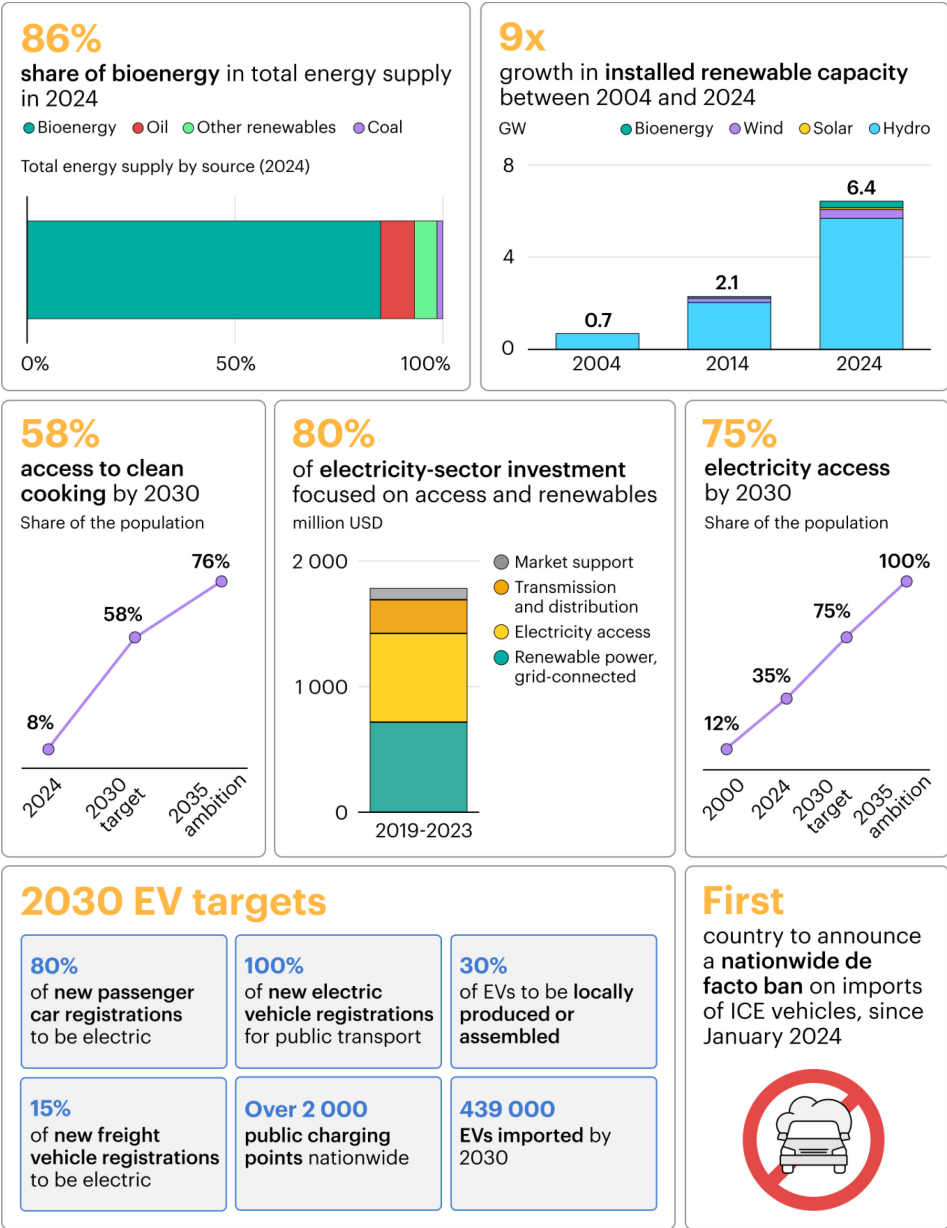
uneven, with urban access far ahead of rural areas. Ethiopia now aims to reach a 75% access rate by 2030 under the National Energy Compact and achieve universal access by 2035 under the National Electrification Program 3.0 (NEP 3.0). The main challenge is ensuring that access is reliable and affordable and supports higher electricity use. Grid reliability and service quality remain weak, constraining household consumption, productive uses and broader economic development, while upfront connection costs continue to prevent many households from connecting even where the grid is nearby. Off-grid solutions, including mini-grids and solar home systems, will be important for reaching remote communities, but their scale-up remains constrained by affordability, financing and regulatory challenges. Achieving Ethiopia's electricity access targets will, therefore, require not only more connections but also targeted grid modernisation, stronger affordability measures and greater support for viable off-grid delivery models.

Ethiopia's energy system is already strongly shaped by renewables. In 2024, renewable energy accounted for about 90% of total energy supply, of which 86% was bioenergy. Renewables supplied almost all electricity to the national grid. Hydropower remains the backbone of the power system, underpinned by the GERD, which has substantially increased generation capacity and reinforced Ethiopia's position as a regional electricity supplier. Ethiopia benefits from high-quality solar and wind resources, as well as substantial untapped geothermal potential, which could help diversify the electricity mix, reduce dependence on hydropower and strengthen resilience. Geothermal could provide firm and dispatchable renewable power, while solar and wind could complement seasonal variations in hydropower output. However, deployment of these technologies has so far progressed more slowly than planned, reflecting challenges related to financing, infrastructure, institutional co-ordination, foreign exchange limitations and project implementation. Ethiopia is also exploring the development of domestic biofuels as part of a broader strategy to strengthen energy security and decarbonise the road transport and aviation sectors. Expanding renewable technologies for productive uses in agriculture and industry, including solar irrigation, agrivoltaics and the direct use of geothermal heat, could improve productivity, reduce dependence on diesel and support rural development.

Ethiopia has made significant progress in expanding access to clean cooking. The number of people with access to modern cooking solutions is now 9 million higher than it was in the early 2000s, when only about 2.5% of urban residents used clean cooking solutions. However, rapid population growth has also meant that, despite gains in absolute numbers, overall access rates have improved only modestly. Ethiopia thus has one of the lowest clean cooking access rates in the world, with

around 120 million people still relying on traditional cooking methods in 2024. Of those, around 8% rely primarily on charcoal, used mainly in urban areas, while roughly 92% depend on firewood. Ethiopia has set ambitious targets of 58% by 2030 and 76% by 2035, with electric cooking and advanced biomass stoves expected to account for most new access. Meeting these targets would extend clean cooking solutions to approximately 91 million people. Success also depends on integrating clean cooking objectives into power sector planning, particularly to anticipate additional demand and manage grid reliability concerns. At the same time, affordability remains one of the main barriers to the clean cooking transition in Ethiopia. For many households, the upfront cost of clean cookstoves and equipment remains prohibitive. While some transitional biomass and biogas solutions can be affordable, broader uptake of advanced biomass and electric cooking requires targeted financial support, consumer financing and stronger supply chains.

To date, investment patterns highlight progress and remaining challenges. In the power sector, financing has been dominated by the public sector and concentrated in electricity access and grid-connected renewable projects, with development finance institutions playing a central role and commercial finance remaining limited, particularly outside generation. In clean cooking, historical investment has been comparatively modest and heavily grant-based, covering only a small fraction of future needs under the National Clean Cooking Roadmap. Ethiopia has improved its broader investment environment through macroeconomic and regulatory reforms, including measures to ease foreign exchange constraints and strengthen the framework for private participation, including foreign investment. However, barriers to investment remain, as shown by a persistently high cost of capital. Further reforms to improve bankability, reduce investor risk and expand the use of concessional and blended finance remain essential.



Policy recommendations for Ethiopia

General energy policy

1. Enhance intra- and inter-ministerial and cross-sectoral co-ordination to promote effective development of Ethiopia's energy sector and ensure the mainstreaming of energy issues and priorities across all sectors.
2. Clarify each ministry's and government institution's institutional mandates, roles and responsibilities to improve predictability for investors.
3. Systemise data collection to improve the tracking, monitoring and reporting of energy data.
4. Use the momentum of hosting COP32 to accelerate progress on energy and attract investment.

Power sector

5. Enhance clarity and transparency for market participants and investors about the market structure.
6. Enhance energy security and resilience through diversified power generation and regional power trading.
7. Strengthen integrated power system planning to improve efficiency and reliability and meet the country's growing economic and social needs.
8. Further enhance the overall energy business environment to accelerate access to private capital.

Renewables

9. Design a complementary renewable-based power system.
10. Promote the deployment and use of renewable energy technologies for power and heat in economic activities.

11. Ensure the long-term sustainability of Ethiopia's domestic bioethanol and biodiesel production.
12. Design and implement a well-structured, transparent and competitive auction system.

Access to electricity

13. Prioritise reliable electricity services through targeted grid upgrades in high-potential areas to unlock a virtuous cycle of demand growth, stronger utility finances and sustainable electrification.
14. Address affordability barriers to support the achievement of on-grid and off-grid electrification targets.
15. Enable private mini-grid investment through clearer integrated geospatial planning, reduced regulatory uncertainty and targeted market facilitation.

Access to clean cooking

16. Develop a comprehensive implementation plan for the Clean Cooking Roadmap, aligned with the National Electrification Program, that sequences grid modernisation and expansion with households' ability to adopt and afford clean cooking solutions.
17. Consider broadening the mix of clean cooking solutions and prioritising high-efficiency stoves to help meet the Clean Cooking Roadmap's access rate targets.
18. Create an enabling environment for clean cooking that attracts the investment required for the transition, strengthens local market actors and drives household adoption.

General energy policy

Endowed with vast renewable energy resources, including significant hydropower, wind, solar and geothermal potential, Ethiopia is well-positioned to anchor sustainable growth through clean energy. Its strategic location in the Horn of Africa also strengthens its role as a regional power hub, with growing prospects for cross-border electricity trade and integration. These ambitions align with the Ten-Year Development Plan (2021-2030), which emphasises expanding dependable power supply to support productivity and jobs and improve the standard of living.

Ethiopia's energy sector has made extensive progress in recent years in policy and institutional development. Major infrastructure developments further underscore this momentum. Landmark projects such as the Grand Ethiopian Renaissance Dam (GERD) represent not only engineering achievements but also a step change in national generation capacity, energy security and regional co-operation.

After hosting the Second Africa Climate Summit in 2025, Ethiopia is set to host COP32 in 2027, placing the country at the centre of global climate negotiations. With one of the world's most decarbonised electricity systems, Ethiopia serves as a strong reference as discussions increasingly focus on implementation, electrification and scaling clean energy investment. Furthermore, Ethiopia is opening its economy and energy sector to greater international engagement and investment, reinforcing its role as a key partner for governments, financiers and industry in Africa's clean energy transition.

Sustaining progress will require addressing key challenges. Stronger co-ordination across institutions is essential to accelerate implementation. Greater regulatory clarity can build confidence for market participants and investors. Power system planning

will need a more balanced renewables mix beyond hydropower. Expanding clean energy access also remains a national priority, given widespread reliance on traditional biomass.

Ethiopia's partnership with the IEA has grown steadily in recent years, reflecting a shared commitment to advancing sustainable, secure and inclusive energy systems. Building on a week-long in-depth review mission conducted with the government of Ethiopia in Addis Ababa in late 2025, this report aims to support these efforts by providing an objective assessment of Ethiopia's progress and key challenges while highlighting opportunities to accelerate the implementation of its energy reform agenda as the country continues to build a secure, sustainable and inclusive energy future.

Country overview

The Federal Democratic Republic of Ethiopia (hereafter, "Ethiopia") is located in the Horn of Africa, bordering Djibouti, Kenya, Somalia, South Sudan and Sudan. The capital city, Addis Ababa, is located near the geographical centre of the country and serves as a major diplomatic and economic hub for the African continent. Ethiopia is landlocked and relies primarily on transport corridors through neighbouring Djibouti for trade and logistics, while also pursuing additional routes, including the Berbera corridor to Somaliland (Somalia), to improve resilience and reduce logistical bottlenecks.

Political structure

Ethiopia is a federal republic with a parliamentary system composed of 12 regional states and 2 chartered cities, Addis Ababa and Dire Dawa. Executive authority rests with the Prime Minister and the Council of Ministers.

Legislative power is vested in a bicameral federal parliament comprising the House of People's Representatives and the House of the Federation. The judiciary is formally independent, with the Federal Supreme Court serving as the highest judicial authority. Ethiopia's federal structure plays a key role in energy development and implementation, particularly for electrification, land use and the implementation of national policies at the regional and local levels.

Population

Ethiopia's population reached just over [132 million](#) in 2024, making it the second-most populous country in Africa. With an annual population growth rate of around 2.6% and almost [40% of the population](#) under the age of 14, demographic pressure

is expected to remain strong. The population is expected to reach [225 million](#) by 2050, offering a significant potential labour force, but also placing growing demands on energy supply, infrastructure and public services.

At the same time, Ethiopia faces substantial humanitarian and development challenges. In 2025, more than [10 million Ethiopians](#) were estimated to be affected by acute food insecurity, driven by a combination of conflict, drought, flooding, earthquakes and economic pressures, including high inflation. Over one-third of the population lives on less than [USD 3 per day](#) (in 2021 purchasing power parity terms). While the [poverty rate](#) has declined markedly over the past two decades, recent shocks, including Covid-19, conflicts in the northern parts of the country, severe droughts, slower gross domestic product (GDP) growth and high inflation, have reversed some of these gains, with the share of the population living below USD 3 per day (in 2021 purchasing power parity terms) rising from 33% in 2016 to 39% in 2021. The poverty rate is projected to reach 43% in 2025. Ethiopia also hosts more than 1 million refugees, mainly from Eritrea, Somalia, South Sudan and Sudan, adding further pressure on resources.

Economy

Despite significant demographic and humanitarian pressures, Ethiopia remains one of the largest economies in sub-Saharan Africa. In 2024, GDP was estimated at around [USD 150 billion](#) and GDP per capita was [USD 1 134](#) (current USD). Following a period of largely double-digit growth between 2008 and 2021, expansion has moderated but [remains strong at 7.6%](#). Looking ahead, GDP is projected to reach roughly [USD 212 billion](#) by 2030, reflecting continued economic expansion.

Income inequality remains low by regional standards, with a [Gini index of 0.31](#), making Ethiopia one of Africa's most equal countries. Ethiopia's [Human Development Index was 0.497](#) in 2023, placing it 180th globally, and grew by about 1.4% per year on average between 2010 and 2023, indicating sustained long-term improvements despite recent shocks. Development gains have been supported by expanding infrastructure and services, including growth in digital financial platforms such as Telebirr, which reached over 50 million accounts within three years of its launch in May 2021. Mobile money services have since been scaled further through wider agent networks, supporting broader use of digital payments. Progress in the services and infrastructure sectors is also reflected in the expansion of Ethiopian Airlines, Africa's largest carrier, alongside plans to develop a new airport in Bishoftu, near

Addis Ababa. The services sector contributes the most to the economy, accounting for about 40% of GDP, followed by agriculture and industry, which represent almost 35% and 25%, respectively.

Ethiopia's trade structure remains heavily imbalanced. Imports are dominated by petroleum products, chemical fertilisers, vehicles, raw sugar and gas turbines. Exports are concentrated in primary commodities, particularly coffee, which accounts for nearly 50% of total exports, alongside dried legumes, flowers and gold. Ethiopia's largest trading partners are the European Union, Saudi Arabia, the United States, the United Arab Emirates and the People's Republic of China (hereafter, "China").

In fiscal year (FY) 2023/2024, Ethiopia's total merchandise exports were [USD 3.8 billion](#), or a 4.8% increase from the previous year, while total merchandise imports reached USD 18.4 billion, a 7.5% annual growth due to higher import bills for goods. The increase in import bills outpaced the growth in export earnings, leading to a widening of the trade deficit. The merchandise trade deficit widened to USD 14.6 billion in FY 2023/2024, an 8% increase from the year before.

In response to these challenges, the government has introduced significant macroeconomic reforms. In 2024, the [National Bank of Ethiopia](#) reformed and liberalised its foreign exchange regime, moving from a tightly-managed system to a more market-based regime and allowing the Ethiopian birr (ETB)¹ to depreciate from its 33.6% peak in early 2023.

Institutional framework

At present, multiple government entities have mandates related to energy policy, investment promotion, licensing, regulation and fiscal oversight, including the MoWE, the Ministry of Planning and Development, the Ministry of Finance, the Ethiopian Investment Commission (EIC), and the Petroleum and Energy Authority (PEA).

The MoWE oversees national energy policy development, power supply, energy resource development and renewable energy projects. Several semi-autonomous government agencies operate in the energy sector, most notably Ethiopian Electric Power (EEP) and Ethiopian Electric Utility (EEU), which were created when the Ethiopian Electric Power Corporation unbundled in 2013.

¹ Exchange rate: 1 Ethiopian birr (ETB) = 0.006457 USD (as of 1 January 2026).

[EEP](#) is responsible for electricity generation and transmission. It plans, designs, builds, operates and maintains national grid generation assets and constructs and operates transmission lines and substations of 66 kilovolts (kV) and above. EEP currently owns almost all operational power plants in Ethiopia. The government aims to have private sector participation in future investments in hydro, wind, solar and geothermal projects, but with EEP acting as the primary electricity purchaser.

[EEU](#) is responsible for electricity distribution and retail supply. It operates and maintains the 45 kV and 66 kV sub-transmission network and the low- and medium-voltage distribution networks; connects customers; and manages metering, billing and customer service. EEU also implements universal electrification programmes and constructs and maintains distribution infrastructure. In addition, EEU is supporting the development of approximately 100 World Bank-financed mini-grids.

[PEA](#) was created in 2021 and succeeded the Ethiopian Energy Authority, taking over as the country's regulatory authority and combining the petroleum and energy sectors under one entity. PEA is, among other things, responsible for formulating and implementing legal frameworks in the sector and reviewing the national electricity tariffs. It is currently operating under the Ministry of Trade and Regional Integration.

The [Ethiopian Statistical Service \(ESS\)](#), the national statistics office, provides official socio-economic, demographic and household survey data that underpin energy planning and monitoring, including indicators relevant to electrification, energy access and household energy use.

The [EIC](#) was established in 2014, replacing the former Ethiopian Investment Agency. It is the federal government's principal investment authority, responsible for promoting and facilitating domestic and foreign investment, issuing investment permits, and co-ordinating with relevant ministries and sector regulators. In the energy sector, the EIC acts as an entry point for investors, while sector-specific licences and regulatory approvals remain the responsibility of specialised entities such as PEA and, for power projects, EEP and EEU.

To promote rural electrification, the government established the [Rural Electrification Fund \(REF\)](#) in 2003 to provide loans and technical services for rural electrification projects led by private operators, co-operatives and local communities. However, constrained funding has limited the REF's operational capacity. To support rural energy development, the [Ethiopian Rural Energy Development and Promotion Center](#) was established in 2002. It supports national energy resources studies, data

collection and analysis, rural energy policy formulation, technology research, and development to promote appropriate energy technologies in rural areas. It also serves as the executive arm of the REF.

While each institution has a defined role, the boundaries between mandates are not always sufficiently delineated in practice. For investors, this can translate into overlapping procedures and uncertainty regarding which institution is ultimately responsible for specific decisions. For example, investors may need to register with the EIC, obtain sector-specific licences from PEA, then revert to other entities to complete approval processes, creating a circular administrative pathway. Such fragmentation not only increases transaction costs but also generates the risk of inconsistent guidance or delays, particularly when responsibilities are misunderstood or communication between institutions is limited.

This challenge is compounded by co-ordination gaps between federal and regional governments. In the absence of clearly articulated roles and structured co-ordination mechanisms, regional authorities may interpret or apply regulatory requirements differently, affecting predictability. This variability can undermine investor confidence and complicate project planning, as observed in distributed energy markets such as solar home systems or mini-grids.

The number of institutions involved in Ethiopia's energy sector underscores the importance of clear mandates and structured co-ordination mechanisms to align priorities, support effective policy and project implementation in the energy sector, and improve predictability for investors and market participants.

Energy and climate policy landscape

A strong set of strategies and policies

Ethiopia has developed a strong set of energy policies and strategies over the past decade. The National Energy Policy, originally [adopted in 1994](#) and [revised in 2015](#), is currently being further revised to better reflect evolving sector priorities, technological developments and climate commitments. In the future, the government aims to review and update the policy on a five-year basis.

The [National Electrification Program](#) is Ethiopia's flagship programme for expanding access to electricity. Following NEP 1.0 and 2.0, the government plans to launch NEP 3.0 in 2026, aligning electrification pathways with the National Energy Compact and covering households, institutions and productive uses.

In September 2025, Ethiopia launched its [National Energy Compact](#),² which outlines data-driven targets, policy measures and resource commitments to accelerate progress towards universal access to energy. Key targets include increasing basic electricity access to 75% of the population, expanding clean cooking access to 58% of the population, raising non-hydro renewable capacity to at least 15%, expanding generation capacity to 14 gigawatts (GW), and mobilising at least USD 3.06 billion in private capital.

The government aims to set up a Compact Monitoring and Delivery Unit within the MoWE to support implementation of the National Energy Compact's commitments. However, meeting the targets will require additional investment, as the current available financing is insufficient to meet the commitments. To enable effective monitoring and course correction, stronger and more systematised energy data collection, sharing and reporting across institutions will be essential.

Other energy and development plans also contribute to shaping the energy sector in Ethiopia. The [Homegrown Economic Reform Agenda \(2020\)](#) identifies energy as a foundation for inclusive and sustainable growth, with a focus on improving utility performance, strengthening regulation, restoring financial sustainability and enabling private investment. Priority measures include strengthening EEP and EEU governance and efficiency, reducing technical and commercial losses, empowering PEA to set transparent rules and performance standards, moving towards cost-reflective tariffs, and expanding private participation through independent power producers and public-private partnerships (PPPs), including updated rules for off-grid and decentralised systems.

The energy sector is also highlighted as a priority in the [Ten-Year Development Plan \(2021-2030\)](#), which outlines Ethiopia's national development vision for the decade and aims to make the country an "African Beacon of Prosperity" by 2030. The Plan's

² The National Energy Compact is part of the Mission 300 Initiative launched by the World Bank and the African Development Bank in January 2025 which aims to connect an additional 300 million Africans to electricity by 2030. As of December 2025, 29 African countries had submitted their energy compacts.

energy objectives include expanding access to reliable energy supply; scaling clean energy technologies in rural areas; strengthening electricity infrastructure; diversifying energy sources; and enabling private investment.

Earlier, the [Growth and Transformation Plan II \(2015-2020\)](#), which targeted an annual growth rate of 11%, set energy priorities linked to its growth agenda, including increasing electricity generation, improving distribution service quality and expanding transmission lines. The Growth and Transformation Plan II was not renewed for a third phase; the Ten-Year Development Plan now provides the overarching national development framework.

The [National Sustainable Energy Development Strategy 2024-2030](#) is the most recent strategy for the energy sector. It provides an integrated vision for the energy transition, linking energy to education, healthcare, gender, productivity and climate resilience. By nature, such a strategy requires the involvement of a diverse group of stakeholders.

The [Climate Resilient Green Economy](#), launched in 2011 in the lead-up to COP17, is Ethiopia's national initiative to pursue climate-resilient, carbon-neutral and sustainable development while maintaining rapid economic growth. It has shaped subsequent climate and energy planning, with priority actions focused on renewable electricity expansion, improved cookstoves and rural energy access, reduced emissions from livestock, and reducing deforestation and forest degradation through REDD+³.

The [National Adaptation Plan \(2019-2034\)](#) provides a 15-year, multisector framework to integrate adaptation into national, sectoral and regional planning, addressing earlier plans that were shorter term and more narrowly focused. Building on the Climate Resilient Green Economy, it identifies climate vulnerabilities across priority sectors and presents measures to strengthen resilience over the long term.

Ethiopia's [Long-Term Low Emission and Climate Resilient Development Strategy \(2020-2050\)](#), developed from the Nationally Determined Contributions (NDCs),

³ REDD+ is a framework established under the United Nations Framework Convention on Climate Change (UNFCCC) that incentivises developing countries to reduce emissions from deforestation and forest degradation, and to conserve, sustainably manage and enhance forest carbon stocks.

supports higher ambition over time and informs future NDC updates. The NDC 3.0 is aligned with the Ten-Year Development Plan and builds on institutional knowledge and lessons learnt.

Ethiopia's robust set of energy policies and strategies demonstrates its ambition to achieve the country's energy targets and advance broader socio-economic development goals. However, translating these ambitions into tangible results will require clear, detailed, adequately resourced implementation plans. While policy objectives are well-articulated, the institutional environment through which these objectives are implemented remains complex and, at times, fragmented. This institutional fragmentation risks slowing implementation, creating uncertainties for investors and reducing effectiveness.

Given the inherently cross-sectoral nature of energy policies and planning spanning transport, agriculture, climate and environment, trade, industry, housing, etc., effective delivery will depend on strong interministerial co-ordination and sustained stakeholder collaboration. Energy policy involves a wide range of institutions and actors. Ensuring policy coherence and avoiding fragmentation, therefore, requires structured and institutionalised co-ordination mechanisms and will help avoid falling short on the government's objectives.

While some platforms for co-ordination mechanisms exist in the sector, such as the Development Partners Group, which convenes periodically to exchange on shared priorities, these engagements are not always regular, sufficiently structured or systematically aligned with implementation needs. Strengthening, formalising and expanding such mechanisms would help ensure more coherent and effective delivery. In particular, platforms that meaningfully engage non-governmental stakeholders such as the private sector are vital. Engaging them early and consistently in the formulation of new strategies and policies is essential to ensure that the resulting frameworks are well-informed, inclusive and grounded in the country's practical realities and institutional context.

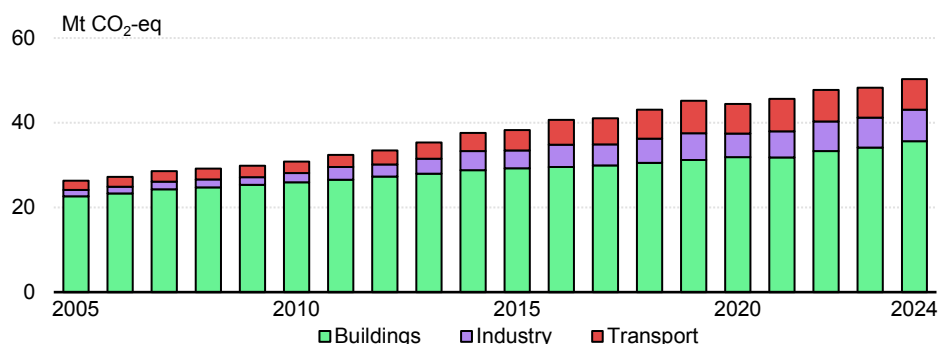
The IEA commends the government of Ethiopia for its efforts to consult non-governmental stakeholders in the preparation of key strategies, such as the National Clean Cooking Roadmap. Nonetheless, these engagement processes could be more consistent, timely and substantive.

High vulnerability to climate change

Emissions and risk profile

Like most sub-Saharan African countries, Ethiopia contributes very little to global climate change, accounting for only a fraction of global energy-related CO₂ emissions. In 2024, Ethiopia's energy-related greenhouse gas emissions reached 50.3 million tonnes carbon dioxide (Mt CO₂), almost double the level two decades ago. Emissions are driven by the buildings sector, which accounts for more than 70% of total emissions, followed by the transport and industry sectors at around 15% each. Oil accounts for 71% of total CO₂ emissions from fuel combustion, followed by natural gas at 15% and bioenergy at 14%. According to Ethiopia's NDC 3.0, economy-wide emissions averaged [273.5 Mt CO₂](#) annually between 2020 and 2023.

Energy-related emissions by sector in Ethiopia, 2005-2024



IEA. CC BY 4.0.

Note: Emissions from electricity and heat generation are negligible (less than 0.1 Mt CO₂) and not visible in the figure.

Source: IEA (2026), [Greenhouse Gas Emissions from Energy](#).

Ethiopia is one of the [top 10](#) most vulnerable countries to climate change, making it also more likely to have high costs for adapting to and mitigating the effects of climate change. The agricultural sector [employs 61%](#) of the population and contributes roughly one-third to GDP, making the Ethiopian economy very vulnerable to climate

change, especially extreme weather conditions. Average temperatures have increased by around [1°C in the last 75 years](#), with increasingly intense and recurrent cycles of flooding and drought.

The [La Niña event](#) that occurred in the Horn of Africa from 2020 to 2022 was the most severe in 70 years due to its high intensity and long duration. The region experienced extreme rains and floods in 2019-2020, followed by the La Niña droughts in 2020-2023, then severe floods again in 2023-2024. Since 2010, the Horn region has experienced [eight failed rainy seasons](#), five average seasons and three wet seasons, all likely influenced by climate change. These extreme weather events have devastating effects on the lives and livelihoods of millions of people. In 2024, Ethiopia experienced two [major landslides](#) triggered by heavy rains, killing hundreds and displacing more than 15 000 people. The [United Nations Office for the Coordination of Humanitarian Affairs](#) has found that at least 4 million people in Ethiopia require urgent food and nutritional assistance due to food scarcity impacted by climate change. These repetitive climate shocks have amplified the costs of vulnerability and reinforced the need for climate-resilient development. In response, the government has increasingly mainstreamed climate considerations into its National Development Plans.

Nationally Determined Contribution

Ethiopia submitted its [NDC 3.0](#) in September 2025, covering the period 2025-2035. In the NDC 3.0, Ethiopia commits to a 70.3% reduction in economy-wide emissions by 2035 relative to the revised business-as-usual pathway, up from 68.8% under [NDC 2.0](#). Conditional on international support, land use, land-use change and forestry is expected to deliver the largest share of emissions abatement, accounting for almost 80% of total reductions in 2030, driven by the afforestation efforts under the Green Legacy Initiative. Agriculture, driven by livestock, is expected to remain the largest contributor to economy-wide emissions in the coming years.

The NDC 3.0 highlights the achievements from the NDC 2.0, which include the Green Legacy Initiative, encompassing restoration and afforestation programmes, accelerated renewable energy generation and electrification of the transport sector; and the establishment of the Green Legacy and Degraded Landscapes Restoration Special Fund, which is financed through annual federal budget allocations of a mandatory contribution of 0.5-1.0% of Ethiopia's total domestic financial resources.

The NDC 3.0 also notes that economy-wide emissions in 2020-2025 were well below the business-as-usual and the unconditional pathways but exceeded the conditional pathway.

Although energy-related emissions account for only 9% of Ethiopia's economy-wide emissions, they play an important role in NDC 3.0, particularly in preventing future emissions growth as demand expands. Under the business-as-usual pathway, energy-related emissions are projected to increase significantly by 2035, with growing energy demand. NDC 3.0, therefore, focuses on avoiding higher emissions by expanding renewable electricity generation, improving energy efficiency and accelerating electrification, particularly in transport. Plans also envisage improving climate resilience and adaptation, including through a more diverse electricity mix.

In the NDC 3.0, Ethiopia commits to mobilise a minimum of 22.5% of its financing needs from domestic resources, such as through the Green Legacy and Degraded Landscapes Restoration Special Fund. The remaining 77.5% is expected to come from external support. By specifying priority measures, targets and financing needs, it provides a clearer basis for partners and financiers to align concessional funding and investment with power system upgrades, renewable deployment and electrification. In addition, Ethiopia's National Carbon Market Strategy to 2035 identifies renewable energy, clean cooking, energy efficiency and electric mobility as priority sectors for carbon market engagement, positioning carbon finance as a complementary mechanism to mobilise resources for energy transition investments.

Energy statistics and data systems

Multiple institutions compile energy data in Ethiopia, led by the MoWE and drawing on data from power sector entities, such as EEP and EEU, as well as public bodies involved in trade and fuels, notably the Ministry of Trade and Regional Integration. However, the broader energy information system remains fragmented, with limited harmonisation of definitions, coverage and reporting practices across institutions. Weak co-ordination and gaps in demand-side data collection affect not only statistical outputs but also the reliability of energy planning and policy monitoring. This can lead to inconsistencies when compiling a national energy balance, particularly for newer or less-regulated parts of the system, such as mini-grids, independent power producers, and charcoal and biogas production. The IEA has previously examined

Ethiopia's energy data challenges in its report entitled *A Review of Ethiopia Energy Statistics and Recommendations to Bridge Data Gaps*.⁴

Only limited parts of the key data required for a high-quality, reliable national energy balance are routinely available. Supply-side data are relatively strong for electricity and fuel imports, but demand-side data remain weak. Data on final energy consumption are often partial or missing across sectors, which is especially problematic for biomass, including fuelwood production and use, which dominates total final energy consumption (TFEC). Other gaps include limited information on final consumption of petroleum products and coal, little to no structured data on biogas production and use despite active programmes, incomplete visibility on off-grid and isolated networks, and small-scale generation sources that matter for rural services.

Limited co-ordination and an unclear division of responsibilities, especially between the MoWE and the Ethiopian Statistical Service, affect the quality and consistency of domestic data collection. In practice, the absence of a formal division of labour arrangement undermines the sustainability and quality of data collection, particularly for demand-side information that is best captured through household and enterprise surveys. At the same time, while many stakeholders maintain sectoral databases or statistics platforms, official datasets are seldom published, and metadata and update cycles are not consistently defined. Together these issues constrain transparency, hinder cross-institution alignment and weaken the tracking of progress.

Energy supply and demand

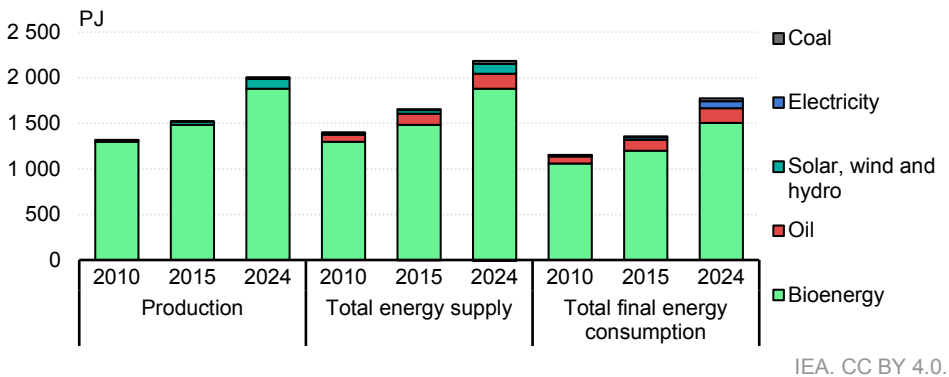
Ethiopia's domestic energy production accounted for around 92% of total energy supply in 2024. Bioenergy dominates the energy mix, accounting for 86% of total energy supply. Oil contributes 8% while other renewables such as solar, wind and hydro represent roughly 5%. Coal makes up about 1%. While some coal is imported, all oil is imported, as Ethiopia does not produce oil nor natural gas. Bioenergy (dominated by traditional biomass such as fuelwood, charcoal and agricultural residues) is mainly used in the residential sector, primarily for cooking and heating.

Oil consumption is concentrated in the transport and industrial sectors, accounting for about 59% and 34%, respectively. Diesel accounted for about 64% of oil products consumed in 2024, followed by gasoline at 19%. Liquefied petroleum gas (LPG) represents a very small proportion of oil consumption. Ethiopia currently does not

⁴ This report is not public. It was elaborated within a multiyear programme funded by the European Commission and shared only with the government of Ethiopia.

have any crude oil refining capacity nor any crude oil production, meaning that all petroleum products are imported. However, the existence of proven hydrocarbon resources has sparked interest in the development of domestic production.

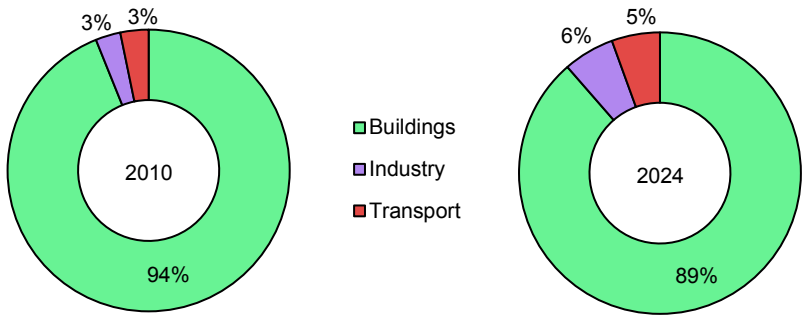
Key energy indicators in Ethiopia, 2010-2024



Note: PJ = petajoule.
Source: IEA (2026), [World Energy Balances](#).

The buildings sector accounts for the vast majority of Ethiopia's energy consumption (89%), followed by the industry and transport sectors at around 6% and 5%, respectively.

Total final energy consumption by sector in Ethiopia, 2010, 2024



Source: IEA (2026), [World Energy Balances](#).

Although it accounts for just 4% of TFEC, electricity consumption has more than quintupled, from 3.8 terawatt hours (TWh) in 2010 to 21 TWh in 2024, driven by increasing electrification and rising residential and commercial demand. Despite these gains, electricity consumption per capita remains low at around 150 kilowatt hours (kWh) – well under the continental average of approximately 550 kWh – but continues to increase.

End-use sectors

Buildings

As mentioned above, the buildings sector is the dominant energy-consuming sector in Ethiopia, accounting for as much as 89% of TFEC. While the buildings sector includes residential as well as commercial and public services, residential buildings account for about 96% of the sector's energy consumption, used primarily for cooking and, to a much lesser extent, space and water heating. Consumption in the sector increased by about 45% from 2010 to 2024. In 2024, bioenergy accounted for 96% of buildings TFEC, with the remaining consumption from electricity (4%) and a very small amount from oil products (<1%). Electricity consumption in the sector has increased almost fivefold but still represents only a very small share of consumption. Bioenergy has been the primary driver of overall growth in energy consumption in the buildings sector over the past two decades, increasing by over 40% since 2010. (For more information on bioenergy, see the section on Access to clean cooking; for more information on electricity consumption, see the section on Electricity demand in the Power sector chapter.)

Ethiopia's [Energy Efficiency Program and Activity Plan](#) calls for energy efficiency programmes such as implementing building codes and labelling, energy audits in larger buildings, and awareness training on energy efficiency. Building energy efficiency provisions have been developed within Ethiopia's construction regulatory framework, but implementation and enforcement remain limited and uneven. The Action Plan has placed establishing building codes under medium-term projects, considering them less urgent than other projects, such as industrial programmes and the implementation of minimum energy performance standards (MEPS).

Ethiopia's regulatory framework enables the relevant authorities to establish MEPS and energy labelling programmes. The Ethiopian Standards Agency establishes national standards, which are regulated through the Ministry of Trade. Strengthening regulatory enforcement, accelerating the adoption of mandatory

building codes and expanding financing mechanisms for efficient construction and retrofits will be critical to moderating future demand growth. Given the continued dominance of biomass in residential buildings, energy efficiency measures will need to be complemented by scaled-up deployment of clean cooking solutions to reduce reliance on traditional fuels.

Electrification, particularly through high-efficiency heat pumps, electric cooking technologies and smart appliances coupled with renewable integration, can simultaneously reduce final energy intensity and enable deeper system optimisation. However, electrification must be efficiency-led. Well-designed policy packages that combine mandatory building codes, appliance standards, targeted retrofit finance and grid planning can ensure electrification moderates overall energy demand growth.

Transport

The transport sector accounted for around 5% of Ethiopia's total final consumption in 2024, but is the primary end user of petroleum products, consuming around 60% of all oil products. After industry, transport has grown faster than any other sector in terms of final energy consumption over the past decade, having expanded by over 160% between 2010 and 2024. Energy consumption in the transport sector is dominated by oil products at 99%, with a minimal proportion of bioenergy and electricity consumption, although recent progress in the uptake of electric vehicles (EVs) may mean that electricity consumption is higher in 2025 (see the Power sector chapter).

The number of registered vehicles in Ethiopia is estimated at around [1.4 million](#) in 2023. For a long time, the country had one of the lowest motorisation rates in Africa, with just [6.7 vehicles per 1 000 people](#) in 2016, compared to the African average of 73 vehicles per 1 000 people. Used passenger vehicles accounted for around 85% of total vehicle imports. Historically high import duties of up to 200%, accompanied by foreign currency shortages, contributed to the country's low rate of vehicle ownership.

In January 2024, Ethiopia became the first country in the world to announce a nationwide ban on the [importation of internal combustion engine \(ICE\) vehicles](#), with the aim of reducing fuel import costs and air pollution. At the end of 2025, no official prohibition was implemented, but the prohibitively high import duties on ICE vehicles are functionally enforcing the ban. Combined with reduced taxation on EVs, this serves as an incentive for EV adoption (see more in the Power sector chapter).

Transport sector energy demand is [expected to increase](#) due to a growing population, growing urbanisation rates and rising vehicle ownership. However, a higher EV adoption rate and fuel efficiency improvements will likely reduce reliance on imported oil over time.

Industry

The industry sector accounts for only a small proportion (6%) of overall energy consumption. Oil products are the dominant source of TFEC at 54%, followed by coal (30%) and electricity (16%). Ethiopia's [main industrial sectors](#) are cement production; metal and metal engineering; chemical industries; textile and garment production; leather and leather article production; agro-processing industries; and micro and small enterprises.

TFEC in the sector more than tripled from 2010 to 2024. Coal has seen the largest increase, growing from only 1 petajoule (PJ) in 2010 to 34 PJ in 2024, while oil consumption doubled over the same period, from 27 PJ to 56 PJ, and electricity consumption more than tripled, from 5 PJ to 17 PJ. The rapid growth in coal also means that Ethiopia consumes around 1.5 million tonnes (Mt) of coal per year, a third of which is imported, mostly for cement production, as well as for steel and ceramic production. To reduce dependence on imports and secure coal supplies for the industry sector, in February 2026, Ethiopia inaugurated the [Arjo Coal Processing Factory](#), a coal washing and processing plant located in the Oromia Region. With a reported production capacity of up to 200 tonnes per hour, the plant is seen as a flagship project for import substitution. It has contributed to replacing imported washed coal with domestic supply and the government has presented it as a milestone in the country's broader industrial transformation agenda.

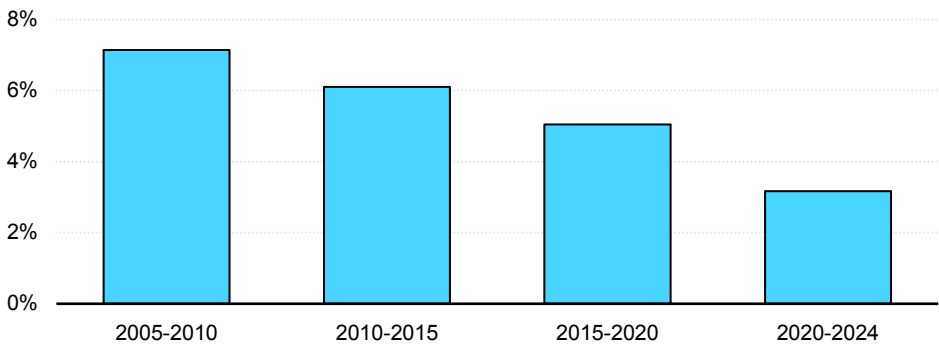
The development of a domestic fertiliser industry is also strategically important for Ethiopia's food security and productivity and is aligned with the country's industrialisation strategy. As such, Ethiopia has started exploring opportunities for developing a domestic market and production. In 2021, the Ethiopian government and Morocco OCP Group signed an agreement to build a [fertiliser complex in Dire Dawa](#) using natural gas. Phase I of the project would involve a production of 2.5 Mt, expanding to 3.8 Mt in Phase II. In July 2025, Nigeria's Dangote Group and the Ethiopian Investment Holdings signed an agreement to develop a [fertiliser production complex in Gode](#) in the eastern part of the country. The plant is expected to produce 3 Mt/yr of urea and nitrogen-based fertilisers for both the local and export markets.

The Ethiopian government has constructed 13 [industrial parks](#), developed and managed by the Industrial Parks Development Corporation, a public enterprise. The aim of the industrial parks is to advance Ethiopia's industrialisation by providing integrated infrastructure for domestic and foreign investors. In late 2024, 11 of the 13 parks were designated as special economic zones, which aim to make it easier, cheaper and more attractive for businesses to invest and operate. These zones are designed to attract more foreign direct investment, create jobs, and enhance trade and productivity. The special economic zones are often provided with better power, water, transport and Internet than areas outside the zones, which can make them more energy-efficient areas for industrial activity. Industrial parks in Ethiopia are heavily export-oriented, focused on textiles, apparel and leather, but the government is aiming to establish an industrial park dedicated to manufacturing EVs (see the section on Transport).

Energy intensity and efficiency

Energy intensity in Ethiopia is relatively high compared to other sub-Saharan African countries, reflecting the structure of the economy and the widespread use of traditional biomass, at almost 6 000 megajoules (MJ) per thousand USD of GDP (in 2015 purchasing power parity), compared to only about 3 800 MJ for Africa as a whole. Average annual energy intensity improvements in Ethiopia have slowed over the past two decades. However, its overall energy intensity decreased by around 50% between 2010 and 2024, a much higher rate than most other countries, and much higher than the African average of 11%. Annual energy intensity improvements have generally been over 4%, in line with the global ambition to double energy efficiency progress by 2030 (COP28 pledge), but have slowed in recent years, reflecting moderating economic growth alongside continued growth in energy demand. Despite the recent slowdown, energy intensity still declined by an average of around 3% per year over 2020-2024, roughly twice the global average of about 1.8%.

Average annual energy intensity improvement in Ethiopia, 2005-2024



IEA. CC BY 4.0.

Note: Energy intensity improvements are calculated as the ratio of total energy supply to GDP.
Source: IEA (2026), [World Energy Balances](#).

Energy security

Ethiopia’s total energy supply is dominated by traditional biomass, which poses a core energy security challenge. While bioenergy is domestically available, its widespread use, particularly for cooking (for more details, see Access to clean cooking section), contributes to deforestation, land degradation and health impacts through household air pollution.

Energy security is a central pillar of Ethiopia’s National Sustainable Energy Development Strategy 2024-2030, which aims to reduce dependence on traditional energy sources, fossil fuel imports and hydropower generation by diversifying its energy sources and investments.

The Strategy highlights several challenges to energy security, including:

- reliance on traditional cooking fuels, which leads to deforestation and impacts climate change
- reliance on oil imports to meet its demand, making it vulnerable to geopolitical tensions and supply disruptions
- political instability and regional tensions, which can disrupt energy infrastructure and investments

- heavy reliance on hydropower, which is threatened by climate change (changes in rainfall and higher evaporation) and soil erosion, which puts the dams at risk
- the economic burden of high petroleum fuel imports leading to large trade deficits
- limited petroleum storage infrastructure.

Ethiopia's current power system is almost entirely renewable, with hydropower accounting for over 97% of electricity generation in 2024. This high concentration of hydropower in the generation mix creates structural vulnerabilities. Electricity supply is highly sensitive to rainfall variability, droughts and changes in hydrological patterns, which are expected to intensify as climate change progresses. Periods of below-average rainfall, experienced in the past in the region, can reduce reservoir levels, constrain generation and increase the risk of supply shortfalls, load shedding and reliance on costly alternatives. Limited diversification within the power generation mix reduces the system's ability to absorb climate-related shocks and increases operational risk.

Ethiopia is a net electricity exporter and a key low-carbon electricity supplier in East Africa. Cross-border electricity trade with neighbouring countries and ongoing preparations to participate more fully in the Eastern Africa Power Pool offer opportunities to enhance system flexibility, improve the use of generation assets and generate foreign exchange revenues.

Beyond the power sector, Ethiopia's broader energy security is constrained by its heavy dependence on imported petroleum products. Oil is fully imported and remains critical for transport, industry and backup power supply. This exposes the economy to international price volatility, geopolitical disruptions and foreign exchange shortages, all of which can rapidly translate into inflationary pressures, higher transport and production costs, and widening trade deficits. Ethiopia's limited production capacity and domestic petroleum stocks heighten its exposure to supply interruptions.

Infrastructure further constrains energy security. Transmission and distribution bottlenecks, along with high technical and commercial losses limit the reliability of electricity access, particularly in rural areas.

Recent natural gas discovery provides an opportunity for enhanced energy security. In October 2025, Ethiopia inaugurated the first phase of the [Ogaden LNG project](#) in Calub (Somali Region). The first phase of the project aims at producing 111 million litres of LNG per year, increasing to 1.33 billion litres per year in the second phase. Besides LNG, the facility is also expected to contribute to Ethiopia's

power grid, with an electricity capacity of 1 000 MW, as well as to be used as input for fertiliser production. This recent discovery present opportunities to enhance energy security, if developed prudently, reducing reliance on imported fuels.

Recommendations

1. Enhance intra- and inter-ministerial and cross-sectoral co-ordination to promote effective development of Ethiopia's energy sector and ensure the mainstreaming of energy issues and priorities across all sectors

As described throughout this chapter, Ethiopia's energy sector is shaped by a wide range of institutions and policies, spanning the power, transport, industry and climate sectors. Ethiopia has also identified several objectives across key energy issues. To achieve the government's energy and climate objectives, strengthening cross-ministerial and cross-sectoral co-ordination across all stakeholders directly involved in energy policy and delivery is key to support coherent implementation and design of energy policies and strategies.

Building on existing co-ordination mechanisms, such as the Energy Development Partners Group, which serves as a great example of such co-operation between government and non-government stakeholders, the government could strengthen structured and regular co-ordination platforms.

Further, establishing a dedicated cross-ministerial co-ordination platform led by the MoWE would help align priorities among government stakeholders and across interlinked sectors, such as transport, industry, agriculture, social affairs, etc.

The Clean Cooking Roadmap provides a useful model, as it recommends establishing an integrated co-ordination platform, led by the MoWE, to streamline efforts among stakeholders, the Ministry of Women and Social Affairs, the Ministry of Agriculture, PEA, the Environmental Protection Agency, non-governmental organisations, development partners, and the private sector. The government could consider extending similar co-ordination approaches to other parts of the energy sector at the national and regional levels. This would support more consistent implementation.

2. Clarify each ministry's and government institution's institutional mandates, roles and responsibilities to improve predictability for investors

The environment for regulations and standards is currently distributed across multiple institutions, with mandates that are not always clearly delineated. This creates complexity for investors and market participants, potentially impacting policy implementation. The government of Ethiopia could consider further clarifying and, where appropriate, formalising the mandates, roles and responsibilities of ministries and public institutions active in the energy sector. Clear institutional roles could reduce duplication and overlap, limit institutional friction, enable more efficient use of resources, strengthen institutional capacity and reinforce accountability.

Notably, the government could consider empowering the regulator by better defining PEA's mandate, role and responsibility. Enhancing the regulator's independence, potentially by clarifying its reporting lines and safeguarding its decision-making autonomy, would reinforce regulatory credibility. A regulator with a clearly defined mandate, transparent procedures and adequate operational capacity could provide investors with greater visibility regarding the applicable rules and enforcement practices. Such capacity reinforcement could include continuing professional training and knowledge exchange.

In parallel, developing and enforcing technical standards (for example for EV batteries, solar home systems, photovoltaic [PV] panels) would help ensure quality supply and consumer protection, as well as faster adoption of the proposed technological solutions. They also provide clarity to private operators on minimum requirements, thereby reducing regulatory ambiguity.

To address licensing fragmentation specifically, the government could consider establishing a single-entry point for private investors, an entity mandated to co-ordinate all licensing and regulatory interactions on behalf of the investor. Whether structured as a strengthened one-stop shop within the EIC or as a dedicated sub-entity under a public holding structure, such a mechanism could streamline procedures, reduce duplication and improve inter-institutional co-ordination. By centralising communication while preserving the technical mandates of line ministries and regulators, the system would remain robust while becoming more user-friendly.

3. Systemise data collection to improve the tracking, monitoring and reporting of energy data

Ethiopia's policies and strategies, including the revised National Energy Policy, the National Energy Compact and the forthcoming NEP 3.0, outline ambitious and time-bound targets. However, as highlighted earlier in this chapter, the main sources of energy data are not always clear. Data come from a large variety of sources, such as the Ethiopian Statistical Service; the MoWE; EEP; EEU; and other state administrations, agencies and regions, with inconsistencies across these institutions. There is thus a need to strengthen Ethiopia's energy information system, including clearer legal instruments for data reporting and sharing, defined institutional arrangements, and sustained technical and financial resources for data collection and publication.

To achieve its energy objectives, the government could consider undertaking a mapping of key energy statistics actors across different groups of contributors such as national institutions, with the mandate to publish national energy statistics and the names of the other institutions responsible for energy reporting. This would allow aligning data originating from different sources and support implementation and progress towards the goals set out in different plans.

Priority should be given to strengthening demand-side data, particularly for electricity access, clean cooking practices, biomass use, off-grid systems and small-scale generation. Integrating energy-related questions into existing household and enterprise surveys would be a cost-effective way to improve coverage and track progress towards national targets.

Establishing a national plan for publishing energy data – with clear metadata, update cycles and institutional responsibilities – would enhance transparency, align figures across institutions and support evidence-based policy making.

4. Use the momentum of hosting COP32 to accelerate progress on energy and attract investment

As the host of the Second Africa Climate Summit in September 2025 and the upcoming host of COP32 in 2027, Ethiopia is well-placed to use increased international attention to accelerate progress on energy and attract investment. The

lead-up to COP32 provides an opportunity to showcase Ethiopia's progress on climate mitigation and adaptation and advance a clear reform and investment agenda.

Building on existing alignment with the Paris Agreement, the government could use the lead-up to COP32 to accelerate priority energy and climate reforms; advance bankable renewable and energy access projects; and communicate a clear investment narrative linked to Ethiopia's Energy Compact, the NEP 3.0, the National Sustainable Energy Development Strategy 2024-2030 and the NDC.

Leveraging COP32 as a platform to demonstrate policy coherence, regulatory clarity and project readiness would not only reinforce Ethiopia's regional leadership on climate action but also help mobilise private capital and international support to close the financing gap in the energy sector. This could be supported by targeted capacity building for federal and local officials to attract and manage private finance, including on project preparation and pitching, power purchase agreement (PPA) negotiations, and project licensing.

Power sector

Sector structure and investment

Ethiopia is at an important intersection in building a power sector that can best support its social and economic development. Ethiopia has already developed a substantial suite of strategies and roadmaps, outlining sectoral development for transport, clean cooking, electricity access and industry. Each of these strategies comes with certain needs and expectations for grid infrastructure development and generation capacity. As these strategies and plans are inherently linked, their success depends on the interplay between generation adequacy and grid infrastructure development to best support evolving demand patterns.

The Ethiopian electricity sector is primarily publicly owned and vertically integrated. EEP owns most operational power plants and manages transmission and sales to large customers such as industry. It is also responsible for cross-border connections. EEU is the only player in the distribution of electricity and the retail market. The Ethiopian Investment Holdings has the ownership of state-owned assets and state-owned enterprises (SOEs) and the mandate to ensure corporate governance, financial transparency, and to mobilise investment. The Ministry of Finance plays a central role in [reviewing](#) and approving PPAs, especially for projects that involve foreign financing or large budgetary implications.

Ethiopia structures its electricity tariffs on the type of consumer and level of consumption. The current system for residential tariffs is seven-tiered from the lowest rate for basic consumption of up to 50 kilowatt hours (kWh) per month to the highest consumption level exceeding 500 kWh. The gap between the first and last tier is substantial, with prices differing by a factor of more than six at the beginning

of 2026. Additionally, tariffs for large consumers and for export are set through contractual agreements such as PPAs. Tariffs for industry also have a capacity component that depends on the voltage level. PEA regulates and oversees tariff mechanisms and adjustments. Tariffs are reviewed on a four-year cycle according to the Energy Regulation.

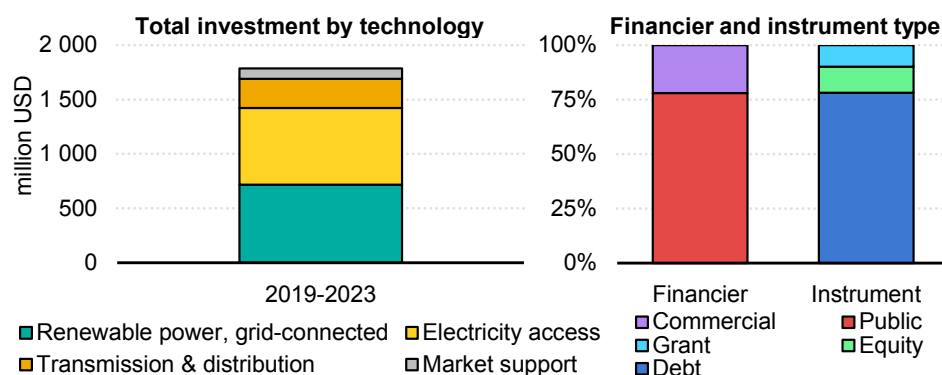
Investment landscape

Investment patterns and sources of financing

To date, international public and private investment in the Ethiopian electricity sector has been dominated by individual large projects, hence the volatile nature of the investments year-to-year. Between 2019 and 2023, almost 80% of investments were focused on electricity access and grid-connected renewable power projects, as per the government's strategy. Electricity access programmes have mainly been financed by development finance institutions, which provided around USD 700 million over the course of this period. In terms of the investor type and instrument, IEA analysis has shown the dominance of the public sector and debt, with commercial finance almost exclusively directed at generation projects. This phenomenon is currently typical across the African market, as can be seen in the latest IEA report [Financing Electricity Access in Africa](#). Due to the limited role played to date by commercial sources of finance in the country's power sector, innovative financing arrangements are critical to mobilise larger pools of capital, leveraging the catalytic role of international and domestic public financing.

In addition to financing provided by international public finance and the private sector, between 2019 and 2023, government capital expenditure – financed via the Treasury – averaged just under USD 20 million per year. This focused on the expansion of distribution networks, especially last-mile electrification via NEPs. Government spending has also been directed at generation projects, with investments primarily for hydropower.

Total electricity sector investment in Ethiopia, 2019-2023 (excluding government)



IEA. CC BY 4.0.

Sources: IEA analysis based on data from [IJGlobal \(2025\)](#), Project Finance Transactions Database; World Bank (2025), [Private Participation in Infrastructure \(PPI\) Database](#); OECD (2025), [Creditor Reporting System \(CRS\)](#); AidData (2023), [AidData's Global Chinese Development Finance Dataset, Version 3.0](#); GOGLA (2024), Investment Data; Cleantech Group (2025), [I3 Market Intelligence](#); BNEF (2025), [Renewable Energy Transactions](#) (database). All databases and datasets accessed on 12 January 2026.

Investment climate, cost of capital and risk factors

Ethiopia has taken steps to improve its overall investment environment, driven by the [macroeconomic reforms](#) developed in partnership with the International Monetary Fund (IMF), including tackling exchange rate controls with the move towards a more free and floating exchange system; however, some barriers remain.

Though a floating exchange and looser controls further enable international businesses to repatriate profits, development finance institution and other international debt is typically provided in hard currency; exchange rate risks thus remain. Further, large import bills, dominated by fuel imports, have made the availability of FOREX (typically dollars) challenging. Ethiopia has, however, sought to alleviate this through supportive policies towards EVs (see the section on Electric mobility). The government has introduced further measures with the [Foreign Exchange Amendment Directive No. FXD/04/2026](#) to enable easier access to FOREX. This included easier approval of external loans and supplier credits, bank guarantees for private loans, allowance for Ethiopians to make investments overseas, and increased delegation of authority to banks to approve repatriation of profits and

opening of foreign currency accounts. The [latest auction of USD by the National Bank of Ethiopia](#) saw the participation of 30 banks and was undersubscribed for the first time, with banks bidding USD 455.29 million and USD 44.71 million left unallocated.

Cost of capital refers to the interest that companies must pay to access debt and has two components: a base rate, which reflects country-level risks (these apply to all projects), and a premium that relates to sector- and technology-specific risks. According to IEA analysis, the base rate accounts for [60-90%](#) of the overall weighted average cost of capital for solar PV plants in Africa, compared with [35% in China and 10% in advanced economies](#). On average, developers in Africa face a cost of capital that is two to three times higher than that of advanced economies – making projects prohibitively expensive and unbankable. The African Union's steps towards the establishment of the [Africa Credit Rating Agency \(AfCRA\)](#) are a welcome development to provide additional information, especially on risks associated with the base rate.

Concessional financing will be key to reducing the cost of capital, and Ethiopia's recent partnership with the [African Trade & Investment Development Insurance \(ATIDI\)](#) supported by KfW Development Bank and Norad through the Regional Liquidity Support Facility, is a promising development. The Regional Liquidity Support Facility provides guarantees and liquidity support to renewable energy independent power producers (IPPs), protecting them against the risk of delayed payments by public offtakers. This will enhance the attractiveness of Ethiopian PPAs to IPPs.

Market structure and barriers to private investment

Since the launch of the [Public Private Partnership Proclamation of 2018](#), Ethiopia has used this policy to allow more private sector involvement in generation and off-grid projects. Ethiopia has also taken significant steps to develop a legislative framework for the participation of private players in the power sector. These legal provisions have laid the groundwork for initiating projects to attract IPPs. While the legal framework is largely in place and initial IPP [projects](#) are [planned](#), other factors hamper broader participation.

Ethiopia's power market currently operates under a single-buyer model. Producers that generate electricity for the national grid sell electricity to EEP for a fixed payment over several years, approved by PEA. In such settings, EEP and its credibility take a central role in the bankability of projects. In general, non-discriminatory access to the national grid for public and private producers, avoiding conflicts of interest, and

transparent dispatch procedures are important features for the reliable operation of the power system and to facilitate private investments. There are several potential ways to guarantee non-discriminatory access in the power sector. The [Ethiopian Energy Outlook 2025](#) mentions the establishment of an independent transmission system operator as a possible way forward to organise system operation. An independent national grid operator could ensure impartial decisions on dispatch. As a step towards clearer responsibilities, Ethiopia plans to introduce financial ring-fencing within EEP and EEU, establishing separate business units with defined mandates. Strategic business units are expected to improve accountability and better manage regional performance.

In addition, a minimum capital requirement of [USD 200 000](#) for foreign investors can discourage investment in some smaller scale projects and exclude certain investors. Similarly, policies and regulations for rooftop solar PV remain at an early stage and limit private investment in smaller scale distributed generation.

Power sector reforms

In recent years, Ethiopia has initiated a range of reforms and modernised the legislative framework. The country has already achieved notable progress toward strengthening EEP and EEU by modernising governance, restructuring operations and improving efficiency across the power sector. The reforms are also designed to improve financial stability and better reflect the cost of electricity generation – all of which will aid the investment landscape, for both public investment and attracting private investment. These measures align with commitments under the Homegrown Economic Reform 2.0, supported by the PRIME programme.

Modernising governance is one of the most important pillars of Ethiopia's reform aspirations. It has strengthened the framework for oversight, corporate governance and financial reporting of EEP and EEU. The [Public Enterprise Law](#) of January 2024 lays the legal foundations for this. EEP and EEU are both undergoing institutional reforms with the aim of improving transparency and corporate accountability. The Ministry of Finance issued a [directive](#) on structural cost reduction and enhanced transparency in the power sector, mandating competitive tendering for all new power infrastructure projects and requiring a least-cost power sector development plan that is updated every three years. This is expected to ensure transparent investment decisions and eliminate uneconomical projects.

Improving power sector operations is another important pillar, with a focus on the performance of SOEs and grid reliability. The rehabilitation and strengthening of the grid is supported by the [PRIME-1 Power Sector Reform and Modernization Programme](#). EEP also allocates a substantial share of its budget to transmission infrastructure. EEU is leading on efforts to improve operational performance, especially through the [Performance Improvement Plan](#) adopted in 2024. As part of the plan, EEU intends to modernise customer relationship management and deploy advanced metering infrastructure. These digital upgrades are expected to lower technical and commercial losses in the system.

While Ethiopia has made considerable progress in modernising its legislative framework and develop sectoral strategies, policy implementation and enforcement are still challenging. The main challenges arise from weak institutional arrangements (see the General energy policy section) and ongoing problems related to fragmented [governance](#). The regulator's [limited enforcement](#) capacity further undermines the effectiveness of policies and regulations. Ethiopia also [lacks public oversight](#) capacity from civil society and has limited avenues for political participation, especially after the dissolution of [more than 1 500](#) civil society organisations in 2024.

Tariff reform

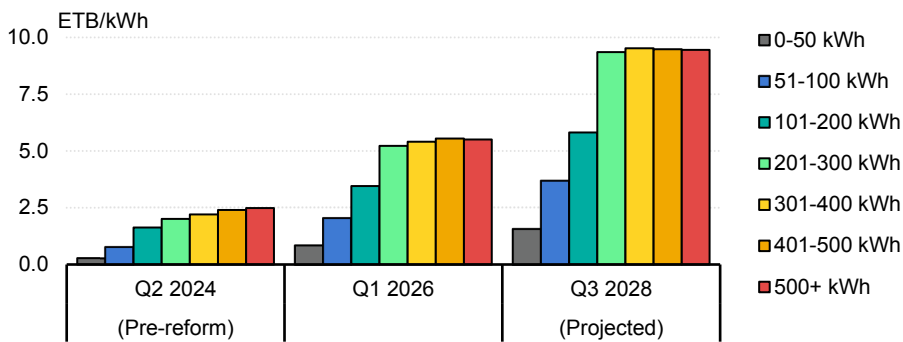
Ethiopia's domestic electricity tariffs have a long tradition of not being cost-reflective. Although regulations mandate [cost-reflective pricing](#), electricity tariffs have historically remained low, partially due to periodic adjustments that were insufficient to account for inflation and the actual costs incurred. This situation led to a large deficit between the revenue collected and the actual cost of electricity supply. Poor grid reliability and low collection rates further degrade the situation. As a result, EEP and EEU contend with financial strains, which also limit their ability to mobilise sufficient funds for infrastructure, new generation and other projects. For example, EEP recorded [ETB 24 billion](#) (USD 155 million) in losses in FY 2022/2023 and ETB 10 billion (USD 65 million) in FY 2023/2024.

To address this, the government adopted a four-year electricity tariff reform in 2024, led by the energy sector reform taskforce, which is co-chaired by the MoWE and the Ministry of Finance. The tariff revisions are intended to improve SOEs' financial situation by aligning electricity prices with the true cost of service delivery. In FY 2024/2025, after the start of the reforms, EEP's sales revenue increased threefold to ETB 75 billion (USD 484 million), while direct costs and operating expenses rose only modestly. However, a twelve-fold increase in financing costs

resulted in a net loss of [ETB 122 billion](#) (USD 788 million). The reform is part of a broader effort to meet IMF [conditions](#) and is supported by the World Bank.

The recent revisions apply to all consumers and introduce tiered increases based on consumption levels: tariffs for consumers with higher consumption are expected to increase roughly fourfold by 2028, while those for smaller consumers are projected to increase roughly [fivefold](#). To ensure a gradual transition, tariffs will increase every quarter over a four-year period starting from September 2024. The tariff revisions include a tariff adjustment mechanism to account for changes in the sector's cost structure and inflation. In addition to the tariff reform, customers with a monthly consumption of more than 200 kWh face a value-added [tax rate of 15%](#) since November 2024.

Evolution of electricity tariffs in Ethiopia, 2024, 2026 and 2028



IEA. CC BY 4.0.

Sources: IEA analysis based on EEU (2024), [Tariff reform announcement](#), (accessed in April 2026); EEU (2026), [Tariff announcement](#), (accessed in April 2026).

Affordability is a significant challenge in Ethiopia's energy sector. Tariff increases can have adverse social impacts and might provoke adaptive actions, including switching to alternative fuels. While the revisions are expected to bring significant benefits to the power sector, they also carry social risks, particularly for vulnerable households. To mitigate these impacts, the latest tariff reform includes a targeted subsidy mechanism for small consumers through a public service obligation. This subsidy will cover [75% of the price difference](#) during the adjustment period for customers consuming less than 50 kWh per month and 40% for those consuming less than 100 kWh per month.

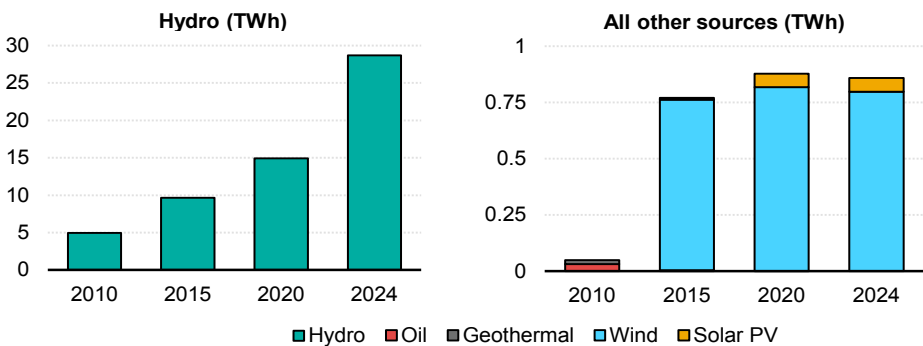
In addition to the widespread tariff reforms, EEP introduced new tariffs for crypto mining companies that came into effect in [December 2025](#). The new tariff system ends the flat-rate tariff of [0.0314 USD/kWh](#), replacing it with a two-tiered system. The new tariffs include a time-of-use structure and grid availability-based adjustments. The rate starts at 0.04 USD/kWh and rises to 0.06 USD/kWh during peak hours and will increase further through 2028. This marks a strategic shift to align costs with grid reliability and peak demand management.

Electricity supply and regional integration

Electricity generation

Hydropower dominates the electricity mix in Ethiopia, generating 97% of all electricity in 2024. Wind (2.7%) is the only other source that supplied electricity to the national grid, while solar PV and oil do not feed into the grid and contribute only marginally to overall electricity supply. The first wind power plant in Ethiopia became operational in 2011; wind supplied close to 800 GWh of electricity in 2024. Between 2010 and 2024, Ethiopia increased its annual electricity generation by around 24.5 TWh, a growth of almost 500%. The recent growth in electricity generation was supported by the Grand Ethiopian Renaissance Dam, which began to yield its first returns in 2022, when [2 of the 13 turbines](#) started operation. With electricity generation of almost 30 TWh in 2024, Ethiopia was the third-largest electricity producer in sub-Saharan Africa and the largest in East Africa.

Electricity generation by source in Ethiopia, 2010-2024



IEA. CC BY 4.0.

Source: IEA (2026), [World Energy Balances](#).

Electricity generation and installed capacity have risen rapidly as the GERD ramps up towards full capacity. EEP generated [35.7 TWh](#) in FY 2025/2026, with the GERD alone supplying more than half of this output. This represents around a 25% increase in total electricity generation compared with the roughly 30 TWh generation in 2024. In the near term, Ethiopia aims to further expand its electricity generation capacity from roughly [9.7 GW](#) in 2025 to [14 GW](#) by 2030. [Hydropower is expected to continue dominating](#) the electricity mix well after 2030, also supported by the new large-scale [Koysba](#) Hydropower Plant.

Resilient and diversified electricity supply

Ethiopia's recent expansion of hydropower has bolstered domestic electricity supply and strengthened its position as a regional energy hub. However, challenges remain in diversifying electricity supply. The current reliance on hydropower represents a vulnerability of the power system, as droughts can affect hydropower generation. Ethiopia finds itself in a particular situation, as thermal power generation is negligible and hydro serves as the primary dispatchable power generation source.

The diversification of the electricity generation mix is one of Ethiopia's key energy policies, but progress is slow. Ethiopia aims to diversify electricity generation, with a share of non-hydro renewable energy sources of at least [15% by 2030](#), up from around 7% in 2015. Solar PV, geothermal and wind technologies are already commercially available and well-positioned to play a greater role in the power system. When supported by appropriate frameworks, renewables benefit from short lead times and rapid deployment, making them well-suited to respond to demand developments. Ethiopia has already developed a sound legal and institutional framework to support the expansion of renewable electricity generation.

Ethiopia is also exploring options for electricity generation from natural gas and nuclear energy development. Natural gas is acknowledged in policy documents and has gained momentum with the discovery of domestic natural gas resources. However, while the technology for natural gas generation is readily available and domestic resources exist, areas such as infrastructure, skills and regulation still require careful attention. Concerning nuclear energy, developments are at an initial stage. Ethiopia first began discussions with Rosatom in 2017 by signing a [memorandum of understanding](#). Over the following years, joint plans and memoranda were signed, mainly focusing on the development of local nuclear infrastructure, technical expertise and feasibility studies. Ethiopia has also established the Ethiopian

[Nuclear Energy Commission](#) to oversee the use of nuclear energy technology. The Commission [announced](#) plans to start generation by 2036, supported by a programme of nuclear safety and security requirements.

Grids

Ethiopia has identified the development of a reliable and resilient supply of electricity as one of its key energy policy priorities. However, its grid performance is poor by global standards. Recent gains in generation have yet to translate into a stable and reliable electricity supply for end-users. There are frequent interruptions, mainly due to weaknesses in the distribution grid. Grid issues are due to the old and poorly maintained infrastructure and insufficient modern control and protection systems. Studies show that interruptions often result from earth faults, short circuits and overcurrent. During the rainy season, high humidity and moisture degrade insulation, increasing the likelihood of leakage currents and faults.

Ethiopia's overall network system losses have been consistently high, often above 20% of electricity generation, and rank among the highest in the world. [Theft](#) of electricity infrastructure further exacerbates the problem. The distribution grid accounts for the largest share of total network losses. The [National Energy Compact](#) mentions transmission losses of around 6%, considerably less than distribution losses of around 22%. Whereas technical losses represent the major share of losses, commercial losses such as theft and billing issues are significant and amount to around 10%, according to the National Energy Compact. Ethiopia aims to decrease losses to 12.5% by 2030, according to the National Sustainable Energy Development Strategy.

Low electricity tariffs, high losses and low reliability have weakened the financial situation of public companies in the power sector and curbed available resources for grid investments. They have also created a vicious circle of lower revenues and underinvestment, worsening outages and losses. This situation has encouraged many end-users, especially large commercial and industrial businesses, to generate their own electricity. As a result, many businesses and end-users that rely on a continuous electricity supply invest in backup generators, largely fuelled by fossil fuels. This situation increases oil imports and worsens the foreign exchange balance. Improving grid reliability would allow utilities to earn more from sales to industrial and commercial customers by discouraging auto-generation and reducing the need for

backup generation during blackouts. Reducing technical and commercial losses is equally important, as it can recover several TWh of effective supply and significantly increase revenue potential.

Investment and financing

Most of the current grid investment programmes aim to improve grid reliability and reduce technical and commercial losses. Financing of grid infrastructure is based on two pillars: 1) public investments through EEP and EEU and other domestic mechanisms; and 2) international programmes. Ethiopia's [Ten-Year Development Plan \(2021-2030\)](#) includes a target to expand transmission lines to almost 30 000 km by 2030, up from around 20 000 km in 2025. The distribution grid is also expected to grow considerably, from around 179 000 km to 456 000 km by 2030.

The maintenance and reinforcement of existing infrastructure already require a significant amount of investment amid difficult financial conditions for SOEs. The dual challenge of modernising and expanding the grid, however, further increases these investment needs. International financiers such as multilateral development banks play an important role in supporting Ethiopia's grid modernisation and expansion. The World Bank's PRIME-1 project focuses on critical grid reinforcements and the replacement of aged infrastructure. Moreover, programmes from institutions such as the French Development Agency offer [support to improve grid stability](#) through digitalisation efforts, an area where, despite notable progress, gaps remain. Financial support from development partners was also essential for the construction of existing interconnectors and is expected to remain important for financing additional cross-border links.

Ethiopia has a significant pipeline of grid expansion and maintenance projects, many of which are financed or co-financed through blended financing agreements with development financing institutions. Expanding the range of investors, including from the private sector, is one option to boost investment in grid infrastructure and enhance system reliability. However, for the transmission sector, the Investment Proclamation of 2012 includes a restriction that the transmission and distribution of electrical energy through the national grid shall exclusively be reserved for the government.

Ethiopia has shown a willingness to find a solution to this restriction and still mobilise private capital via the dedicated Public-Private Partnership (PPP) Proclamation adopted in 2018, with a PPP Board and PPP Directorate General in the Ministry of Finance, to approve and procure infrastructure projects, including on transmission.

This has resulted in the announcement of the [Joint Development Agreement](#) between [Gridworks](#), the Ministry of Finance and EEP, and applies to the delivery of two large-scale transmission projects:

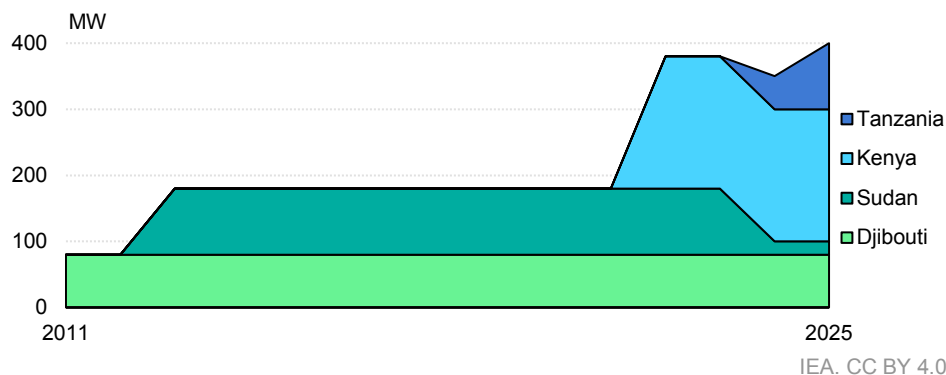
- the 206 km, 132 kV Degehabur-Kebridehar line connecting Ethiopia's Somali Region with the country's central and north-east grids
- the 198 km, 400 kV Hurso-Ayisha line enabling the development of new sources of energy in the north-east and strengthening the interconnection with Djibouti.

Regional integration

Ethiopia is strongly committed to advancing regional integration and co-operation, based on the [principles](#) of shared development and mutual benefits. Ethiopia is interconnected with three neighbouring countries and has considerably strengthened cross-border transmission capacity in recent years, most notably through the high-voltage direct current line to Kenya, commissioned in 2022. Kenya is now Ethiopia's most important electricity export destination, followed by Djibouti and Sudan. Exports to Sudan vary due to technical constraints and political instability. The expansion in electricity exports reflects Ethiopia's long-standing ambition to position itself as a regional energy hub. Total export volumes tripled between 2013 and 2023.

The new [Kenya-Tanzania interconnector](#), finalised in January 2025, allows power trade between Ethiopia and the United Republic of Tanzania. The initial [100 MW](#) deal could increase to 200 MW by 2027. A trial run was successfully completed in July 2025. This interconnector synchronises Tanzania's electricity grid with those of Burundi, Rwanda, Kenya, Uganda and the eastern part of the Democratic Republic of the Congo and represents a key project under the Programme for Infrastructure Development for Africa, a flagship project of the African Union's Agenda 2063.

Realisable electricity export capacity from Ethiopia, 2011-2025



Sources: IEA analysis based on ESI Africa (2025), [Kenya: Successful energy wheeling trial with Ethiopia, Tanzania](#), (accessed in July 2026); World Bank (2022), [Second Djibouti-Ethiopia power system interconnection project](#), (accessed in July 2026); Ethio Negari (2025), [Ethiopia's electricity exports to Sudan drop by 80%](#), (accessed in July 2026).

Electricity exports generated considerable foreign exchange earnings of [USD 118.1 million](#) in FY 2024/2025, contributing to more than 20% of EEP's total revenue. Foreign exchange earnings are of particular importance for Ethiopia to stabilise its local currency. Ethiopia currently exports power at fixed prices through long-term PPAs with periodic reviews, managed by EEP. Export tariffs are set at levels that are financially sensible for Ethiopia and competitive for importing countries. For example, export tariffs to Kenya are currently fixed at 0.065 USD/kWh, significantly above domestic electricity prices in Ethiopia. In Djibouti, electricity generation can cost as much as [0.26 USD/kWh](#), while the export tariff was fixed between [0.06 USD/kWh and 0.07 USD/kWh](#) depending on the season.

Ethiopia plans to expand electricity exports from around 1.8 TWh in 2023 to up to 7.2 TWh by 2030. However, plans hinge on international financing, technical readiness and co-ordination with trading partners. The technical potential of the current infrastructure has also not yet been fully utilised. For example, although the Kenya-Ethiopia electricity highway has a technical potential of 2 000 MW, actual power flows are currently limited to 300 MW (including 100 MW wheeled to Tanzania). The operational capacity is planned to be expanded to 400 MW, pending the completion of ongoing reinforcement in Kenya's network. By 2030, the operational capacity could reach 1.2 GW. A [second interconnector](#) to Djibouti is expected to more than double the current capacity to Djibouti. The project has experienced significant delays, but a second tender in [2024](#) showed promising signs that the project will move

forward. Ethiopia's strategy includes additional interconnections with neighbouring countries, such as [Somalia](#) and [South Sudan](#). These plans will further strengthen cross-border capacity and Ethiopia's role as an energy hub in the region.

Ethiopia is also part of the Eastern Africa Power Pool (EAPP), which aims to provide reliable, affordable and sustainable electricity across the Eastern Africa region through co-ordinated actions. EAPP members have started selecting a [market operator](#) as part of a broader objective to create a regional power market and increase regional power trade. However, power trading had not yet commenced by the end of 2025. Existing bilateral agreements are expected to remain in place even with the implementation of the EAPP.

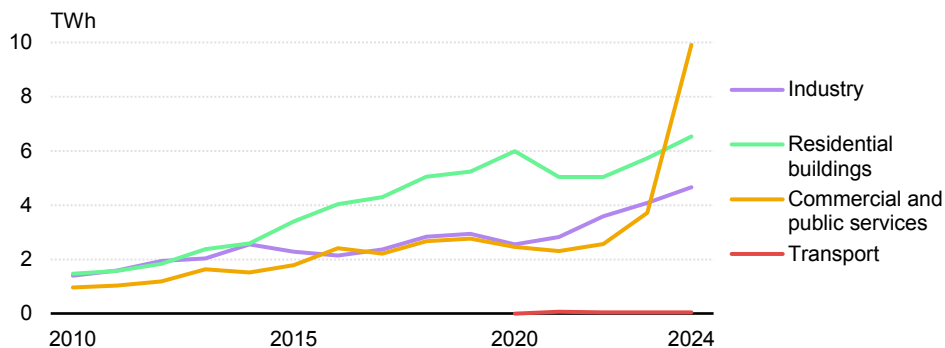
A strong cross-border electricity infrastructure can increase the reliability and resilience of the Ethiopian power grid as well as those of its neighbouring countries. Power pools enhance flexibility and make system balancing easier as they aggregate loads over a larger area and pool diverse sources of generation. Regional interconnections provide additional revenue opportunities through ancillary and other system services. Established grid codes and clear regulatory frameworks across countries are important prerequisites for the provision of cross-border ancillary services.

Electricity demand

Electricity demand per capita in Ethiopia was 157 kWh in 2024, well below the 2023 African average of 529 kWh per capita. Limited access to electricity remains a considerable factor for Ethiopia's low consumption levels.

Electricity demand increased from around 4 TWh in 2010 to 21 TWh in 2024, an increase of 17 TWh (or around 450%). The strongest growth occurred in commercial and public services, where demand rose by more than 550%. For much of the last decade, residential buildings were the largest consumers of electricity. However, in 2024, the sector was overtaken by commercial and public services, which saw demand increase by 166% year-on-year. In 2024, commercial and public services consumed almost half of all electricity, followed by residential buildings (31%) and industry (22%). Cryptocurrency mining, which is included in the commercial and public services category, was a key driver of the 2024 demand increase. Electricity in residential buildings is mainly used for appliances such as refrigerators and lighting, and to a certain extent for electric cooking. In industry, electric motors consume [more than 75%](#) of electricity.

Grid-connected electricity consumption by sector in Ethiopia, 2010-2024



IEA. CC BY 4.0.

Source: IEA (2026), [World Energy Balances](#).

Electricity demand is set to rise rapidly, initially driven by crypto mining. New household connections, a growing population and electrification are all expected to add additional demand from residential buildings. Manufacturing is expected to be the main demand driver in industry. The [National Sustainable Energy Development Strategy's](#) medium-term scenario estimates that electricity demand in the industry sector will increase to 5.6 TWh by 2030, up from 2.3 TWh in 2015. Electricity demand from transport could reach about 1.7 TWh by 2030 in the high demand scenario. In the context of growing electricity demand, the [Energy Efficiency Program and Activity Plan](#) from 2019 sets out specific, quantifiable measures to improve the efficiency of electricity use.

Ethiopia has quickly become a major player in cryptocurrency mining, supported by low power generation costs and electricity tariffs. Mining companies are expected to consume [more than 8 TWh](#) in 2025, corresponding to around one-third of total electricity demand. The country has attracted more than [25 mining firms](#) and is now among the [top 10](#) mining hubs in the world. In FY 2024/2025, EEP earned around [USD 220 million](#) from the mining sector alone, with earnings in the first half of FY 2025/2026 already exceeding [USD 180 million](#). These foreign exchange earnings far exceed those generated from electricity exports. Ethiopia [halted](#) new crypto mining permits in August 2025 to be able to continue meeting growing domestic needs from households and industries. Furthermore, EEP introduced higher tariffs for crypto mining customers. These tariff structures also encourage electricity demand that better reflects system conditions and grid constraints (see Tariff reforms section).

Electric mobility

Ethiopia is strongly committed to build a domestic electric mobility ecosystem as part of its broader climate and low-carbon strategies. Its ambition to cut fossil fuel imports and ease foreign exchange shortages is one of the primary drivers of the rapid adoption of electric mobility. Ethiopia spends around [USD 4.5 billion](#) annually on the import of fossil fuels, most of which is used in transport. EVs offer the opportunity to gradually reduce this dependence. Another motivating force behind the shift to electric mobility is to reduce [urban air pollution](#), particularly in Addis Ababa. Ethiopia's electric mobility strategy is designed to scale progressively, with an initial focus on Addis Ababa and urban centres before expanding to rural areas. The commitments and actions have positioned Ethiopia as one of the most ambitious countries in electric mobility policy in Africa.

As one of the main measures to accelerate the uptake of EVs, Ethiopia introduced high import taxes of [up to 200%](#) on the imports of ICE vehicles. Combined with comparatively low electricity prices compared to gasoline, the switch to EVs is attractive for many consumers. In Ethiopia, fuel costs per 100 km for EVs are roughly [15% of those for ICE](#). An additional [30% tax on fossil fuels](#), implemented in December 2025, further strengthens the case for EV adoption in the short term. As a result of these measures, EV registrations and stock are growing rapidly. While the total EV stock in 2022 stood at around [7 000](#), it is reported to have reached [115 000](#) in 2025 according to the Ministry of Transport and Logistics. Data from the Addis Ababa Vehicle Licensing Authority suggests that in 2024, more than half of all newly registered passenger cars in the capital were electric, up from [less than 5%](#) in 2020. Ethiopia's strategy includes a target to increase EVs' share of annual new vehicle registrations to 80% by 2030. Ethiopia initially set a target to import around [153 000 EVs](#) by 2030 but revised it to [439 000](#). Data on EV registrations are administered by regional authorities, resulting in fragmented and incomplete national registration data. Given this system, national-level figures should be interpreted with caution.

In October 2025, the Ministry of Transport and Logistics published the [Ethiopia E-Mobility Strategy and Implementation Plan](#), which sets objectives, strategies and an implementation plan to develop the domestic EV sector in Ethiopia by 2030. The strategy also includes public transport, aiming for exclusively electric registrations by 2030. [One hundred](#) electric buses started operation in Addis Ababa in July 2025, out of a fleet of around 1 170 public transport buses. Overall, Ethiopia had around

[400 electric buses](#) on the road in early 2026. Ethiopia's strategy is less ambitious for the electrification of freight vehicles, with the aim for 15% of new freight vehicle registrations to be electric by 2030.

Local manufacturing and assembly of EVs is an explicit part of Ethiopia's transport strategy. Ethiopia sees this as an opportunity to lower costs and stimulate job creation and skills development. The transport strategy outlines an ambition to locally produce or assemble 30% of newly registered EVs by 2030. To incentivise domestic EV production and assembly, the government has [put in place](#) tax breaks and reduced import duties for locally assembled vehicles, structured through a tiered customs-duty system that offers the [lowest](#) rates for full local assembly. The first companies are advancing on local assembly efforts, for example of [electric buses](#).

Ethiopia's public charging infrastructure is in its early stages, with most of the deployment efforts currently concentrated in Addis Ababa. The expansion of the charging infrastructure is, however, considered a central pillar of the E-Mobility Strategy. The [electric vehicle charging system](#) directive outlines the minimum requirements for future infrastructure development, including mandatory charging stations every 50-120 km along national highways. The directive also covers licensing, tariffs, and technical and safety protocols. Public charging stations currently [follow](#) the general electricity tariff, but the introduction of new tariff categories is possible. By 2030, Ethiopia plans build more than 2 000 public charging points: [1 176](#) in Addis Ababa and 1 054 across other regions. By the end of 2025, over [100 public charging points](#) had been installed in the Ethiopian capital, including some fast-charging options. This number is soon expected to [exceed 150](#) following an announcement by the Ministry of Transport and Logistics in December 2025 to add more than 50 charging points. In addition, there are over 460 semi-public charging points. Public charging stations are rare outside the capital, posing challenges for widespread EV adoption in rural areas, long-distance travel and regional connections.

Ethiopia has created a promising framework for electric mobility, but challenges remain. Infrastructure gaps and the lack of reliable electricity supply are two of the main barriers for the roll-out of EVs. Public charging stations are mainly concentrated in urban centres such as Addis Ababa while rural areas often lack access to electricity. Another major hurdle to EV adoption in Ethiopia is the high upfront cost and limited financing options. Furthermore, while a promising framework for electric mobility exists, implementation and [enforcement](#) challenges persist.

Recommendations

5. Enhance clarity and transparency for market participants and investors about the market structure

Ethiopia's power sector is dominated by two public entities, with EEP and EEU as the main players. Ethiopia aims to strengthen energy sector financing through the involvement of the private sector. In such settings, efficient, transparent and predictable market structures help facilitate investments and attract investors. This applies not only to private investments but also to attracting diverse financing sources, including development banks and other blended finance mechanisms. A well-defined market structure should also include an empowered regulator that can effectively oversee, regulate and enforce rules for actors in the power system.

Investors in Ethiopia's power sector face high perceived risks and low bankability of projects. An enabling framework supported by clear responsibilities along the value chain, from licensing and permitting to financial agreements, can help lower perceived risks. The Ethiopian power market currently operates under a single-buyer model. A fair, non-discriminatory and transparent power market can mitigate concerns about possible conflicts of interest. One measure that can help reduce such risks is financial ring-fencing, which separates accounting and business units.

6. Enhance energy security and resilience through diversified power generation and regional power trading

Ethiopia's power generation almost entirely depends on hydropower. Such a high reliance increases the vulnerability of the energy system and poses hydrological and climate risks. Ethiopia has significant potential to deploy other renewable energies. It also has domestic natural gas reserves that can support a more resilient and secure power system. However, the expansion of non-hydro renewable energy projects is slow and the use of natural gas for electricity is at an early stage. Nuclear ambitions, which are also present in Ethiopia, usually involve long lead times. Stronger efforts to accelerate the diversification of the generation mix are essential to build a power system that can serve as the engine for economic growth. A more diverse generation mix can also improve system efficiency and reduce power outages and losses.

In a context where SOEs face limited investment capacity, mobilising additional sources of finance, such as from private investors, can help diversify generation sources. One possibility is to facilitate commercial and industrial consumers and private households to participate in power generation as merchant power plants, supplying their own demand and exporting any surplus to the grid. This requires a comprehensive regulatory and supportive framework, and a grid that is fit-for-purpose. Such models can also serve to expand the number of domestic companies in the energy sector and boost domestic value chains.

Regional interconnections and power pools also play an important role in a secure and reliable electricity supply. Ethiopia has already made significant progress to expand interconnection capacity and is planning to strengthen existing interconnections while exploring new links with other neighbours. It can further advance regional co-operation and strengthen system security while increasing revenue prospects through electricity trade and system services. Establishing a regulatory framework that allows IPPs to participate in regional power trading and the EAPP could help diversify generation sources and attract more private capital.

7. Strengthen integrated power system planning to improve efficiency and reliability and meet the country's growing economic and social needs

Ethiopia's power sector has grown fast over the past years, driven by the expansion of power generation capacity. This rapid development is expected to continue to expand access to electricity and meet new demand such as electric mobility. To guide this development and maximise its potential, Ethiopia has developed many sectoral strategies and roadmaps, such as the NEP 3.0, the Clean Cooking Roadmap and a charging infrastructure directive linked to the national E-Mobility Strategy.

However, as Ethiopia pursues these ambitions, the power sector faces structural challenges. Low grid reliability and high grid losses lower utilities' revenues and undermine cost recovery, ultimately reducing investment potential. These constraints also weaken investor confidence and risk slowing the implementation of national plans.

Historically, sectoral strategies in Ethiopia have progressed in parallel rather than through a fully integrated planning framework. Different sectoral agendas such as clean cooking, industrial development and electric mobility create distinct infrastructure needs and influence generation planning and renewable integration. A

co-ordinated approach that links generation, transmission, distribution and evolving demand could support the creation of a more resilient, reliable and stable power system capable of meeting Ethiopia's growing needs.

An integrated investment plan, such as European transmission system operators' [Ten-Year Network Development Plan](#), can outline the development, modernisation and expansion of the electricity infrastructure over a longer period. A similar plan, developed for the Ethiopian context, could help guide stakeholders and investors by providing greater transparency on the future needs of the power system and ensuring coherence across the sector. Aligning grid investment and expansion plans with other national roadmaps and strategies can further support informed investment decisions and lead to infrastructure that better meets the needs of the Ethiopian energy sector. Such plans are essential given the long lead times required for upgrades and new electricity infrastructure projects. Regularly updating an integrated power system plan helps ensure it remains relevant for all stakeholders.

8. Further enhance the overall energy business environment to accelerate access to private capital

Under the Homegrown Economic Reform Agenda, Ethiopia has made great strides in improving the business environment for domestic and international investors. The IEA commends Ethiopia for the reforms implemented to date. These reforms have included improved access to FOREX, strengthening the domestic capital market and monetary policy modernisation. Together with the tariff reform, these reforms will continue to enhance the bankability of projects. To fully capitalise on these reforms in the energy sector, the government may consider the following recommendations, which aim to reduce real and perceived risks and thus the cost of capital while enhancing bankability.

Ethiopia's current approval process for IPPs [can take two to three years](#), compared to six to nine months in Kenya. Further streamlining the licensing and approval process for energy projects, including potentially the digitalisation of processes via an online platform, would greatly reduce the transaction costs associated with doing business in Ethiopia and crowd in further investment.

[Investment Proclamation No. 1180/2020](#) sets the current minimum capital requirement for wholly owned foreign projects at USD 200 000, and USD 150 000 for a joint venture with an Ethiopian investor. This could be prohibitively high for energy

access projects. The government could consider reviewing these levels, potentially creating a different level for projects related to energy access, given their smaller nature and strategic importance for delivering electricity to Ethiopians.

There are instances of the Ministry of Finance and/or Customs requesting an approval letter from the MoWE and/or EEP and/or EEU, despite official regulations only requiring the approval of PEA, which places an additional administrative burden on developers. Strengthening the role of the regulator and issuing further clear directives to the relevant bodies that PEA provides all necessary approvals for projects, would reduce transaction costs and risks and could increase investment in the sector.

Issues of elevated prices being used by customs officials to calculate import duties create issues for “below cost selling” when the products are sold. The government has, as has been stated, made great strides in improving the FOREX situation and providing beneficial conditions on import duties for key energy technologies. However, it could ensure the rules and regulations are consistently implemented, including working with other ministries to provide further communications around key policies, such as pre-qualification for access to FOREX and importation costs for value-added tax (VAT) purposes of key energy technologies.

Further, building off the recommendations made for the overall business environment, the government, through IPPs, could increase access to private finance via the blending of public domestic and international financing, including via innovative financing arrangements such as guarantees, currency hedging products, green bonds and investment facilities. The government may wish to consider channelling them through domestic financing vehicles, such as the Climate Resilient Green Economy Facility, which will further enhance the expansion of the domestic capital market as well as local capacity.

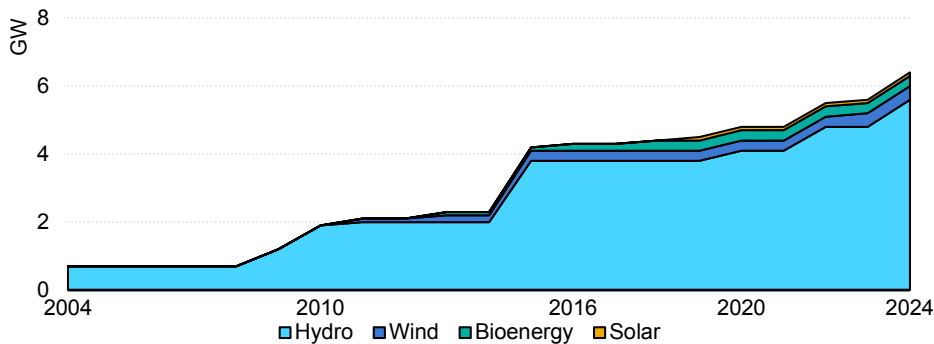
It would be advantageous to encourage a larger group of investors into the market, both new and increasing investments to complement those from the World Bank and African Development Bank. To do so, the government could develop sector investment plans to prioritise investment against different business models and potential funding sources.

Renewables

Overview

In 2024, renewable energy represented 91% of Ethiopia’s total energy supply. Bioenergy accounted for 86%, hydro for 5% and the remaining 9% was from imported fossil fuels (primarily oil products and coal). Ethiopia currently has 6.4 GW of installed renewable generation capacity, accounting for 100% of power generation. Hydropower (97%) provided the highest share of electricity generation, followed by wind and solar.

Cumulative installed capacity additions in Ethiopia, 2004-2024



IEA. CC BY 4.0.

Source: IEA (2025), [Renewable Energy Progress Tracker](#).

As set out in its National Energy Compact, Ethiopia aims to significantly [expand its installed electricity generation capacity](#), targeting 14 GW by 2030, through the expansion of renewables (hydro, wind, solar and geothermal) and grid-scale batteries.

Renewable electricity capacity and supply

Hydro

Ethiopia has the second-largest hydropower potential on the continent, and the highest installed hydropower capacity among African countries. Estimates suggest that Ethiopia has up to [45 000 MW](#) of untapped hydropower technical potential. Between 2023 and 2024, Ethiopia's hydropower capacity grew by 17%, rising from 4 800 MW to 5 600 MW. In 2024, hydropower generated 28.6 TWh of electricity. In September 2025, the Grand Ethiopian Renaissance Dam was inaugurated, with a [capacity of 5 150 MW](#) through 13 turbines across two power stations and with an expected output of about 15.7 TWh. The Koysba Hydropower Dam, located in the south-west of the country along the Omo River, is scheduled to become operational [before the end of 2028](#), with an installed capacity of [2 200 MW](#). EEP owns and operates all hydropower plants in Ethiopia. Future power generation projects are encouraged to be [developed through PPPs](#) and IPP agreements, while EEP focuses on the management of existing power generation plants, substations and transmission lines.

The maintenance of existing hydropower capacity is fundamental to supporting Ethiopia's energy security to ensure a reliable power supply, maximise efficiency and meet growing demand amid ageing infrastructure. Currently, [around 25%](#) of the country's installed power capacity is not operational, primarily due to challenges in procuring spare parts for maintenance amid severe hard currency shortages. Many of the country's hydropower plants were commissioned between the 1950s and the 1980s and are facing several challenges related to the performance of ageing infrastructure, reduced efficiency and degradation that hinder reliable output and energy security. Refurbishing these plants is of strategic importance for a country like Ethiopia, which relies entirely on hydro for electricity, as it extends plant life, restores

idle capacity and boosts output. In this regard, the [World Bank's PRIME-4 programme](#) is supporting the rehabilitation and refurbishment of hydropower plants in Ethiopia. It also supports upstream development of renewable energy parks, site preparation and the construction of transmission infrastructure for other renewables.

Grand Ethiopian Renaissance Dam

On 9 September 2025, Ethiopia inaugurated the GERD, Africa's largest hydroelectric project. The dam is owned and operated by EEP and is [located on the Blue Nile](#), about 14 km upstream of the border with Sudan, measuring 1 800 metres long and 170 metres high. The construction of the plant was completed in July 2025, but it has been generating electricity since February 2022. The GERD is designed to host [a total of 13 turbines](#), with 11 each generating 400 MW while the other two generate 375 MW. One of the most remarkable aspects of the project lies in its financing. The [USD 5 billion](#) project was financed by the Ethiopian state through instruments such as national bonds and popular contributions, without direct recourse to international donors or multilateral financing institutions.

However, from its inception, the GERD project has fuelled diplomatic tensions between Ethiopia and its neighbouring countries, Egypt and Sudan. Sharing the Nile River, Egypt and Sudan have seen the dam as threatening their water supply from the river. Egypt relies on the Nile for nearly all its freshwater supplies and sees the dam as an existential threat, while Sudan has expressed concerns about flow regulation and dam safety. As of September 2025, the disagreements were still unresolved.

Beyond these tensions, the GERD is a monumental project for East Africa's energy development. By increasing domestic electricity supply, it will contribute to increasing energy access and transforming the country's industrial base, enabling greater local processing in industries such as manufacturing, textiles, food and agriculture. The additional capacity from the GERD will also allow for exports to neighbouring countries (Djibouti, Kenya, Somalia and Sudan) as part of a regional energy integration strategy.

Hydropower stations in Ethiopia

Name	Capacity (MW)	Status	Method
Grand Ethiopian Renaissance Dam	5 150	Operational	Reservoir
Gilgel Gibe III	1 870	Operational	Reservoir
Tana Beles	460	Operational	Run-of-river
Gilgel Gibe II	420	Operational	Reservoir
Tekeze	300	Operational	Reservoir
Genale Dawa	246	Operational	Reservoir
Gilgel Gibe I	184	Operational	Reservoir
Melka Wakena	153	Operational	Reservoir
Finchaa	134	Operational	Reservoir
Fincha Amerti Neshi	97	Operational	Reservoir
Tis Abay II	73	Operational	Run-of-river
Koka	43	Operational	Reservoir
Awash II	32	Operational	Run-of-river

Name	Capacity (MW)	Status	Method
Awash III	32	Operational	Run-of-river
Tis Abay I	11.4	Operational	Run-of-river
Aba Samuel	6.6	Operational	Reservoir
Koysha Hydropower Dam	2 200	Under construction	Reservoir
Halele Werabesa	422	Announced	Reservoir
Upper Dabus	326	Announced	Reservoir
Total (operational)	9 212		

Solar

Ethiopia's grid-connected solar capacity remains limited, with only [22 MW](#) installed in 2024, generating 61 GWh of electricity. However, the country has a much larger base of PV distributed systems (mainly off-grid and small-scale solar systems), with an installed capacity of around 100 MW. Solar energy holds strategic importance for the Ethiopian government. It is seen as a key solution to the country's pressing energy and development challenges, as well as to decreasing its reliance on hydropower. For example, the National Energy Compact targets a 75% electricity access rate by 2030, with at least 70% of connections met through the grid and the remaining 30% through off-grid solutions, primarily solar. Ethiopia also joined the World Bank's [Scaling Solar initiative](#) in 2016 to develop up to 500 MW of solar PV (Round 1). In 2019, Round 1 was held for the Gad and Dicheto PV projects for a total of [250 MW](#). Both were awarded to ACWA Power, with a record-breaking tariff agreement of 25 USD/MWh. However, [neither of the projects reached financial closure](#). Round 2 was launched for up to an additional 750 MW across six sites, but had a similar

outcome, with no projects reaching financial closure. Another auction round was announced in February 2025 for the development of [two solar PV projects](#) – the Gad II (125 MW) and Weranso (100 MW) plants.

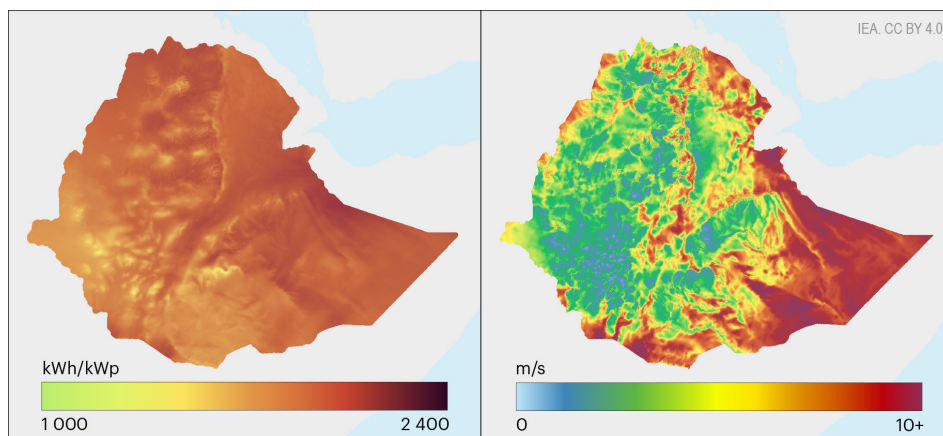
Ethiopia possesses high untapped solar energy potential thanks to its abundant sunshine throughout the year and vast unoccupied land areas. The country's average global horizontal solar irradiation is [5-7 kWh/m²/day](#), depending on the region and season. This is comparable to or slightly below the top areas in the world and even in low months (i.e. rainy season) exceeds the solar potential of many European countries investing heavily in solar (e.g. Germany). The Afar, Somali and eastern Oromia regions have the highest levels, due to minimal cloud coverage, while Western Amhara, Central Highlands (e.g. Addis Ababa) and the Southwestern Highlands have lower irradiation due to higher cloud cover and elevation.

Ethiopia's strong solar resources create opportunities not only for land-based PV but also for innovative applications, such as floating solar. This technology can enhance hydropower reliability by reducing water evaporation and can also optimise solar-hydro operation by taking advantage of existing grid infrastructure. There are a few examples in the world of [floating solar on hydro reservoirs](#), such as the Dezhou Dingzhuang in China (also the largest project of its kind in the world) and the Cirata Floating Solar Power Plant in Indonesia.

Wind

In 2024, [Ethiopia](#) had 440 MW of installed wind power, generating approximately 800 GWh of electricity through four wind farms: Adama II, Ashegoda, Adama I and [Aysha II](#), for which phase one (32/48 turbines) was only partially operational until the [final inauguration](#) at the end of January 2026. The [Assela Wind Farm](#) (100 MW) was inaugurated in April 2026, although its turbines started feeding power into the national grid in April 2025. The farm comprises 29 turbines of 3.46 MW each and generates over 300 GWh of electricity per year. AMEA Power is currently developing the [300 MW Aysha II Wind Power Project](#), located in the Somali Region in eastern Ethiopia. In July 2026, the project received a financing package of [USD 110 million](#) from the African Development Bank (AfDB), making it the first utility-scale renewable energy project developed under a PPP framework in Ethiopia. The total [estimated investment](#) is USD 620 million, with both AfDB and the International Finance Corporation as mandated lead arrangers.

Yearly global horizontal irradiation (left) and wind speed (right) in Ethiopia



Note: kWp = kilowatt peak.

Source: The solar map (left), adapted by the IEA, was obtained from the “Global Solar Atlas 2.0”, a free, web-based application developed and operated by the company Solargis s.r.o. on behalf of the World Bank Group, using Solargis data, with funding provided by the Energy Sector Management Assistance Program. For additional information, see: <https://globalsolaratlas.info>. The works are licensed under the Creative Commons 4.0 Attribution International licence, CC BY 4.0. The wind map (right), adapted by the IEA, was obtained from the Global Wind Atlas version 4.0, a free, web-based application developed, owned and operated by the Technical University of Denmark. The Global Wind Atlas version 4.0 is released in partnership with the World Bank Group, using data provided by Vortex, using funding provided by the Energy Sector Management Assistance Program. For additional information, see: <https://globalwindatlas.info/en>. The works are licensed under the Creative Commons Attribution 4.0 International licence, CC BY 4.0, except where expressly stated that another licence applies.

Ethiopia has a [strong wind potential](#), estimated to be between 6 700 MW and 10 000 MW. Ethiopia is among the top five countries in Africa with [the best wind potential](#), predominantly concentrated in the highland areas of the Somali and Oromia Regions, where speeds are sufficient for utility-scale projects. However, the wind power sector faces [several challenges](#). The first is a lack of robust wind resource data at a granular level. Wind resource assessments in Ethiopia have mostly been carried out on a site-by-site basis, and only when needed for specific project development. This slows the expansion of wind, as investors do not have easy access to nationwide resource information to evaluate opportunities. However, efforts are underway to address this gap and improve the availability of granular wind data. In particular, under the [Enhanced Denmark-Ethiopia Energy Partnership](#) programme, the Danish Energy Agency is developing a Wind Atlas for Ethiopia. The project is a flagship activity of the co-operation between Denmark and Ethiopia and aims to produce a

comprehensive, state-of-the-art national dataset on wind resources to support evidence-based planning and investment in wind energy across the country. The project started in 2025 and will be completed at the end of 2027. The second challenge is transmission infrastructure bottlenecks, as the best wind sites are often remote from the national grid. The third challenge is a shortage of skilled domestic workforce and overreliance on foreign technicians and experts to regularly operate and maintain turbines. This leads to delays and increased downtime of turbine units, as foreign experts are often brought in to resolve any issues. Finally, there is heavy dependence on imported technologies and spare parts. This results in long supply chain delays due to difficulties in securing sufficient foreign currency to purchase those components.

Geothermal

Ethiopia lies along the East African Rift System, one of the [most extensive rift](#) zones in the world. The Afar depression and the Main Ethiopian Rift in particular host [high-enthalpy](#) geothermal resources, with well temperatures indicating a technical potential of [4 200 MW to 10 800 MW](#). Geothermal exploration began in the late 1960s, led by the Geological Survey of Ethiopia Institute in collaboration with the United Nations and Japan International Cooperation Agency. While exploration has not covered the entire country, the Rift Valley areas are well-covered. To date, [25 geothermal prospects](#) have been identified along the East African Rift and detailed surface exploration studies have been completed at 20 sites, most of which show high-enthalpy resources for power generation. Nine sites are currently at different stages of development. In addition, geothermal resources offer potential for direct heat applications (see the Renewable energy for productive uses section).

Planned production of geothermal power

Locality	Developer	Current status	Total under implementation or planned (MW)
Aluto Langano	Public (EEP)	Under implementation, expanded	70
Alalobad (Tendaho 2)	Public (EEP)	Under the preparatory phase	25

Locality	Developer	Current status	Total under implementation or planned (MW)
Corbetti	Private (Corbetti Geothermal)	Under implementation	150
Tulu Moye	Private (Tulu Moye Geothermal)	Under implementation	150
Shashemene (Wendo Genet)	Private (Ormat Plc)	PPA negotiation	100
Dofan	Private (Ormat Plc)	PPA negotiation	100
Boku	Private (Ormat Plc)	PPA negotiation	100
Dugna Fano (Abaya 2)	Private (Ormat Plc)	PPA negotiation	150
Fentale	Private (Cluff Geothermal)	PPA negotiation	150

Source: [Ethiopian Electric Power \(2022\)](#).

The [Aluto-Langano](#) Plant in the Oromia Region underpins Ethiopia's geothermal development. It was commissioned in 1998 with an initial capacity of 7.3 MW, but has faced persistent operational challenges, which prompted a major rehabilitation and expansion programme led by EEP. It remains the country's only operating geothermal plant. Production testing from six newly drilled wells confirmed a combined capacity of about [25 MW](#), with further expansion supported by a [World Bank loan](#). The project is being developed in two phases, targeting a total installed capacity of 70 MW. Beyond generation, the project constructed [157 km of transmission lines](#) and multiple substations to support regional interconnection, including with Somalia.

Private sector participation began in 2009-2010 when Reykjavik Geothermal initiated Ethiopia's first geothermal IPPs, despite geothermal resources then being legally classified as minerals, which excluded private ownership or operation. Preliminary exploration agreements enabled data collection and engagement with EEP and the

Geological Survey of Ethiopia. This early private interest, together with government recognition of limited public capacity, led to the development of a dedicated geothermal legal framework that formalised private investment (see Policy section).

The Corbetti project in the Oromia Region is Ethiopia's first flagship geothermal IPP. It was initiated in 2009, with investors and donors joining from 2011. It targets 150 MW in two phases, with a potential expansion [up to 500 MW](#). It was developed by Reykjavik Geothermal, InfraCo Africa and the African Renewable Energy Fund (initially), and secured concessional support from the World Bank and KfW-supported [Geothermal Risk Mitigation Facility](#), the African Development Bank's [SEFA grant](#) and other donors. A 25-year [PPA](#) with EEP was signed at a tariff of 75.3 USD/MWh. As of 2024, the project had advanced from surface studies to exploratory drilling, with three wells underway. Phase 1 includes a new substation and [15 km of transmission lines](#). In [June 2026](#), the Private Infrastructure Development Group (PIDG) and Taranis Operations Ltd signed a convertible loan agreement to support the next stage of development, including exploration drilling activities. The agreement forms part of a total investment of USD 27 million in equity to advance the project through its exploration and development phases.

Tulu Moye, also in the Oromia Region, is the second flagship IPP, targeting 50 MW in Phase 1 and 150 MW at full scale. It was conceptualised in 2010, secured donor support from 2017 onwards, and was developed by Reykjavik Geothermal and Meridiam. Concessional support includes the African Development Bank's [SEFA grant](#) for drilling and exploration, the [US DFC technical grant](#) and [World Bank guarantees](#) covering equity risks. The project signed a 25-year [PPA](#) with EEP at a tariff of 69.5 USD/MWh and included [11 km of new transmission lines](#) and a new substation in Phase 1. By mid-2024, however, the project entered a temporary "pause and reassess" phase due to unproductive wells, financing constraints and security concerns, including armed activity that required a temporary withdrawal of personnel; by early 2026, talks to resume the project had begun, but it still had not fully restarted.

Governance and policy framework

Ethiopia does not have a single, dedicated geothermal development authority, unlike [Iceland](#) or the [Philippines](#), or an authority that co-ordinates, as in [Kenya](#). Instead, responsibilities are spread across several institutions: the MoWE sets overall energy policy; the Ministry of Mines oversees exploration and resource rights; the Ethiopian Geological Institute conducts resource assessment and drilling; PEA regulates the sector and issues licences; and EEP is responsible for power generation, grid

connection planning and PPAs. This fragmentation means geothermal development is co-ordinated across several entities rather than in a unified “one-stop” agency, increasing transaction costs and slowing project delivery.

Ethiopia targets [2.5 GW](#) of geothermal power capacity by 2030, with the [National Sustainable Energy Development Strategy 2024-2030](#) aiming for geothermal to account for almost 7% of total generation by 2030. However, geothermal is not included in Ethiopia’s most recent [NDC 3.0](#), which signals a misalignment between national energy planning and climate commitments that could weaken and constrain access to climate finance.

The legal and institutional framework for geothermal has evolved significantly, with support from [international partners](#), but implementation remains uneven. The [2016 Geothermal Resource Development Proclamation](#) and the [2019 Geothermal Regulation](#) separated geothermal from the mining regime; clarified licensing, land access and environmental safeguards; and enabled private ownership and operation. These laws also include local participation provisions, mandating preferential employment of qualified Ethiopian citizens, skills transfer, and fair resettlement and livelihood measures. The [Energy Proclamation \(2013\)](#) and [Energy Regulation \(2019\)](#) further link geothermal to power market and grid access reforms. Ongoing revisions since 2020 seek to streamline permitting, clarify fiscal and environmental obligations, and align investor protection with international PPP standards. Institutional roles are shared between PEA for licensing and oversight, [EEP](#) for offtake and project facilitation, and the Ethiopian Geological Survey for resource data and technical support, though co-ordination and capacity constraints across institutions continue to limit effectiveness.

Geothermal development has so far relied heavily on donor and development finance, including concessional loans and grants from the [World Bank](#), the African Development Bank’s [SEFA](#), Japan International Cooperation Agency, KfW and others, notably through the [Geothermal Risk Mitigation Facility](#) for Africa. While this support has reduced early-stage risk, financing remains project-based and donor-led, with limited private capital mobilisation to date. Current policy discussions thus focus on better use of concessional finance to crowd in private investment through risk-sharing and PPP mechanisms.

Geothermal in the power mix: Its strategic role and challenges

Ethiopia holds world-class geological resources, comparable to regional leaders such as Kenya, with technical potential exceeding [10 000 MW](#). Yet current geothermal deployment remains negligible – at [less than 0.1%](#) of installed capacity and even less of power generation – representing a large, untapped opportunity.

Geothermal offers baseload and flexible, dispatchable power and could address key system challenges: hydropower dependence exposed to climate variability, growing electricity demand, limited grid access and environmental risks from reliance on traditional biomass for off-grid applications (see Designing a complementary power system section).

Despite clear benefits, structural and financial barriers constrain deployment. Distorted electricity pricing, transitional tariff reform, weak cost recovery, limited access to long-term finance and heavy reliance on concessional funds reduce investor appetite. IMF-supported macroeconomic reform makes tariff adjustments unavoidable, but this transition increases regulatory and political risk for investors in long-lived infrastructure. Exchange rate volatility, currency convertibility constraints and limited local capital markets further raise financing costs and reinforce reliance on development finance rather than private investment.

The geothermal cost profile remains challenging. Even with concessional support, long-term PPA tariffs typically exceed 100 USD/MWh. This reflects high upfront drilling costs and outdated subsurface data, which inflate exploration uncertainty and due-diligence costs, as well as the single-buyer model, which prevents large consumers from contracting directly and limits market signals and competition (see Policy spotlight below). These factors make geothermal uncompetitive relative to lower-cost renewables under current market and regulatory conditions. Tailored tariff structures and updated geospatial data with open market access are needed to reduce entry barriers, lower risk premia and attract private capital at scale.

Financial constraints, limited drilling capacity, rig availability, shortages of specialised staff, grid connection bottlenecks and underdeveloped transmission infrastructure further increase project risk and timelines. As discussed in the previous section on governance, responsibilities are spread across multiple agencies, without a dedicated geothermal authority, which slows co-ordination and licensing. Countries such as the [Philippines](#), [Iceland](#) and to some extent [Kenya](#) have successfully addressed these challenges through centralised “one-stop shops” that streamline exploration, licensing and investment facilitation.

Policy spotlight: Geothermal for data centres

Ethiopia's emerging industries, particularly data centres, face growing power market constraints. IMF-backed tariff reform and cost-recovery pressures are likely to raise prices, which will increase demand for stable power such as geothermal. The [Digital Ethiopia 2025 strategy](#) and the new [Digital Ethiopia 2030 roadmap](#) are accelerating digital infrastructure and data centre expansion, which requires reliable electricity at a significant scale.

However, Ethiopia's single-buyer model currently prohibits large consumers from contracting directly with geothermal or other IPPs. Physical bilateral PPAs are not permitted and virtual PPAs remain underdeveloped and would require regulatory reform. This limits geothermal's ability to respond to industrial demand. Without frameworks for direct procurement, third-party grid access and bilateral contracting, geothermal projects remain dependent on utility offtake and donor backed financing rather than market signals.

International experience shows that data centres can contract directly for geothermal power, either through physical or virtual PPAs, including Google ([Chinese Taipei](#) and the [United States](#)), Meta (the [United States](#)), Microsoft ([Kenya](#)), G42 ([Kenya](#)) and operators in the [Philippines](#). These operators are willing to pay a [premium tariff](#) for more expensive but firm, high-capacity baseload geothermal power. [Indonesia](#) is explicitly targeting geothermal for data centres.

Designing a complementary power system

The integration of different renewable resources can create a more flexible and reliable energy system. By leveraging the unique strengths of each resource, a co-ordinated approach enables a smoother balance between supply and demand, and greater resilience of the system. Ethiopia has the opportunity to design a complementary system where different renewable technologies interact dynamically to ensure stability, reliability and efficiency. Wind and solar PV can progressively account for a larger share of electricity generation while hydropower and geothermal could serve as steady, controllable baseload sources that compensate for the natural fluctuations of solar and wind power. By absorbing their variability, hydropower would act as an energy stabiliser, maintaining grid balance during periods of low sunlight or weak winds.

Complementary roles of renewable energy technologies in the power mix

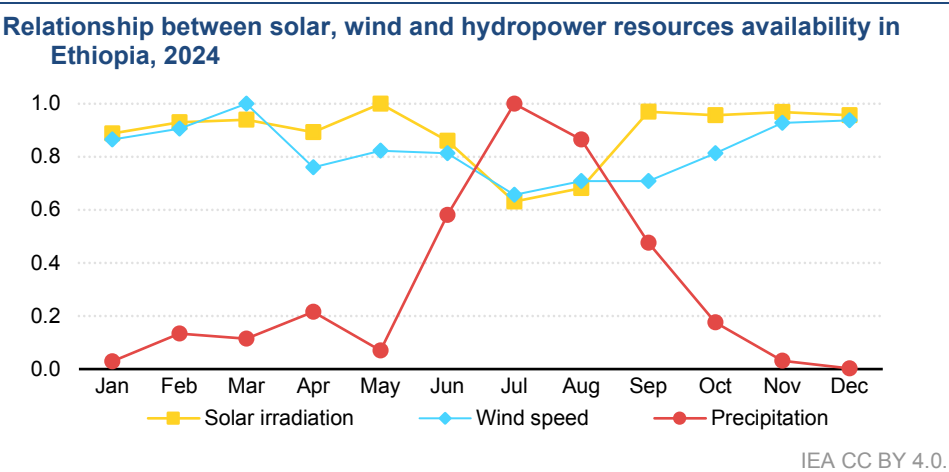
Technology	Main strength	Role in the mix
Hydropower	Seasonal reservoirs can store excess power and ramp up quickly	Balancing and storage/ acting as a battery for solar/wind
Geothermal	Steady output, dispatchable	Firm, baseload and dispatchable
Solar PV	Complements hydro during periods of low flow, perfect for mini-grids	Peak potential during daytime and distributed access
Wind	Complements solar and high-capacity factors in projects' site zones	Intra-day variability

Hydropower should be seen not only as a low-cost source of electricity but also as a key source of system flexibility across multiple time scales. Most of Ethiopia’s hydropower plants are reservoir-based, providing a wide range of valuable system services. These installations offer fast ramping capability, allowing operators to quickly increase or decrease output in response to short-term changes in demand. They also support inter-day and seasonal balancing by shifting production to periods of higher system demand and/or lower variable renewable generation. Reservoir hydropower can also provide spinning reserve and frequency regulation while offering relatively high efficiency and the possibility of multi-purpose use such as irrigation, flood control and water supply.

Geothermal can provide firm, baseload power with long-term system stability thanks to high-capacity factors and durability. It can also be designed for a dispatchable, grid-connected operation. Currently, Ethiopia only has one partially operating geothermal plant. However, new projects could be built with reservoir management and control systems that allow output to adjust to grid needs and provide ancillary services. This increases costs compared to simple baseload designs, but the increase is relatively small compared to the system benefits and flexibility value gained. Real-world examples of dispatchable geothermal include the [Puna Geothermal Venture](#) in Hawaii and [Fervo](#) projects, which are explicitly designed for flexible, grid-responsive operation.

Over time, as wind and solar technologies continue to mature and expand their share in the energy mix, greater integration through advanced storage solutions, smart grids and demand-side management will further enhance overall system resilience.

The figure below illustrates the monthly variations in solar irradiation, wind speed and precipitation in Ethiopia for 2024 and highlights their complementary relationship for renewable energy planning. Solar irradiation and wind speed follow a similar pattern, with high levels from January to May and from September to December, dipping from June to August. Precipitation has been used as a proxy for hydropower availability and contrasts sharply with wind and solar. It remains low, close to zero, from January to May, rises dramatically during the heavy rain season (June-August) and gradually falls back to minimal levels by December. The inverse relationship between solar, wind and hydropower shows the complementarity of these resources, as high hydro periods offset lower solar and wind output, and vice versa. Geothermal complements the seasonal variability, as it provides consistent output year-round, unlike solar and wind peaks in dry months or hydro surges in the rainy season.



Notes: Data are normalised. Precipitation has been used as a proxy from hydropower availability.
Sources: Solar irradiation and precipitation data from [Renewables.ninja](#), (accessed in February 2026). Wind speed data from [Luft time](#), (accessed in February 2026).

Auctions

Ethiopia’s first experience with renewable energy auctions started in 2016, when EEP launched the first tender for a 100 MW solar PV project in Metehara. The project was

tendered as part of the World Bank's Renewable Energy Guarantees Programme with support from the United States Agency for International Development as transaction adviser through "Power Africa". The auction was won by ENEL Green Power at a price of 58.98 USD/MWh. While the number of bidders and the awarded price indicate a well-designed auction, the project did not reach financial closure.

At the time, there was limited domestic capital; international financing was needed. However, ENEL Green Power was unsuccessful in securing the debt primarily due to restrictions and a lack of foreign exchange and uncertainties around the ability to repatriate profits. These challenges undermined lenders' confidence. In addition, EEP's poor financial health, with a high debt burden, mounting annual losses and subsequent debt payment delays, further increased the offtake risk. Finally, land acquisition and allocation issues and regional conflicts posed further challenges to project realisation.

After the first auction, Ethiopia took part in the World Bank's Scaling Solar programme, an initiative targeting several sub-Saharan African countries, including Senegal and Zambia, to create viable markets for privately funded grid-connected solar PV projects. The first round of the programme in Ethiopia involved two projects: Gad and Dicheto for a total of 250 MW. Both projects were awarded in 2019 to the Saudi Arabian company ACWA Power for a record-breaking price of 25 USD/MWh. However, both projects were terminated due to delays in securing financing and starting construction, foreign exchange problems, and regional conflicts.

Ethiopia is currently advancing a new round of utility-scale solar procurement with a PPA of 25 years for two projects: Gad II and Weranso of 125 MW and 100 MW, respectively. Both projects are in the request for proposal stage and the final award is expected by the end of 2026.

Bioenergy

Bioenergy dominates Ethiopia's energy supply. In 2024, biomass supplied 1 880 PJ (87% of total energy supply), primarily used in the residential sector for cooking purposes. The main types of biomass used in Ethiopia include fuelwood, agricultural residues, charcoal, forest residues, animal dung and biogas. The country's [Revised Biofuel Development Strategy](#) (2025) outlines best practices for bioenergy use around the world and recognises the importance of harnessing Ethiopia's vast domestic bioenergy potential. The document is a forward-looking plan designed to boost energy security, foster sustainable development and reduce reliance on

imported fossil fuels. Central to the strategy is the promotion of renewable biofuels (i.e. bioethanol, biodiesel and biogas), with an emphasis on feedstock production expansion, modernisation of bioenergy facilities and encouraging private sector investment to scale up biofuel output. Considering that the government is prioritising the electrification of the transport sector, biodiesel will not be an option in the fuel mix of new light-duty vehicles. Instead, the Strategy lays out [phased targets](#) for biodiesel blending in existing diesel-fuelled vehicles and in heavy-duty vehicles. In the transport sector, a target of 10% bioethanol blend (E10) is set for 2030, rising to 15% (E15) by 2035, while a [10% sustainable aviation fuel \(SAF\)](#) blend is set to be introduced in the aviation sector by 2030.

However, the development of a domestic bioethanol and biodiesel industry presents a unique set of challenges that must be carefully addressed to ensure long-term sustainability. The first is a lack of industrial-scale crop cultivation. Establishing large-scale crop farming and securing supply chains, including transport, storage and processing facilities, is a difficult task that requires substantial investment and strong institutional support. The second challenge is land management and community engagement. Land disputes and a lack of transparency within the communities, especially in regions targeted for expansion, could derail or hijack projects. Limited technological capacity and skilled human resources are the third challenge. The operation of bioethanol and biodiesel plants requires technical expertise, as well as advanced technologies that require consistent maintenance standards. The shortage of trained professionals, coupled with limited access to modern equipment and research facilities, hinders the efficiency and competitiveness of the industry. Without targeted investment in technology transfer, capacity building and institutional partnerships, it will be difficult to scale production and maintain quality standards.

Bioethanol

Ethiopia has been actively exploring bioethanol as part of its broader strategy to diversify energy sources, promote renewable energy and enhance rural development. Almost all the feedstocks needed to produce bioethanol (sugarcane, sugar beet, cereals and maize) are grown in Ethiopia. However, for food security reasons, national policies discourage the use of food crops as feedstocks, and bioethanol is currently being produced only as a byproduct of sugarcane processing. There are currently 13 sugar factories in Ethiopia, but only two produce bioethanol: [Finchaa](#), with 20 million litres/yr, and [Metehara](#), with 12.5 million litres/yr. In October 2025, Sunbird Bioenergy Africa and the Ethiopian Mining Corporation announced a partnership to develop a 23 000 hectare [agricultural biorefinery](#). The facility will begin

operations in 2030 and is set to produce SAF for aviation, ethanol for transport and household biofuels. In parallel, [Ethiopian Airlines](#) has committed to replace up to 5% of its jet-fuel consumption with domestically produced SAF.

Biodiesel

Ethiopia has a significant potential for biodiesel production thanks to its vast land resources and abundant non-edible oil feedstocks. The country has prioritised the [production of three feedstocks](#): castor beans, *Jatropha curcas* and palm.. Ethiopia's Biofuel Strategy recognises biodiesel as a strategic fuel, especially for heavy-duty transport and aviation, and seeks to create an enabling environment for its development. Recent years have seen the development of several pilot and commercial initiatives. For example, [API Renewable Energy PLC](#) operates one of the country's largest biodiesel plants in Adama, with a planned annual capacity of up to 70 million litres. [Africa Power Initiative](#) and [ATRIF Alternative Energy](#) are developing two other smaller scale facilities: one aiming to produce 12 000 litres per day of biodiesel and the other 200 000 litres per day. On the feedstock side, the [Ethiopian government](#) has promoted large-scale jatropha cultivation to support the production of up to 500 million litres of biodiesel over five years. Despite these developments, the sector remains in the early stages of development and faces substantial challenges, such as unclear regulatory frameworks, financial constraints and limited infrastructure. Land access and environmental concerns also pose obstacles to scaling biodiesel plantations.

Renewable energy for economic development

Renewable energy for fertiliser production

Overview

Agriculture is the backbone of Ethiopia's economy, accounting for [33% of the country's GDP](#) and employing around [60% of the population](#). Like the majority of sub-Saharan African countries, Ethiopia has no domestic production of fertilisers and imports 90% of its needs. With a total of [1.97 Mt of imported fertilisers](#) in 2024 for a value close to [USD 1 billion](#), [Ethiopia is Africa's largest fertiliser importer](#). The main fertiliser types are nitrogen-phosphorous, primarily supplied by [Morocco](#), and urea, mainly imported from [Egypt and Oman](#). However, in recent years, a [growing market for other fertiliser](#) types are also emerging, namely calcium ammonium nitrate;

calcium nitrate; nitrogen, phosphorus and potassium; and potassium nitrate. There is currently no primary production of fertilisers in Ethiopia, but the country has five fertiliser blending plants; however, only two are partially operational.

Responsibility for the import and distribution of fertilisers falls under the [Ethiopian Agricultural Business Corporation](#), a state-owned company under the supervision of the Ministry of Agriculture. The company is responsible for purchasing fertilisers in large quantities from international suppliers, often under long-term contracts, and for distributing domestically via co-operative unions and primary co-operatives. With the objective of protecting farmers from price volatility and foreign exchange constraints and maintaining productivity, the government has always allocated significant financial support in the form of subsidies to fertiliser procurement. For example, [at the beginning of 2025](#), the government had earmarked ETB 82 billion (USD 529 million) for fertiliser subsidies and ETB 60 billion (USD 387 million) for safety nets.

Opportunities for a domestic renewable fertiliser industry

The concentration of fertiliser production among a few large producers makes the fertiliser trade increasingly dependent on a market that is highly vulnerable to geopolitical shocks and supply disruptions. The recent geopolitical instabilities, namely the Russian Federation's invasion of Ukraine and the closure of the Strait of Hormuz, have put this vulnerability on display and led to concerns among countries on how to deal with this uncertainty and better respond to future shocks. Ethiopia's electricity mix is already 100% renewable, mostly from hydropower, and has an abundant and untapped renewable potential, namely solar and wind. The new power generated from the GERD is meant to play a role as a driver of economic and industrial development, not just power generation. By providing a reliable and affordable source of electricity, the GERD will enable the expansion of energy-intensive industries while attracting domestic and foreign investments in industrial development. Moreover, Ethiopia has access to abundant water resources needed to produce renewable hydrogen, which can then be synthesised to produce renewable ammonia, the main ingredient of nitrogen-based fertilisers. The development of a domestic renewable-based fertiliser industry has a dual benefit for Ethiopia. First, it could reduce Ethiopia's overreliance on imported fertilisers, which has always been a challenge to guaranteeing food security and agricultural resilience. A domestic industry would enable savings on import bills, easing pressure on foreign currency reserves while guaranteeing a more stable and self-reliant fertiliser supply. In addition, it would create new skills and jobs, along with new technical and

manufacturing capacity. Second, it could open new economic opportunities. With neighbouring countries like Kenya, Somalia and Sudan facing persistent fertiliser shortages, Ethiopia could strategically position itself as a regional supplier of fertilisers. The shift from import dependency to export capability aligns with the country's broader industrialisation agenda while also supporting regional economic integration under the [African Continental Free Trade Area](#).

Renewable energy for productive uses

Renewables offer compelling benefits for productive uses by delivering decentralised power and heat to agriculture, agro-processing and industries at costs that are 50-80% lower than diesel generators. Expanding renewable energy applications for productive uses in Ethiopia could significantly boost industrial and agricultural productivity, enhance rural livelihoods, and contribute to reducing reliance on expensive diesel.

For example, agrivoltaics combines solar energy and farming on the same land and allows land-use efficiency to be increased by simultaneously cultivating crops, raising livestock and generating renewable electricity. Agrivoltaics is gaining momentum in Ethiopia through the [Integrating Agrivoltaics for Climate-resilient Agriculture and Energy Transition](#) initiative launched by the Global Green Growth Institute in December 2025. The initiative involves conducting pre-feasibility studies for agrivoltaics in selected regions of Ethiopia to support the integration of agrivoltaics into Ethiopia's energy and agricultural landscape. It also includes an investment document to attract funding for agrivoltaics projects and a capacity-building programme to train local experts.

Solar irrigation is another key technology which improves access to water for crop yields and extended growing seasons, enables more consistent agricultural productivity, and reduces reliance on diesel. The [Sustainable Energy for Smallholder Farmers](#) project contributed to the promotion of solar irrigation pumps for smallholder farmers in Ethiopia, Kenya and Uganda. The project was implemented by EnDev together with SNV Netherlands Development Organisation and GIZ and was funded by the IKEA Foundation (EUR 8 million). Its key achievements across the three countries include the sale of 5 809 solar water pumps, the establishment of 20 demonstration farms, the creation of almost 600 jobs, training for farmers and workshops to share experiences between countries, and reduced fossil fuel consumption.

Direct use of geothermal heat in Ethiopia remains limited to traditional hot springs and a few megawatt thermal (MW_{th}) of isolated applications, despite substantial geothermal resources, notably at [Aluto-Langano, Dubti and Abaya](#). While these resources are ideal for direct steam use in industrial and agricultural processes, no commercial applications have emerged to date. The constraint is not technical but structural. Policy has prioritised power generation, institutional responsibilities for geothermal and heat remain fragmented, and the absence of steam networks and standardised business models (e.g. heat purchase agreements, utility-like steam sales or other bankable financing models) makes projects rely on an individual end-user, leaving them uneconomic without demand aggregation.

Several countries offer relevant examples. By leveraging similar resources (100-220°C), Kenya has scaled around 50 MW_{th} of direct-use capacity by designing enabling heat purchase agreements, developer-led [steam networks through Geothermal Development Company](#), and industrial park clustering supported by clear tariff structures and temperature ranges. This approach has allowed Kenya to diversify geothermal revenue streams beyond power while capturing local economic value. At this stage, Kenya remains in a [pilot](#) and scale-up phase, with several projects under development growing investor interest and improving its policy and regulatory framework. Japan shows the [cascading use](#) of geothermal resources, where residual heat from power generation (typically 50-100°C) is deployed for direct-use applications, improving overall system efficiency and local value creation. Ethiopia could replicate these approaches by developing business models, establishing a dedicated steam utility special purpose vehicle such as Kenya's Geothermal Development Company, and mandating geothermal-industrial park co-location at priority [geothermal sites](#) to aggregate demand, reduce investment risk and minimise thermodynamic losses.

Recommendations

9. Design a complementary renewable-based power system

Ethiopia's power system is facing growing demand driven by population growth, data centres and electric mobility. In addition, overreliance on hydropower creates operational and financial risks. Abundant wind and solar, as well as proven geothermal resources, offer a timely opportunity to diversify the renewable mix, reduce seasonal imbalances and stabilise supply.

The country could benefit from an evaluation of the potential to integrate renewables into the power mix through a thorough assessment of resource complementarities; that is, how wind, solar and geothermal profiles align with hydropower (seasonal patterns, etc.).

10. Promote the deployment and use of renewable energy technologies for power and heat in economic activities

Agriculture and industry are the backbone of the Ethiopian economy, accounting for a large share of GDP and employment, yet both rely heavily on imported diesel for heat and backup electricity. This dependence exposes companies and farmers to fuel price spikes and unreliable supply.

Integrating renewable power technologies such as agrivoltaics and solar irrigation can significantly increase land productivity and access to water, enhance agricultural output, and boost rural incomes.

Direct use of geothermal heat offers a response on the heat side. Geothermal resources could provide reliable steam and hot water for agro-processing, crop drying, greenhouses and light industry. However, to unlock this potential, policy makers need to go beyond power generation and actively promote the deployment and use of geothermal heat for productive activities: developing standardised business models, creating a dedicated steam utility and co-locating industrial and agro-industrial parks with geothermal power generation to aggregate demand, reduce investment risks and minimise thermodynamic losses.

11. Ensure the long-term sustainability of Ethiopia's domestic bioethanol and biodiesel production

Ethiopia has a growing domestic bioethanol and biodiesel production and abundant feedstock potential. However, a unique set of challenges needs to be addressed to fully exploit this potential, including the lack of industrial-scale crop cultivation, challenges in land management and community engagement, limited technological capacity, and a shortage of skilled human resources. In this regard, securing private sector investment is crucial for scaling up Ethiopia's domestic biofuel production, as it provides the capital needed for infrastructure, technology upgrades and supply chain development.

12. Design and implement a well-structured, transparent and competitive auction system

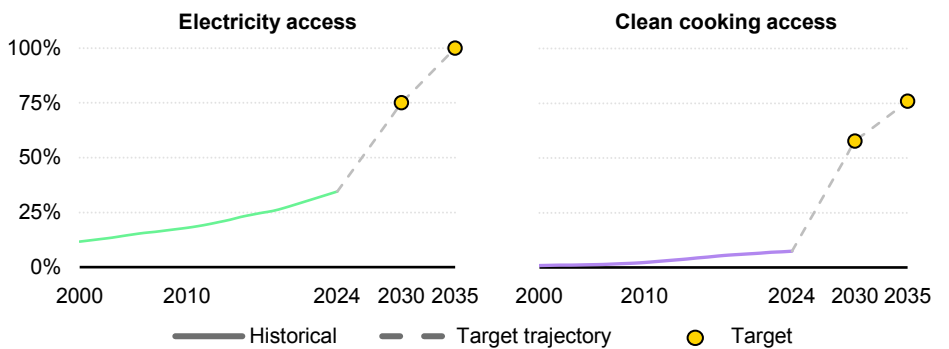
Auctions are a powerful instrument to secure renewable energy capacity at a competitive price while also developing local industry and capacity. Well-designed renewable energy auctions are essential for accelerating Ethiopia's transition to a sustainable power system, as well as for involving and aligning private sector participation with national decarbonisation goals. Based on Ethiopia's past experience, three key aspects have been identified as essential for accelerating renewable energy auctions and ensuring project realisation:

- **Guarantee an enabling financial environment** by ensuring that projects can access long-term and affordable financing under stable and reliable conditions. Clear regulatory frameworks, currency risk mitigation mechanisms, creditworthy offtakers and supportive financial instruments all help reduce investor risk and lower the cost of capital.
- **Streamline the land allocation process** by establishing transparent procedures, clear land rights and co-ordinated institutional responsibilities. This is fundamental to reduce uncertainty for investors and prevent disputes with local communities.
- **Ensure that the auctioning authority is adequately resourced and well-staffed.** Sufficient technical expertise and institutional support enable the authority to design robust auction frameworks, manage complex bidding processes and enforce contracts effectively. This reduces risks of delays but also contributes to building investor confidence.

Access to energy

Achieving universal access to electricity and clean cooking is an integral part of strategies for economic and human development. Remarkable progress has been made globally over the past decades: since 2000, 1.6 billion people have gained access to electricity and 2.2 billion have moved away from traditional, inefficient cooking methods that are harmful to health and the environment. Yet the challenge remains vast. Today, around 730 million people still live without electricity, and nearly 2 billion – a quarter of the global population – continue to rely on polluting cooking methods. Four out of five households without access to electricity live in sub-Saharan Africa, while around 1 billion people in the region do not have access to clean cooking.

Energy access in Ethiopia, 2000-2024 and targets to 2035



IEA CC BY 4.0.

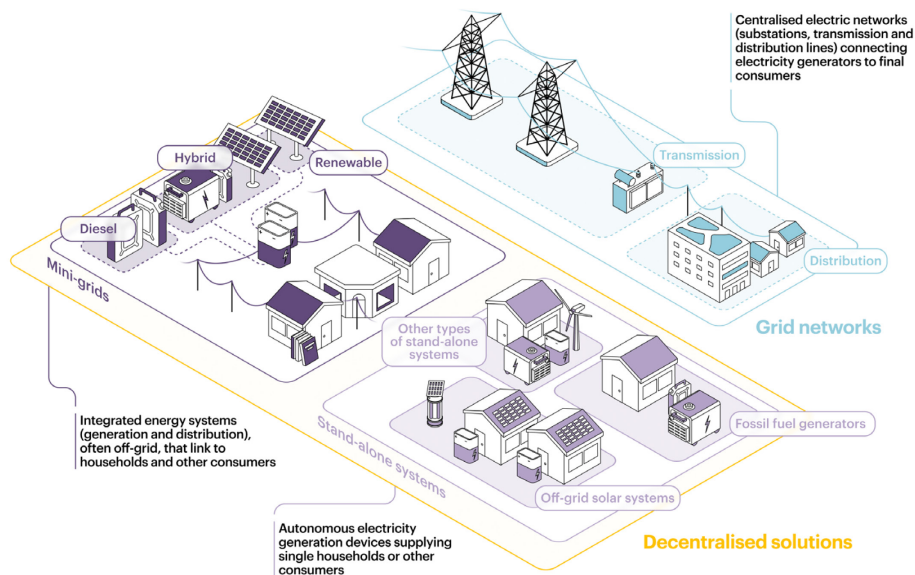
Sources: Targets from the [Ethiopia National Energy Compact](#) (2025), [National Clean Cooking Road Map](#) (2025), and [National Electrification Program 3.0](#) (2026).

Ethiopia still faces substantial energy access challenges, with electricity access reaching around 35% of the population and clean cooking access only 8% – both below the sub-Saharan African average. The government targets 75% electricity access by 2030 and universal access by 2035 and has recently updated its NEP to support delivery of this target. New clean cooking policies have also renewed momentum, positioning clean cooking as a national priority and aiming for 76% access by 2035, with an interim milestone of 58% by 2030.

Access to electricity

Definitions and context

Illustration of technologies providing electricity access



IEA. CC BY 4.0.

Source: IEA (2025), [Financing Electricity Access in Africa](#).

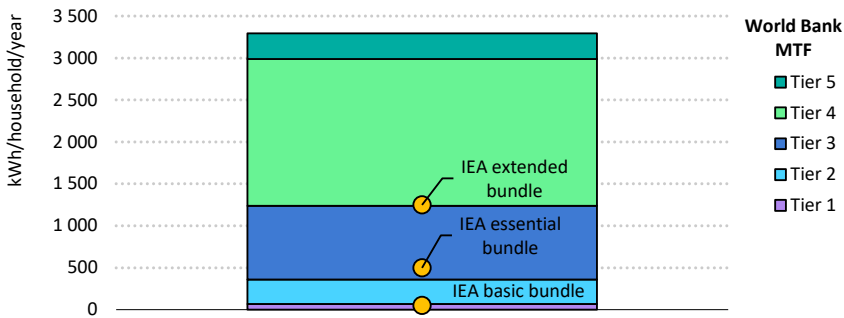
A household is defined as having electricity access when it benefits from an active connection that provides enough electricity to power at least a minimum level of services and is capable of growing over time. Electricity access can be achieved via the grid or decentralised solutions, such as mini-grids or stand-alone systems (see figure above). Mini-grids can be renewables-based, a hybrid system powered by

a renewable source with a diesel generator for backup, or diesel only, although this option is becoming less common in new projects. Stand-alone systems represent a broad group of products, primarily solar home systems, but also solar multi-light systems, solar lanterns, fossil fuel generators and other types of stand-alone systems (such as micro-hydro, wind, rechargeable batteries and hybrid systems).

The minimum required energy service for a household to be considered as having access to electricity differs between institutions. [The IEA defines electricity access](#) via a series of bundles based on household consumption levels. The basic bundle, or minimum level of services, includes more than one light point providing task lighting, phone charging and a radio, and is broadly equivalent to a range of around 50-75 kWh per household per year (see figure below). Only solar home systems above 10 watt-peak (Wp) can provide this level of services. The IEA basic bundle represents a critical first step and baseline for access, but a higher level of energy service is needed to support productive activities and drive socio-economic development. This need is captured within the IEA’s essential bundle of 500 kWh per household per year, and the extended bundle of 1 250 kWh per household per year.

Another commonly used metric is the World Bank’s Multi-Tier Framework (MTF), which adopts a multidimensional understanding of energy access. The World Bank considers electricity access starting from a small solar multi-light system of 3 Wp, and its MTF establishes six tiers of electricity access, taking into account a combination of energy consumption, reliability and affordability. The lowest tier is broadly equivalent to 4.5 kWh per household per year.

Defining access: Minimum level of energy service thresholds



IEA. CC BY 4.0.

Source: IEA (2023), [Guidebook for Improved Electricity Access Statistics](#).

Unless otherwise stated, all access levels cited in this section are based on the IEA definition and metrics.

State of electricity access in Ethiopia

Overview

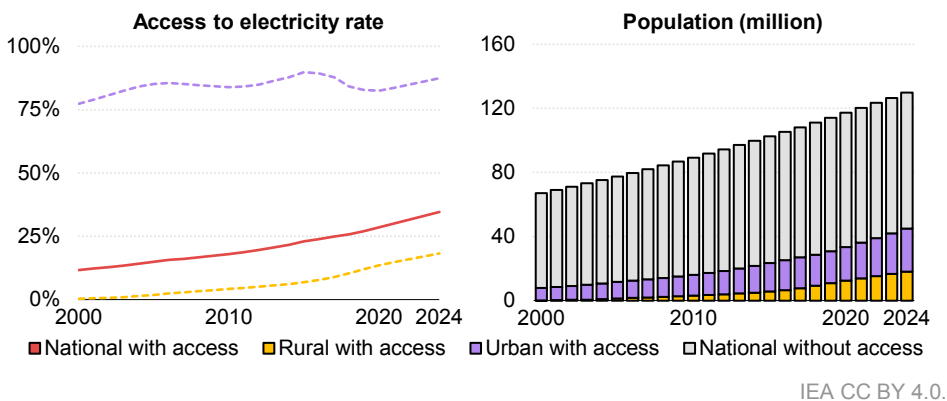
In the early 2000s, only around 12% of the Ethiopian population had access to electricity. In response, the government launched the Universal Electricity Access Program in 2005, which aimed to extend grid electricity to rural towns and villages. The Program ranks among the largest grid electrification programmes in sub-Saharan Africa. By 2015, approximately 6 000 towns and villages nationwide had been connected to the grid, up from fewer than 700 in 2005, representing around 60% of villages across the country. However, the Programme focused primarily on grid expansion, while last-mile household connections lagged behind. As a result, only 23% of the population had access to electricity in 2015.

Following these outcomes, the government placed last-mile electrification at the core of its development agenda. After 2015, it shifted its approach to prioritise household connections, as articulated in the Growth and Transformation Plan II. This vision was subsequently translated into policy through the National Electrification Strategy, released in 2016, which provided a high-level framework for accelerating access to electricity nationwide and emphasised the need for on-grid and off-grid solutions. The Strategy was put into practice with the launch of the first NEP in 2017, which set out a detailed implementation plan to achieve universal access by 2025. To support delivery, the NEP led to the creation of the Directorate of Electrification within the MoWE in 2018, alongside a National Steering Committee for Electrification to provide guidance and facilitate co-ordination across ministries. In 2019, the NEP was updated and relaunched as NEP 2.0, refining targets and timelines. The NEP 2.0 aimed to achieve universal electricity access by 2025, with 65% of the population connected through the grid and 35% through off-grid solutions, including mini-grids and stand-alone solar systems, for an estimated total cost of USD 6 billion.

Building on major gains in power generation and grid extension and densification, Ethiopia has almost tripled its national access rate since the early 2000s, even as the population has nearly doubled. Progress accelerated markedly after 2015, particularly in rural areas, following the government's paradigm shift that placed last-mile connections at the centre of electrification and development policies, though the pace has slowed somewhat since the Covid-19 pandemic. Despite these advances, the country still fell short of its target of universal electricity access by 2025. The

electrification rate stands at around 35%, leaving nearly 85 million people without sufficient access to meet the IEA basic service bundle – more than 15 percentage points below the sub-Saharan African average.

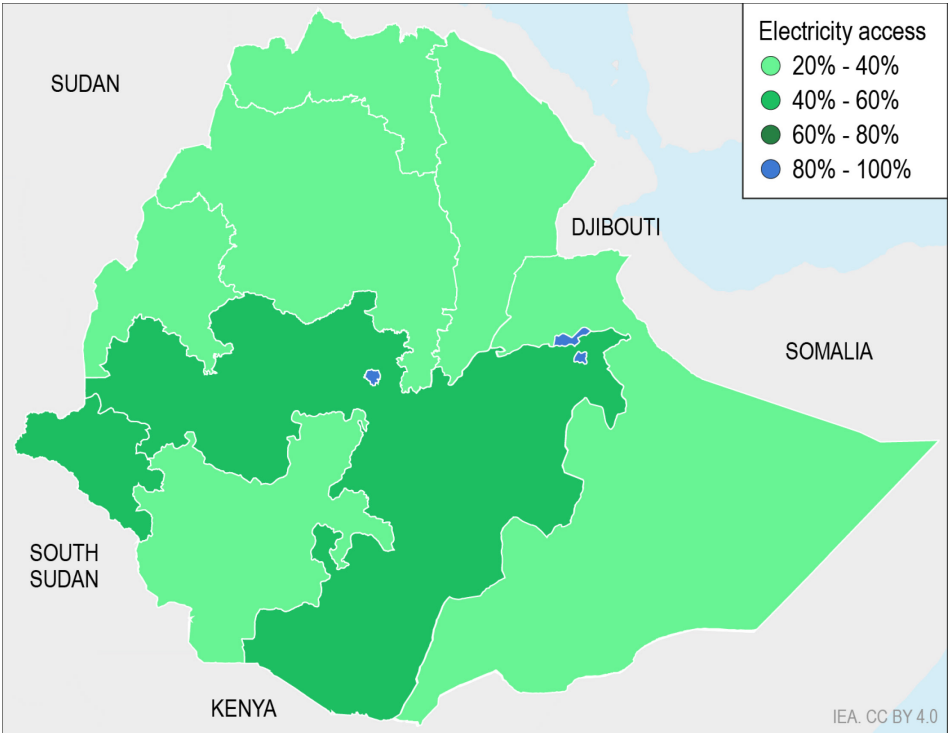
Electricity access in Ethiopia, 2000-2024



Notes: Electricity access in this graph follows the IEA definition of the basic service bundle (see section above). It excludes solar lanterns and multi-light systems below 10 Wp, which are included in some other organisations' access statistics, such as the World Bank.

The contrast between urban and rural access is stark: while more than 87% of urban households now have an electricity connection, only about 18% of rural households do. In remote rural areas, far from the national grid, some communities rely on off-grid solutions. To date, EEU operates 39 solar-based mini-grids across the country and private operators a further two, together providing electricity to fewer than 10 000 households. Overall, approximately 30% of the population is connected to the national grid, with a further 5% relying on stand-alone systems and less than 0.1% on mini-grids. Most households using stand-alone systems are equipped with small solar home systems, typically sufficient only for basic services such as lighting, mobile phone charging and powering a radio.

Electricity access by region in Ethiopia, 2024

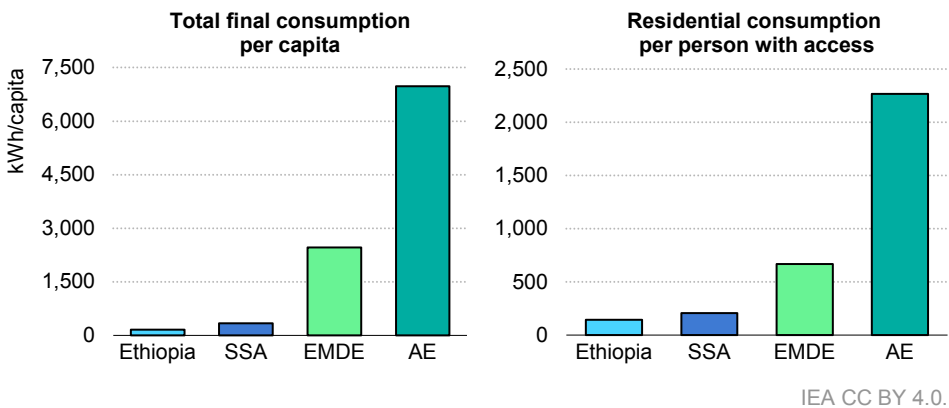


To renew momentum on electricity access, the government set a target of 75% access by 2030 in its 2025 National Energy Compact. NEP 3.0, released in 2026, subsequently established a detailed geospatial electrification and investment pathway to universal access by 2035. The Compact envisages delivering around 70% of the connections targeted through 2030 via the national grid and the remaining 30% through off-grid solutions, including mini-grids and stand-alone solar systems providing at least Tier 1 service. By contrast, the least-cost analysis underpinning NEP 3.0 suggests that, around 82-85% of new connections would be grid-based by 2035 and 15-18% would be supplied through off-grid technologies, depending on the demographic scenario.

While these efforts mainly focus on expanding access, electricity use in Ethiopia remains low by regional and global standards, even among those with a connection. Economy-wide, per capita electricity consumption is around 165 kWh – two times

lower than the sub-Saharan African average, around 15 times lower than the average in emerging market and developing economies, and 45 times lower than in advanced economies. A similar pattern holds at the household level, where average consumption among electrified households is 30% below the sub-Saharan African average and 16 times lower than in advanced economies.

Electricity consumption per capita in Ethiopia compared with other regions, 2024



Notes: SSA = sub-Saharan Africa; EMDE = emerging market and developing economies; AE = advanced economies.

Moreover, electricity consumption among Ethiopian households has not meaningfully improved in recent years, as the quality of access for connected households has deteriorated. Evidence from the [latest energy access surveys](#) shows that while the share of the population with at least a Tier 1 connection remained broadly stable between 2017 and 2025, the share of households with higher-tier connections has declined. The proportion of households with Tier 3 access fell from 17% to 12%, those with Tier 4 access from 7% to 5%, and those with Tier 5 access from 4% to 2%.

Together, these trends highlight a disconnect between progress in electricity access and outcomes in electricity use. Ethiopia’s electrification policies have been effective in expanding the national grid, including in rural areas, and increasing household connections, but these gains have not yet translated into higher levels of electricity consumption. As the government pursues its new electrification targets, a key challenge will be ensuring that expanded access is accompanied by rising demand. This requires moving beyond an approach that treats electricity primarily as a basic

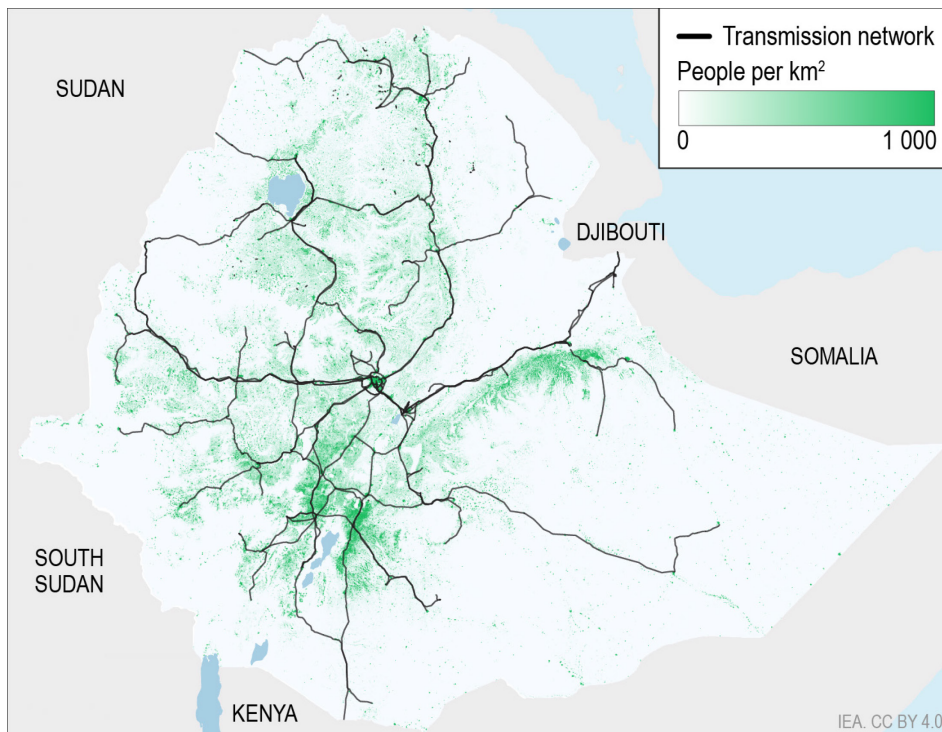
service, comparable to water supply, towards one that places a greater emphasis on its role in supporting the development of the Ethiopian economy by enabling productive activities, income generation and, in turn, greater household capacity to afford electricity and appliances. NEP 3.0 moves in this direction by integrating productive uses and wider socio-economic benefits more systematically into demand forecasting and the prioritisation of electrification projects.

On-grid access

Grid connections remain the primary means of electricity access in Ethiopia. Today, around 30% of households are connected to the national grid, representing roughly nine out of ten households with access to electricity. Grid access remains highly uneven, with more than 85% of urban households connected to the grid compared with about only 10% of rural households. Since the launch of the Universal Electricity Access Program in 2005, the grid has expanded substantially and now reaches or passes close to many rural towns and villages (see figure below). Geospatial analysis indicates that approximately 64% of the population lives within 5 km of existing infrastructure, 82% within 10 km and 94% within 25 km. Many households could be reached through grid densification (less than 1 km) and intensification (around 1-2.5 km). Further grid extension would eventually be necessary to electrify more remote towns and villages that remain far from current infrastructure. However, the concentration of unconnected communities near existing lines represents a major opportunity for cost-effective scale-up of grid access.

Despite the broad coverage of the national grid, households living in electrified areas are not systematically connected. In rural regions, for example, less than half of households living in electrified villages are actually connected to the grid, contributing to the overall low rate of rural grid access. Upfront connection costs – including fees for extending a service cable from the nearest pole or transformer to the dwelling, for the electricity meter and for associated labour – are often a major barrier preventing households from connecting. Geospatial analysis by the IEA indicates that, owing to relatively low electricity tariffs, most households in Ethiopia could afford electricity consumption up to the level of the IEA essential bundle once connected. However, this picture changes significantly when upfront connection charges are considered. When these costs are included, around 85% of households currently without access would be unable to afford the connection fee and a basic level of electricity consumption during the first year of service (see Affordability section). Affordability is further constrained by the cost of internal wiring, which can match or even exceed the connection fee itself.

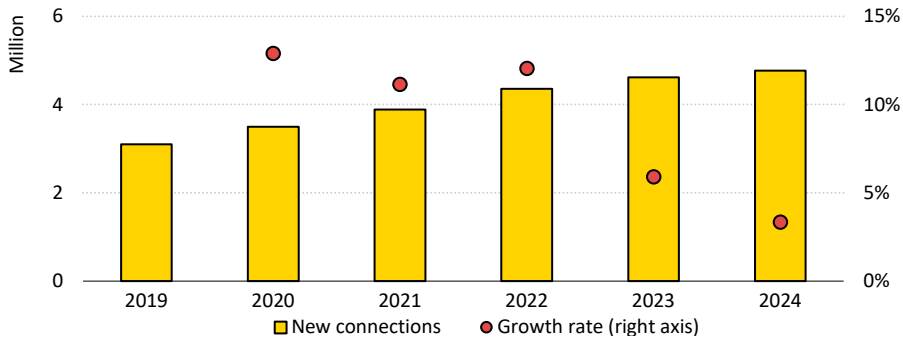
National grid and population in Ethiopia, 2024



Sources: [OpenStreetMap](#) (accessed 3 September 2025). Schiavina et al. (2025), derived from GHS-POP (R2023) and projected using the CRISP model, multitemporal (1975-2100).

The latest connection data reported by EEU indicate that the number of grid connections increased from around 3.1 million in 2019 to approximately 4.8 million in 2024. However, the pace of new additions has slowed in recent years, reflecting the impact of recent crises. Meter sharing remains widespread, with around half of grid-connected households [lacking a dedicated meter](#). While around 7% of households rely on informal connections – a share that has remained broadly stable in recent years – other grid-connected households without an individual meter pay indirectly for the electricity they consume but are not captured in the connection statistics reported by EEU. Beyond increasing safety concerns, meter sharing and informal connections complicate the government's ability to track electrification progress using supply-side data between surveys. The NEP 2.0 identified unmetered grid connections as a key issue and initiated efforts to regularise affected users. The NEP 3.0 renews and seeks to operationalise this largely unmet ambition.

Metered grid connections in Ethiopia, 2019-2024



IEA CC BY 4.0.

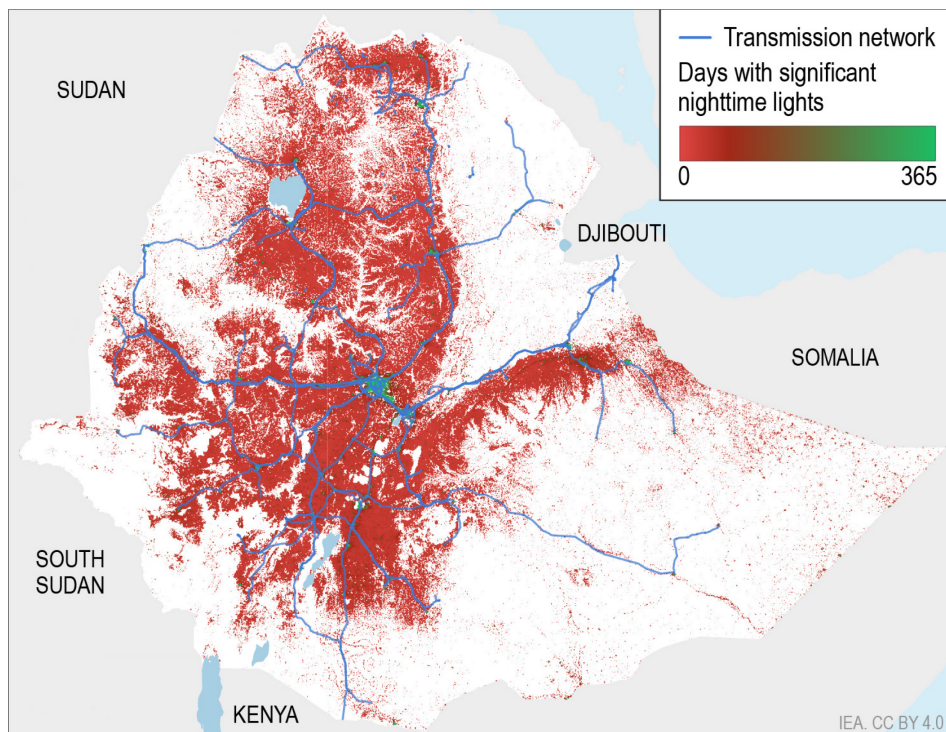
Source: Ethiopian Electric Utility (EEU).

Limited grid reliability and voltage instability – particularly on distribution lines – remain key challenges for electricity access, constraining households’ ability to consume power and invest in appliances. Satellite-based nighttime light analysis suggests that in 2024, although 35% of households had access to electricity, only 26% of the total population lived in areas that benefited from supply availability exceeding 75% of the time due to frequent outages, while around 66% of the population lived in areas that experienced electricity services less than 50% of the time. Evidence from household surveys confirms these findings. The World Bank’s 2018 MTF survey indicates that almost 60% of grid-connected households experience 4 to 14 outages per week. About 5% of connected households receive fewer than four hours of electricity per day. Severe voltage fluctuations, which can damage appliances, affect roughly 15% of grid-connected households. Some urban households that can afford diesel generators use them as backup. However, persistent instability in the distribution grid means many connected households continue to consume only very small amounts of electricity. Satellite imagery and more recent household surveys suggest that the situation has deteriorated in recent years. EEU’s difficult financial situation – partly linked to non-cost-reflective tariffs – has constrained investment in grid maintenance and modernisation, contributing to the observed deterioration in service quality.

Beyond household electricity use, grid instability also constrains economic development in the country. According to the [World Bank Enterprise Surveys](#), on average, Ethiopian firms report revenue losses of almost 10% in a typical month due to power outages and around half of firms own diesel generators as a backup source,

increasing operating costs and reducing profitability. Moreover, unreliable electricity supply on the distribution network can deter small and medium-sized enterprises and light manufacturing activities from establishing or expanding operations in the country.

Nighttime lights in Ethiopia, 2024



Sources: IEA analysis based on Román et al. (2026), [VIIRS/NPP Gap-Filled Lunar BRDF-Adjusted Nighttime Lights Daily L3 Global 500m Linear Lat Lon Grid](#); Schiavina et al. (2026), [GHS population grid multitemporal](#); Schiavina et al. (2023), [GHSL: Degree of Urbanization 1975-2030 V2-0](#).

Although the government has undertaken tariff reviews to move towards cost-reflective tariffs to strengthen the financial position of the national utility, persistently low levels of electricity consumption continue to limit EEU's ability to generate sufficient revenue to invest in the necessary grid modernisation. At the same time, ongoing reliability challenges constrain consumers' capacity to increase electricity use, particularly in a context of rising tariffs. Breaking this cycle may require a stronger focus on productive uses of energy within electrification planning. Targeted investment in the modernisation of selected high-priority distribution network

segments – where reliable supply could unlock substantial productive and residential demand – could help create a critical mass of consumption. Combined with gradual tariff reform, this would create the financial space for EEU to scale up grid reinforcement, enabling higher consumption and generating additional revenues that could be reinvested in further network densification, expansion and modernisation. Such an approach would imply moving beyond an electrification strategy centred primarily on additional household connections towards a more systemic planning framework, mapping potential demand to prioritise strategic grid upgrades. These upgrades would foster economic activity, stimulate income growth and strengthen EEU's capacity to deliver reliable, high-quality service to a growing number of customers across the country, ultimately improving customer's ability to pay. Mobilising the financing required for such targeted investments may be challenging in a context of constrained public resources. However, strategic grid modernisation could attract concessional finance and support from multilateral development banks and development partners, particularly where investments demonstrate clear economic and social benefits.

Mini-grid access

Despite the relative proximity of many households to the electricity grid, millions still live far from existing infrastructure. Expanding, densifying and reinforcing the transmission and distribution networks to achieve universal access represents a large-scale undertaking that will require time to implement. In this context, mini-grids can be deployed in parallel to grid expansion to supply electricity to remote settlements, as well as to less isolated villages that might otherwise face long delays before connection to the distribution network. Since the 2016 National Electrification Strategy, the government has identified mini-grids as an essential electrification technology to reach remote communities, assigning them a strategic role within the national electrification effort. Under NEP 2.0, mini-grids were envisaged to serve around 1.5% of the population by 2025 as a long-term solution for deep rural communities. More recently, the National Energy Compact has elevated their importance. Taking into account ongoing electrification programmes and the additional connections expected under the National Energy Compact, mini-grids are projected to account for around 14% of the population gaining access to electricity by 2030. However, the least-cost optimisation subsequently published in NEP 3.0 assigns mini-grids a role broadly comparable to that envisaged under NEP 2.0.

In 2019, [EEU operated 31 diesel mini-grids](#) across the country, five of which had already been integrated into the main grid. A few donor-funded hydroelectric mini-grids were also run by co-operatives. That same year, the government launched the first EEU engineering, procurement and construction pilot, comprising 12 solar-based mini-grids, to test utility-led deployment of solar hybrid systems at scale. The initiative was conceived as a learning platform to inform the future roll-out of solar-based mini-grids, with the objective of identifying technical configurations, business models and tariffs best suited to Ethiopia's conditions. Contracts were awarded to four international engineering, procurement and construction contractors responsible for system design and installation. EEU retained ownership of the assets and responsibility for electricity sales to local communities. To date, EEU operates 39 solar-based mini-grids across the country, with two additional systems managed by private entities. Overall, solar mini-grids currently supply electricity to fewer than 10 000 households, representing less than 0.1% of the population.

To achieve its off-grid electrification targets, the government, through its successive NEPs, recognised the need to mobilise private mini-grid developers. To establish a dedicated regulatory framework for their participation, EEA issued the [Mini-Grid Directive No. 268/2020](#) in late 2020 (which entered into force in early 2021). The Directive lays out the regulatory conditions governing renewable-based mini-grid development, including licensing procedures; site reservation mechanisms; community engagement requirements; technical, safety and environmental standards; service quality obligations; tariff-setting principles; and compensation arrangements in the event of main grid extension (see table below).

The adoption of the Directive was an important policy milestone, providing greater regulatory clarity and aiming to reduce perceived investment risk. However, five years after its enactment, private sector deployment of renewable-based mini-grids is limited. Only two solar mini-grids are currently in operation, both of which relied heavily on grant financing to cover investment costs. This gap between policy ambitions, the regulatory framework and market outcomes suggests that some barriers persist, constraining private developers' ability to scale up investment and contribute meaningfully to national electrification targets. This gap, therefore, underscores the need for the government to assess remaining regulatory, financial and institutional constraints and, where necessary, refine the existing framework to enhance its effectiveness.

Main regulatory requirements under the Mini-Grid Directive No. 268/2020 in Ethiopia

Regulatory area	Summary of requirements for private developers
Licensing	• Licences are site-specific and granted by the Petroleum and Energy Authority (PEA). They can cover a set of sites • Each mini-grid must obtain a licence prior to operation • Licence category depends on installed capacity • Licence duration is determined on a case-by-case basis • Project sites can be reserved for up to 12 months prior to licence issuance • Community consultation and documented consent are required as part of the licence application • At least 50% of annual consumed energy must originate from renewable energy sources
Tariffs	• All tariffs must be approved by PEA to obtain a licence • Tariffs must reflect project financial viability (capital expenditure, operating costs, fuel costs and reasonable return on investment) while considering affordability • Developers must consult and agree on proposed tariffs with the beneficiary community before submission to PEA • Grants and subsidies cannot be factored into the tariff calculations • Three forms of cross-subsidies can be integrated into the tariff proposal • Tariffs are subject to review by PEA every four years
Technical and environmental standards	• Licence applications must include an approved environmental impact assessment and environmental clearance certificate issued by the competent authority • Developers must comply with prescribed technical standards covering, for instance, system design, procurement, installation, generation units, safety, protection equipment, monitoring systems, distribution networks and metering
Guarantees and exit provisions	• Operational and compliant mini-grid assets may be sold or transferred subject to regulatory approval • In the event of main grid arrival, two principal options are provided: 1) asset absorption into the national grid upon agreement between EEU and the developer and reasonable compensation; or 2) continued operation through conversion into a supplier to the national utility under a power purchase agreement approved by PEA

Several barriers continue to constrain the development of privately operated mini-grids in Ethiopia. A primary concern relates to tariff competitiveness. The current directive reflects a community-centred regulatory approach, requiring developers to negotiate tariffs with beneficiary communities prior to applying for a licence. However, cost-reflective tariffs for mini-grids – which operate at a small scale and lack the economies of large interconnected systems – are inherently higher on a per-unit basis than those of the national grid. At the same time, grid tariffs in Ethiopia are not yet cost-reflective despite ongoing reform. Mini-grid tariffs can, therefore, be an order of magnitude higher than prevailing grid tariffs. Communities typically use the national grid tariff as a reference point and may be reluctant to accept such a premium, particularly in areas located relatively close to existing grid infrastructure. This challenge is compounded by the absence of publicly available, time-bound integrated geospatial grid expansion plans. Without clear information on when, or whether, the main grid will reach their locality, communities may delay engagement with mini-grid developers in the expectation of imminent grid connection.

Uncertainty surrounding tariff approval under the current directive also acts as a deterrent to private mini-grid investment. Although tariffs are submitted as part of the licensing process, PEA retains the right to review and adjust them after the licence has been issued. In practice, the assessment of cost-reflective tariffs at the project stage is still relatively new, and the administration has limited experience with privately operated renewable-based mini-grids in Ethiopia. As a result, final tariff levels may only be confirmed once the project is constructed. This can require developers to commit capital expenditure without full certainty regarding the revenue framework, increasing perceived risk and reducing bankability.

Beyond tariff-related challenges, a range of operational, regulatory and institutional constraints continues to limit private mini-grid deployment in Ethiopia. Developers rely heavily on imported equipment and spare parts, making projects sensitive to foreign exchange availability and currency volatility. Past episodes of foreign exchange scarcity have contributed to heightened investor risk perceptions, particularly around the potential for longer procurement timelines and higher costs, while concerns regarding profit repatriation and broader macroeconomic stability continue to weigh on confidence. Although licence renewal is possible under the directive, the case-by-case determination of licence duration may create misalignment with asset lifetimes and debt repayment schedules. Similarly, while the directive outlines options in the event of main grid expansion, compensation mechanisms are not fully specified in advance and some developers express uncertainty regarding the practical implementation of asset transfer or integration arrangements with the utility. The

comprehensiveness of the current directive, while providing an important framework, also introduces procedural complexity that can pose challenges for small project developments. Developers must comply with multiple technical, environmental and administrative requirements prior to construction, increasing costs and development timelines. Institutional capacity constraints may also slow implementation, as licensing procedures, inter-agency co-ordination and tariff reviews can generate delays and increase development costs. Finally, under Investment Proclamation No. 1180/2020, the USD 200 000 minimum capital requirement for wholly foreign-owned investment may act as a barrier to entry for smaller mini-grid developers seeking to implement small-scale projects. Taken together, these factors create a perception of cumulative risk that continues to constrain large-scale private investment in renewable-based mini-grids.

Enabling the development of privately operated mini-grids will be important for achieving Ethiopia's off-grid electrification targets without further straining the utility. Customers connected to EEU-operated mini-grids currently pay the same tariff as grid-connected users, despite the significantly higher costs associated with mini-grid deployment and operation. This cross-subsidisation places additional pressure on EEU's financial sustainability at a time when substantial investment in grid modernisation is required. Addressing the remaining barriers to private mini-grid development may require a combination of targeted financial support mechanisms to improve mini-grids' competitiveness, improved and clearly communicated geospatial electrification planning including timelines and zones reserved for mini-grid development, regulatory simplification, and less regulatory uncertainty.

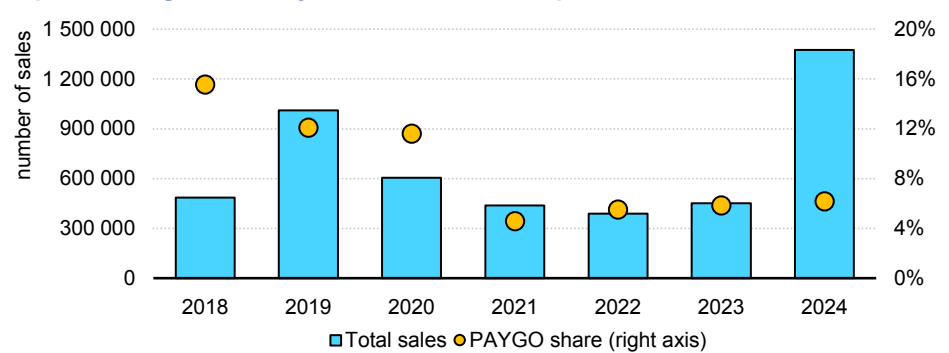
Stand-alone system access

As discussed in the previous section, mini-grids can play an important role in advancing electrification across rural areas of Ethiopia, but they are not suitable for all settlement types. Their viability typically depends on a sufficient customer base and the presence of an anchor load – such as an agricultural holding – to secure a stable level of demand and enable cross-subsidisation, whereby higher-tariff commercial users help lower costs for households. Such arrangements can be mutually beneficial, as agricultural operators may reduce energy expenditure by replacing diesel-based generation and water pumping with electricity. However, many settlements consist of only a small number of households and lack nearby anchor loads, limiting the feasibility of mini-grids. In these contexts, renewable-based stand-alone solutions, including solar home systems, may offer a more appropriate pathway to electrification.

Ethiopia’s off-grid solar market remains at an early stage of development. Sales reported by GOGLA affiliates exceeded 1 million units in 2019, but around 90% were systems below 10 Wp, which do not qualify as electricity access under the IEA definition. Sales subsequently declined, particularly those of larger systems capable of meeting the basic energy bundle, which fell by almost 85% between 2019 and 2023. They rebounded in 2024, tripling year on year, largely because of [bulk procurement of solar lanterns](#). GOGLA affiliates are [estimated](#) to account for 32% of the Ethiopian market for systems below 10 Wp, but only 1% for larger systems. After adjusting for total market sales, the IEA estimates that qualifying off-grid solar systems currently provide electricity access to around 5% of Ethiopia’s population. Sales continued to grow in 2025, surpassing their 2024 level. In a further positive sign, Sun King [announced in 2026](#) plans to invest up to USD 150 million by 2030 to deploy solar energy solutions to more than 2 million Ethiopian households and businesses.

The PAYGo model has proven effective in scaling solar home system markets across many African countries. In Ethiopia, however, it represents only a small share of sales, including for larger systems. One main reason for this is the market’s continued reliance on imported equipment – either as fully assembled products or as components for local assembly. Limited access to foreign exchange in recent years has constrained imports and contributed to a structurally undersupplied market. As a result, suppliers typically face little difficulty selling available inventory through upfront cash sales, reducing incentives to expand PAYGo offerings, which entail higher working capital requirements and repayment risk.

Reported off-grid solar systems sales in Ethiopia, 2018-2024



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Notes: Reported sales cover GOGLA-affiliated companies only. The latest estimates suggest that these companies account for around 32% of sales of systems below 10 Wp in Ethiopia, but only around 1% of sales of systems above 10 Wp.

Source: IEA analysis based on the sales databases of the Global Off-Grid Lighting Association (GOGLA, 2026).

In its National Electrification Program and National Energy Compact, the government recognises the important role that solar home systems are expected to play in the country's electrification pathway. Under NEP 2.0, they were expected to account for 34% of connections by 2025, primarily as a transitional solution pending grid arrival by 2030. More recently, the National Energy Compact projects that solar home systems will deliver around 16% of new connections by 2030. The least-cost modelling subsequently presented in NEP 3.0 suggests that solar home systems will account for around 14% of connections by 2035.

In parallel, the country is pursuing the expansion of upstream solar manufacturing capacity, including emerging solar-cell production initiatives, which could support the longer-term development of the off-grid solar market. Since 2010, fiscal measures have been introduced to reduce the cost of selected solar products which meet some [quality requirements](#). Imported solar lanterns typically face a 25% customs duty (compared to up to 35% for other goods), a 10% surtax (standard rate) and a 15% VAT, while multi-light systems face a 5% duty, no surtax and a 15% VAT. For both products, duties may be reduced to 0% if importers obtain a letter of support from the Ministry of Finance or a delegated authority. Solar home systems, by contrast, are exempt from customs duties and surtax but remain subject to a 15% VAT.

Despite these incentives, IEA affordability analysis (see Affordability section) indicates that solar home systems remain unaffordable for a large share of rural households targeted for electrification through stand-alone systems. Although Telebirr was launched in 2021 and enables mobile payments, PAYGo models – which could help alleviate upfront cost barriers – remain marginal. Access to microfinance in rural areas is also limited. As a result, existing fiscal measures alone may be insufficient to translate policy ambition into effective market uptake. Addressing this gap may require complementary actions, including scaling mobile money-enabled PAYGo models, the development of dedicated microfinance instruments and a reassessment of the VAT treatment applied to solar home systems.

Affordability of electricity access

Affordability constraints remain at the core of the electricity access challenge. To better understand local affordability dynamics, the IEA conducted a geospatial analysis comparing the cost of gaining access to electricity with household income at the square-kilometre level. The assessment draws on the electrification targets under the National Energy Compact to estimate the share of households expected to gain access through on-grid and off-grid solutions. Affordability was evaluated across the

three consumption levels defined in the IEA energy access bundles, with electricity access considered affordable when meeting the specified energy needs requires less than 5% of a household's disposable income.

When connection charges are excluded and only today's electricity tariffs are assumed, almost all households gaining access through the grid can afford consumption up to the essential bundle. Under these conditions and at today's income levels, nearly all households would spend less than 10% of their disposable income to reach the extended bundle, with around 80% remaining within the affordability threshold. However, the picture changes markedly when connection charges are included in the analysis. With connection costs incorporated, the affordability of the IEA basic and essential bundle decreases to 60-65% and around 30% of households would need to spend between 5 and 10% of their disposable income. The extended bundle would become unaffordable for 70% of the connected population, and 25% of population would need to spend more than 10% of their disposable income. These findings are consistent with household surveys, which frequently identify upfront connection costs as a key barrier to on-grid electricity access in Ethiopia.

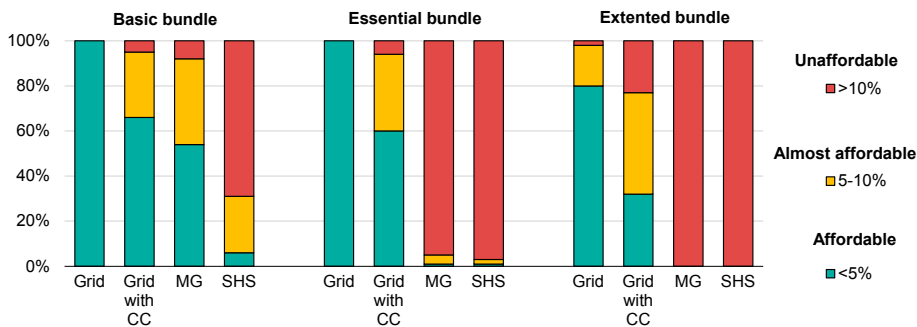
In Ethiopia, the national average grid connection fee – including the extension of a service cable from the nearest pole or transformer to the dwelling, the electricity meter and associated labour – is around USD 100 for a typical residential connection, with costs typically ranging from USD 24 to USD 190. However, the affordability of grid connections varies significantly across the country, given variances in household incomes. Assuming that connection fees are considered affordable when they amount to less than two weeks of household income, around 40% of the population gaining access via the grid in Ethiopia would be unable to afford a new connection. A comparison with neighbouring countries highlights strong disparities: this share rises to 100% in Burundi but falls to only 1% in Uganda, largely due to its Electricity Connection Policy, which provides free connections for eligible households.

Off-grid solutions are generally less affordable than on-grid access in Ethiopia. Mini-grids operate at the community level and do not benefit from the economies of scale of the national grid. Without further subsidies, only around 54% of households gaining access through mini-grids would be able to afford the basic bundle, which typically covers a few lamps, a radio and phone charging. Almost no households could afford the essential bundle under these conditions, while a small share, around 5%, would need to spend less than 10% of their disposable income. Nearly all households

gaining access via mini-grids would have to spend more than 10% of their disposable income to reach the electricity consumption level of the extended bundle.

Solar home systems do not have ongoing operating costs, but their upfront investment remains a significant barrier for remote rural households with no alternatives in the short to medium term. Assuming households must pay the full system cost upfront, which remains the prevailing situation in Ethiopia due to the limited availability of PAYGo financing, only around 5% of households would be able to afford a small solar home system providing the basic bundle, typically between 10 Wp and 50 Wp. Larger systems above 50 Wp, which can provide energy services aligned with the essential and extended bundles, remain unaffordable for virtually all households when financed entirely upfront.

Affordability of electricity access in Ethiopia, 2025



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Notes: Grid with CC = grid with connection charges; MG = mini-grid; SHS = solar home system. IEA and KTH Royal Institute of Technology analysis based on the OnSSET model developed by KTH Royal Institute of Technology. Income levels per location are approximated based on the Relative Wealth Index. The model applies real tariffs for decentralised solutions. These are gathered from different operators across the region and from GOGLA data. “Grid with CC” refers to affordability in the first year of connection in which the household is charged for the payment of the connection charge on top of its electricity consumption.

Sources: IEA analysis based on data collected by Toulouse School of Economics; [Relative Wealth Index META \(2025\)](#); [OnSSET results KTH \(2025\)](#); ESMAP (2024), [Off-Grid Solar Market Trends Report 2024](#); and [Mukisa et al. \(2022\)](#).

This analysis shows that both on-grid and off-grid solutions could raise significant affordability challenges for the Ethiopian population, limiting their ability not only to gain electricity access but also to consume energy services beyond basic levels that deliver broader development benefits. To achieve the electrification target of reaching

75% of the population by 2030 and all the population by 2035, the government could consider a range of affordability measures, including subsidising grid connection fees, supporting mini-grid tariff reductions, reducing import taxes and VAT on solar home systems to lower upfront costs, and fostering the development of PAYGo and Energy-as-a-Service business models. While such measures could create additional fiscal pressures, they may also enable more households to connect and increase electricity consumption, potentially generating additional revenue streams. Further analysis would be required to fully assess their net impacts. Some of these interventions could also be supported through donor-funded electrification programmes, as illustrated by the government of Denmark's support to reduce connection charges for 480 000 low-income households under the Accelerating Sustainable and Clean Energy Access Transformation (ASCENT) Ethiopia programme (see next section).

Beyond households gaining access to electricity, those already connected also face affordability challenges, as reflected in relatively low levels of electricity consumption in Ethiopia compared with other sub-Saharan African countries and the recent decline in consumption tiers. Energy efficiency measures can play an important role in reducing household electricity demand while maintaining the same level of service and helping to keep electricity affordable despite rising tariffs. They can also moderate demand growth in the coming years as access expands, easing pressure on already constrained grids. Ethiopia has started undertaking planning and stakeholder initiatives to adopt minimum energy performance standards (MEPS) for appliances; however, few have been adopted so far. Currently, MEPS and energy labels have only been implemented for electric *mitad* stoves and for electric motors, which have a high share of electricity consumption and therefore high energy-savings potential. The government is considering or planning MEPS for other products as well.

Electricity access investment

Ethiopia's electrification strategy has been guided by the NEP and its subsequent updates. Within this framework, expanding energy access has become one of the government's core investment priorities, with around 40% of government expenditure in the electricity sector directed towards electricity access projects between 2019 and 2023. Alongside public spending, several large donor-supported programmes have been implemented under the NEP, complementing national investment and supporting progress towards the country's electrification targets.

To operationalise the NEP, released in 2017, the Ethiopia Electrification Program (ELEAP) was first launched in 2018 with support from the World Bank. ELEAP was structured as a programme-for-results operation running from 2018 to 2023, supporting the government's electrification programme with an estimated initial total cost of around USD 677 million, including a USD 375 million International Development Association (IDA) credit complemented by government counterpart funding and programme revenues. The [programme was scaled up](#) in 2023 through additional financing of USD 413.7 million, of which USD 250 million was provided through a further IDA credit, extending implementation to July 2026 and bringing the overall programme envelope to about USD 1.09 billion. The programme has primarily supported electrification through grid connections alongside institutional capacity building, with a final target of around 10 million new people connected to the grid. To date, it has connected more than [8 million people](#) to the grid and around 20 000 people – approximately 4 000 households – through 11 mini-grids.

To complement grid expansion efforts, the Access to Distributed Electricity and Lighting in Ethiopia (ADELE) programme was approved in 2021 with support from the World Bank to accelerate off-grid and distributed electrification under the NEP framework. The programme, financed through a USD 500 million IDA credit and running from 2021 to 2028, focuses on expanding electricity access to remote and deep-rural households, smallholder farmers, small businesses, and health and education facilities through solar-hybrid mini-grids and stand-alone solar systems. By the end of the programme, ADELE aims to provide electricity access to around 240 000 households through mini-grids and 750 000 households through solar home systems, representing nearly 5 million people. The programme also targets the modernisation of distribution infrastructure around selected urban centres to improve the reliability of electricity supply and strengthen the government's implementation capacity.

Building on the achievements of the ELEAP and ADELE programmes, the Accelerating Sustainable and Clean Energy Access Transformation (ASCENT) Ethiopia programme was approved in 2025 with support from the World Bank and the government of Denmark to further accelerate electricity access under the NEP framework. Structured as a programme-for-results operation, it is financed through a USD 400 million IDA credit complemented by a USD 24 million grant from Denmark. ASCENT places a strong emphasis on grid densification and last-mile connections, targeting households and non-residential customers located near the existing medium-voltage network while also supporting policy reforms, institutional capacity building and improved utility performance, including through grid digitalisation.

Denmark's contribution is expected to promote inclusive energy access for low-income groups by reducing connection costs for around 480 000 new households, addressing a key barrier to electricity access. Overall, the programme aims to provide electricity access to around 6 million additional people by 2030.

Beyond these three programmes primarily focused on expanding electricity access in Ethiopia, other multilateral and bilateral development banks have financed broader initiatives to strengthen the country's electricity sector. For instance, the African Development Bank has supported [high-voltage transmission](#), [urban distribution upgrades](#) and [regional interconnection projects](#), while the European Investment Bank has approved financing for [transmission digitalisation and system modernisation initiatives](#). Bilateral development banks such as the French Development Agency have complemented these efforts through [grid modernisation](#), [technical training and capacity-building programmes](#). Although not directly targeted at expanding access, these investments have contributed to improving the reliability and performance of the Ethiopian power system, thereby supporting greater access to reliable electricity across the country.

Public investments by the government of Ethiopia, complemented by these donor-supported programmes, have played a critical role in advancing electrification across the country. However, these efforts have not been sufficient to meet the initial targets set under the NEP and will need to be scaled up significantly to mobilise the estimated USD 9.6 billion in electricity-sector investment required by 2030 to achieve the objectives of the National Energy Compact, and the USD 18 billion required by 2035 to realise the ambition of NEP 3.0. Existing programmes are expected to deliver around 2.98 million of the 9.23 million connections targeted by 2030 under the National Energy Compact, leaving a financing gap equivalent to approximately 6.25 million additional connections. Closing these gaps will require a substantial increase in financing and a stronger alignment of resources with national electrification targets, including expanded external financing, increased domestic budget allocations at the federal and subnational levels, and greater mobilisation of consumer contributions where affordability allows.

Key recent donor-supported electricity access programmes in Ethiopia

Programme	Period	Financiers	Financing (million USD)	Main targets and achievements
ELEAP	2018-2026	World Bank	Initial: 375 Addition: 250 Total: 625	- Supported grid connections for more than 8 million people - Targets access for around 10 million people by programme completion - Supported the installation of 11 mini-grids serving around 20 000 people
ADELE	2021-2028	World Bank	500	- Targets electricity access for nearly 5 million people, 131 500 enterprises and 1 900 public facilities - Focuses mainly on decentralised solutions for rural areas, including solar stand-alone systems and solar-based mini-grids - Strengthens distribution networks in urban areas
ASCENT	2025-2030	World Bank	400	- Targets electricity access for around 6 million people, prioritising grid densification - Targets to reduce connection costs for 480 000 low-income households - Targets to enhance policies and institutional frameworks
		Government of Denmark	24	Targets to improve utility performance and digitalisation

Recommendations

13. Prioritise reliable electricity services through targeted grid upgrades in high-potential areas to unlock a virtuous cycle of demand growth, stronger utility finances and sustainable electrification

Expanding electricity access remains a national priority for the government. However, as highlighted throughout this chapter, the development impact of new connections is increasingly constrained by the reliability and quality of supply. Despite ongoing reforms to move towards cost-reflective tariffs, persistently low levels of electricity consumption continue to limit the utility's ability to generate the revenues needed for grid modernisation. At the same time, reliability and stability challenges reduce consumers' capacity and willingness to increase electricity use, particularly in a context of rising tariffs, reinforcing a cycle of weak demand, constrained utility finances and limited reinvestment in network upgrades. Strengthening the quality of electricity service alongside continued access expansion will, therefore, be critical to achieving sustainable electrification outcomes. In this context, the government could consider pairing connection targets with minimum service levels for connected users.

Targeting strategic upgrades along selected high-potential distribution network segments, where reliable electricity supply could unlock substantial residential, commercial and productive demand, could help create a critical mass of consumption capable of breaking this cycle. Coupled with tariff reforms, this critical demand mass could translate into improved cost recovery for the utility. Over time, this approach could enable the utility to progressively strengthen its financial position and further scale up grid reinforcement and modernisation, fostering a virtuous cycle of rising demand, stronger utility finances and sustainable electrification expansion.

Moving beyond an electrification strategy centred primarily on additional household connections towards a more systemic, demand-driven planning framework would help ensure that new connections are accompanied by reliable electricity services and translate into meaningful economic and social benefits. Segment-based grid modernisation could be implemented progressively, building on existing electrification and utility reform programmes and aligning with areas of strong productive and domestic growth potential. While mobilising financing for such targeted investments

may be challenging in a context of constrained public resources, strategic grid upgrades that demonstrate clear development impact are well-positioned to attract concessional finance and support from multilateral development banks and development partners.

14. Address affordability barriers to support the achievement of on-grid and off-grid electrification targets

Affordability constraints remain at the core of Ethiopia's electricity access challenge. IEA geospatial analysis indicates that, at current income levels, many unelectrified households would struggle to afford electricity access or would only reach very low consumption levels with limited socio-economic benefits. Achieving the target of reaching 75% of the population by 2030 and universal access by 2035 may, therefore, require a stronger focus on targeted affordability measures across on-grid and off-grid solutions.

Reducing the affordability barrier of grid connection fees – through measures such as cost-sharing schemes or payments spread over time – could significantly improve the affordability of national grid access, while targeted support to mini-grid tariffs may be needed to make these systems more attractive and financially viable for rural communities. Addressing the upfront cost barrier of solar home systems will also be critical to enable large-scale deployment in remote rural areas. Policy tools could include adjustments to VAT, support for the development of mobile money-enabled PAYGo business models in rural areas and expanded access to microfinance solutions for rural households. While such measures may create additional fiscal pressures in the short term, they could enable more households to connect and increase electricity consumption, potentially strengthening utility revenues over time. Further analysis could help assess the net fiscal and economic impacts of different support mechanisms.

Strengthening the reliability of supply and promoting productive electricity use, as outlined in the previous recommendation, could also help improve household incomes and gradually reduce reliance on subsidies. Beyond newly connected households, ensuring affordability for existing customers will remain essential, particularly in a context of low demand and rising tariffs. Building on ongoing government efforts, further expanding energy efficiency policies, including the progressive introduction of

MEPS for additional appliances, could help reduce electricity demand while maintaining service levels, supporting affordability and easing pressure on already constrained grids as access expands.

15. Enable private mini-grid investment through clearer integrated geospatial planning, reduced regulatory uncertainty and targeted market facilitation

Mini-grids are expected to play a central role in Ethiopia's electrification pathway. The government has already taken important steps to establish an enabling framework, notably through the adoption of the Mini-Grid Directive No. 268/2020. However, despite this progress, privately operated renewable-based mini-grids remain limited in number, suggesting that regulatory, financial and institutional barriers continue to constrain market scale-up. An update to the Directive could help address the remaining barriers and accelerate private mini-grid deployment.

Greater transparency and predictability in electrification planning could help reduce perceived investment risks. The absence of publicly available, time-bound geospatial plans indicating expected grid expansion zones and timelines creates uncertainty for developers and local communities, who may delay engagement in anticipation of future grid connection. Establishing a publicly accessible planning platform with clearer geospatial maps, including areas reserved for mini-grid development, could help align stakeholder expectations and facilitate site development. Integrating anchor-load mapping into geospatial electrification planning could help define priority areas reserved for mini-grids and support financially viable project design.

In addition to the affordability measures highlighted in the previous recommendation, enhancing regulatory certainty could further strengthen the investment environment for private mini-grid developers. Building on the provisions already established in the Mini-Grid Directive, greater clarity and predictability around tariff approval processes, compensation arrangements in the event of main grid arrival, and licence durations aligned with asset lifetimes could help reduce financial risks and improve access to project finance. Streamlining administrative procedures and strengthening institutional co-ordination across licensing, planning and tariff-setting processes may also help reduce development timelines and transaction costs, particularly for smaller scale projects. While the Mini-Grid Directive already introduces capacity-based licensing categories, further aligning environmental and administrative requirements

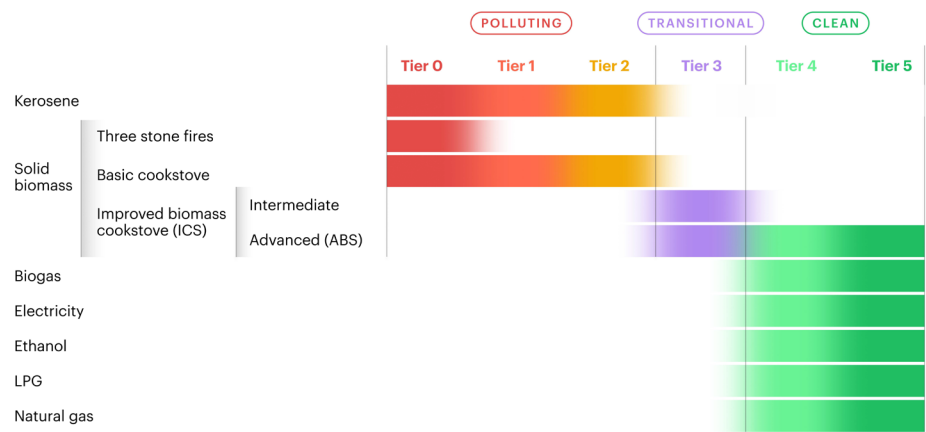
with project scale and risk could help facilitate smaller solar-based systems, as demonstrated in neighbouring countries such as Rwanda and Tanzania. Reviewing the minimum capital requirement for wholly foreign-owned investments under Investment Proclamation No. 1180/2020, particularly for small-scale mini-grid projects, could also help lower entry barriers.

Access to clean cooking

Definitions

The IEA definition of clean cooking follows the World Health Organization (WHO) definition of clean, transitional and polluting fuels and technologies which is based on the ISO-tier framework (see figure below). In this definition, a stove-fuel combination is counted as clean only if it achieves at least Tier 4 for PM_{2.5} emissions and Tier 5 for carbon monoxide emissions. Tier 3 devices are treated as transitional, while those in Tiers 0-2 are classified as polluting and fall outside the scope of clean cooking access.

Classification of stove types by tier and access levels



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Notes: LPG = liquefied petroleum gas. Tiers follow the WHO-ISO clean cooking framework, which rates stoves by thermal efficiency, black-carbon emissions and PM_{2.5} emissions (WHO, 2014). Source: IEA (2025), [Universal Access to Clean Cooking in Africa](#).

Most fuel and stove combinations are relatively straightforward; however, there are nuances within solid biomass cooking. There are three broad types of commonly referred to solid biomass cooking. First is the three stone fire, which is an open fire cooking set-up where three stones or similar supports are arranged to hold a cooking pot above the flames. The second type is basic biomass stoves (Tier 0-2), which are usually made of clay or metal and produced in the home or in artisanal workshops and offer only slight improvements over open fires in terms of efficiency and indoor air quality. Together, three stone fires and basic cookstoves make up the combined category of traditional use of biomass (up to and including stoves of ISO Tier 2).

Improved biomass cookstoves is the next tier up and is further delineated between intermediate improved biomass cookstoves (ICS) and advanced biomass cookstoves (ABS), ABS being a subset of ICS. ICS encompass stoves that use engineered enhancements and standardised manufacturing to improve thermal efficiency and reduce emissions. ICS include both intermediate designs (typically ISO Tier 3, considered transitional solutions) and ABS, which integrate technologies such as fans or gasifiers to achieve higher efficiency and lower emissions (ISO Tiers 3-5, with the highest tiers classified as clean cooking solutions under the WHO guidelines). The use of solid biomass fuels in biomass stoves of Tier 3 and above is classified as modern solid bioenergy.

Local cooking context

Ethiopia's food traditions mirror the country's remarkable cultural and agroecological diversity, with dishes, staple foods and cooking methods varying across regions and communities. In much of the country, especially in towns and cities, households typically prepare several components of a meal at the same time. A main stew is often left to simmer in one pot while additional sauces or sides are cooked separately, making the use of multiple pans a common feature of everyday cooking. Boiling and long simmering are dominant techniques, although frying is also used for certain dishes.

The injera, a traditional flatbread usually made from fermented teff, occupies a prominent place in Ethiopian culinary culture and is widely recognised as a national staple. However, its dietary importance is not uniform across the country. While injera is eaten at [almost every meal in towns](#), highland cereal-growing areas and many market connected regions, other staples such as sorghum, maize or enset-based foods play a greater daily role in some lowland, pastoralist and southern communities.

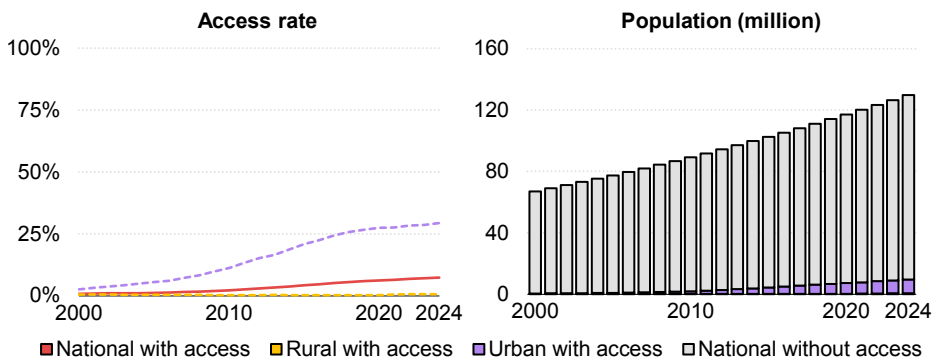
Preparing injera calls for specialised equipment: a wide, flat griddle, of usually 50-60 centimetres, heated evenly to roughly 200°C. This griddle, known as a mitad, is often powered by electricity or fuelled with biomass. Because injera baking can be energy-intensive and culturally embedded, the prominence of the mitad in many households strongly influences their fuel choices and appliance preferences, making it a central consideration when analysing and planning successful clean cooking transitions in Ethiopia.

State of clean cooking access in Ethiopia

Ethiopia remains one of the countries with the lowest levels of clean cooking access in the world. In 2024, more than 120 million of the country’s 130 million inhabitants still relied primarily on traditional and inefficient cooking practices, leaving the national clean cooking access rate at just above 7%. Access is highly uneven across the country. Nearly 30% of urban households now cook mainly with modern fuels, whereas in rural areas fewer than 1% have access to comparable solutions.

More than 9 million additional people now have access to modern cooking fuels compared with the beginning of the century. Progress, however, has been concentrated in towns and cities. In the early 2000s, only about 2.5% of urban residents used clean cooking solutions, but uptake has increased steadily since; rural access, however, has not changed much. Rapid population growth has, nevertheless, outpaced these gains: over the same period, the number of Ethiopians without access to clean cooking has increased by more than 55 million.

Clean cooking access in Ethiopia, 2000-2024



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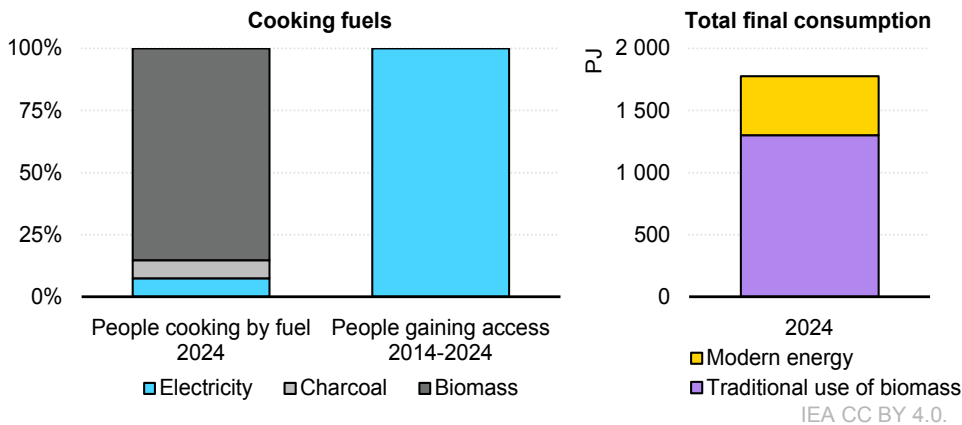
Source: IEA analysis based on the WHO (2025). [Cooking Fuels and Technologies](#) (database).

Of the 120 million Ethiopians who still lack access to clean cooking, around 8% rely primarily on charcoal – used mainly in urban areas – while roughly 92% depend on firewood. A very small share of rural households in agricultural regions use agricultural residues, including crop waste and animal dung, as their main cooking fuel. Among households with access to modern cooking solutions, electricity is the dominant option, and nearly all gains in clean cooking access over the past decade have been driven by the expansion of electric cooking in urban areas. This trajectory contrasts with developments across most of sub-Saharan Africa, where LPG has emerged as the leading clean cooking fuel in recent decades. Across the region, LPG accounts for around 70% of the population with access to clean cooking and over 90% of recent access gains. Despite the growing uptake of electric cooking in Ethiopian cities, fuel stacking remains common, with more than 40% of households that cook with electricity also relying on charcoal as a complementary fuel, particularly when stove capacity is insufficient to prepare multiple dishes or when electricity supply is unreliable.

Several factors linked to Ethiopia's cooking culture and energy policy help explain why electricity dominates among modern cooking fuels. As discussed earlier in this chapter, the central role of injera baking in Ethiopian cooking culture – which requires a wide, evenly heated mitad operating at stable temperatures – makes electricity particularly well-suited to everyday cooking practices. Alternative clean options such as biogas and LPG have been tested for this purpose, but the high fuel consumption required for baking injera leads to elevated operating costs, limiting wider uptake. Moreover, the high and concentrated heat produced by these fuels tends to burn the injera during baking, affecting its texture and quality and making these alternatives less attractive to many households. Policy decisions have reinforced this technological fit. From the late 1970s and early 1980s, government programmes promoted electric cooking and electric mitads in urban areas in response to a surplus of electricity following the commissioning of new hydropower plants, as well as growing concerns about the environmental impact of biomass use.

Traditional cooking methods are highly inefficient, typically wasting 85-95% of the energy input. As a result, although the amount of useful energy required for cooking is modest compared with sectors such as industry or transport, the traditional use of biomass for cooking accounted for around three-quarters of total final energy consumption in Ethiopia's end-use sectors in 2024. This highlights the importance of the clean cooking transition for Ethiopia's energy sector, as a shift towards modern cooking solutions could significantly reshape energy demand patterns.

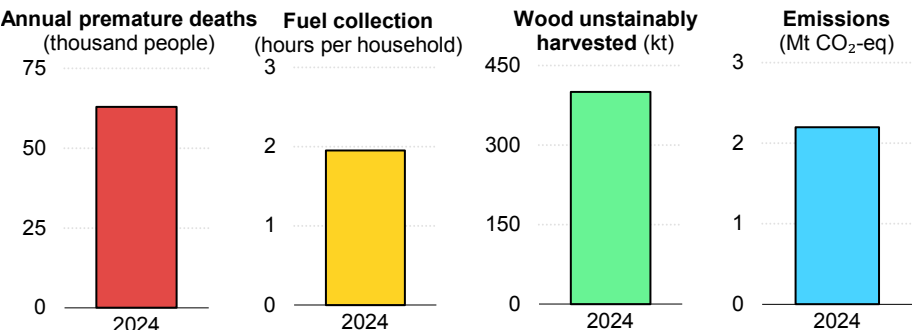
Population cooking by fuel, access by fuel and share of traditional use of biomass in total final consumption in Ethiopia



Sources: IEA analysis based on the WHO (2025). [Cooking Fuels and Technologies](#) (database).; IEA (2025), [World Energy Balances](#).

Beyond its energy implications, the lack of access to clean cooking in Ethiopia has far-reaching consequences for human health, the economy and the environment. More than 60 000 premature deaths each year are linked to household air pollution in the country, most of it stemming from traditional cooking practices. Women and girls typically spend around 2 hours a day collecting fuel, amounting to around 20 billion hours annually nationwide – comparable to the total number of hours worked in countries such as Tunisia or Portugal. Around 400 000 tonnes of wood are harvested unsustainably each year to meet cooking needs, contributing to forest degradation and deforestation and releasing roughly 2.2 Mt CO₂-eq emissions annually – equivalent to about 15% of national emissions from energy combustion.

Impacts of traditional cooking methods in Ethiopia, 2024



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Note: kt = kilotonne.
Source: [Ethiopia's National Clean Cooking Roadmap](#) (2025).

An emerging policy momentum for clean cooking

Policies shaping Ethiopia’s clean cooking pathway

Ethiopia has recently strengthened its policy framework for clean cooking through a sequence of policies that together define clearer targets, financing structures and institutional responsibilities for the sector. The National Clean Cooking Roadmap, released in early 2025, followed by the National Clean Cooking Energy Sector Investment Plan in mid-2025 and the inclusion of clean cooking within the National Energy Compact mark a transition from fragmented project-based interventions towards a more integrated national framework for clean cooking.

The National Clean Cooking Roadmap sets out the vision and targets underpinning Ethiopia’s clean cooking transition. It assesses four alternative development pathways and identifies the scenario aligned with Ethiopia’s NDCs as the preferred national trajectory, reflecting a balance between ambition and feasibility. Under this pathway, Ethiopia targets an intermediate milestone of 57.74% access to cleaner cooking by 2030, scaling up to the deployment of around 36.25 million Tier 3 and Tier 4 cooking devices by 2035. This would reach approximately 91 million people and bring access to cleaner cooking solutions to 75.87% of the population in 2035.

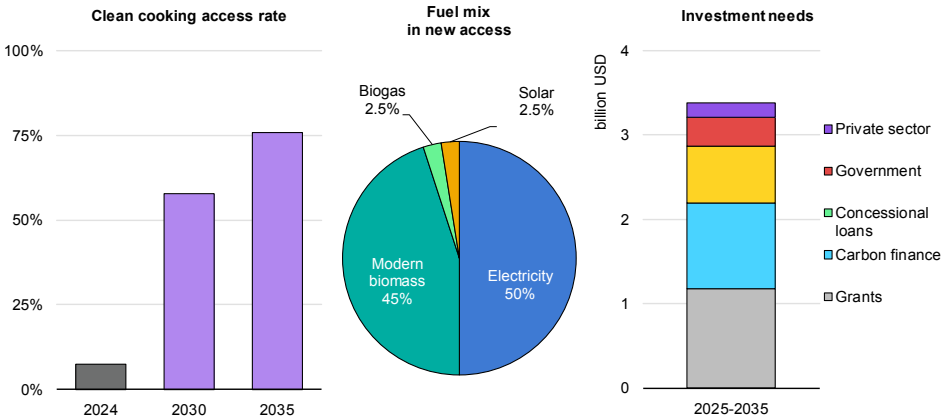
Electric cooking is at the centre of the transition, accounting for roughly 50% of new access by 2035, while advanced biomass stoves play an equally significant role,

representing about 45% of the technology mix. The remaining 5% is met by biogas and solar cooking technologies. To support implementation, the Roadmap identifies the main barriers currently limiting the uptake of clean cooking solutions in the country. Affordability constraints, limited awareness, infrastructure gaps, gaps in enabling policies and regulations, and the need to align technologies with local cooking practices emerge as key challenges. The Roadmap proposes three phases for implementation, beginning with market preparation and pilot programmes, followed by the scale-up of manufacturing and distribution systems, and culminating in widespread adoption of higher efficiency cooking technologies by the mid-2030s. Achieving this Roadmap will require USD 3.38 billion in investment, of which around 30% is allocated to programme implementation; awareness-raising campaigns; and other enabling components supporting adoption, standardisation and implementation. The establishment of a Clean Cooking Coordination Unit within the MoWE is, for instance, proposed to strengthen implementation and oversight. Cumulatively, this clean cooking transition pathway is estimated to reduce emissions by 75 Mt CO₂-eq, save more than 105 Mt of wood, create over 335 000 jobs and empower 2 million women nationwide.

To operationalise this strategic vision, the government released the National Clean Cooking Energy Sector Investment Plan in June 2025, setting out a financing strategy to mobilise the USD 3.38 billion required over the coming decade. Of this total, around USD 2.6 billion is directed towards technology deployment, including 16.2 million electric cooking appliances, 18.6 million advanced biomass stoves, and 1.45 million biogas and solar systems. This USD 2.6 billion investment prioritises demand-side affordability and market expansion through mechanisms such as consumer financing schemes, carbon credit pre-financing and targeted subsidies to reduce upfront costs. Additional support is directed towards revolving finance facilities, local manufacturing and supply-chain development, alongside innovation funding. The remaining share of the USD 3.38 billion is allocated to foundational ecosystem development to enable the sustained adoption of cleaner cooking solutions. The proposed financing mix combines grants (35%), carbon finance and pre-financed carbon-linked loans (30%), concessional loans (20%), direct government contributions (10%), and private sector investment (5%). This structure builds on Ethiopia's experience with carbon finance while also increasing the role of concessional and public funding to limit long-term grant dependency in a shifting climate finance landscape. Direct government contributions signal strong national ownership and commitment, helping to derisk investment and reinforce the long-term sustainability and resilience of the clean cooking transition.

Clean cooking has also been elevated within Ethiopia’s National Energy Compact, reinforcing high-level political commitment and aligning clean cooking ambitions with broader energy and climate objectives. By identifying access to modern energy as the cornerstone of the country’s strategy for economic transformation, social development and climate resilience, the National Energy Compact reframes clean cooking as a cross-cutting development priority rather than a stand-alone household energy issue. It reiterates clean cooking access milestones of 58% by 2030, with electric cooking and advanced biomass cookstoves expected to deliver most of the gains. The National Energy Compact also highlights strategic implementation enablers the government identified, including consumer awareness, accessible financing mechanisms, and stronger local manufacturing and distribution networks.

Ethiopia’s national clean cooking pathway



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Source: IEA analysis based on Ethiopia, Ministry of Water and Energy (2025), [National Clean Cooking Roadmap](#).

Energy implications of the clean cooking transition

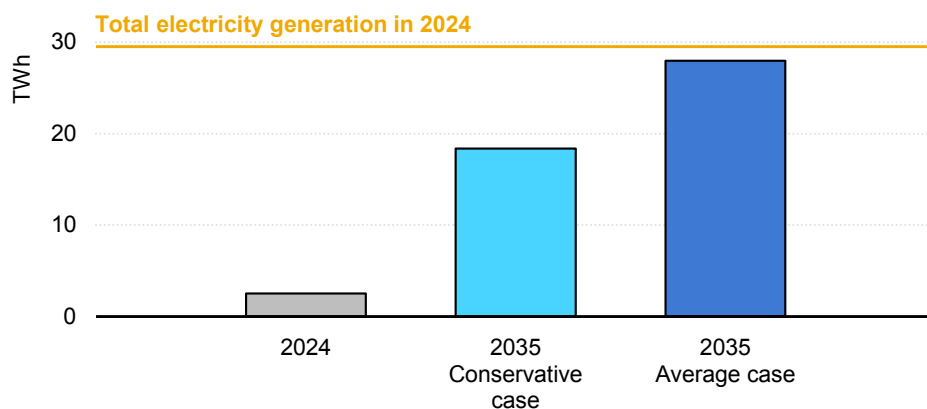
The clean cooking policies the government has introduced over the past two years mark an important step towards an ambitious and sustainable clean cooking transition. Taken together, the Roadmap, Investment Plan and National Energy Compact outline a comprehensive framework, setting clear access targets while identifying priority fuels and investment needs. However, as highlighted earlier in this chapter, traditional biomass use for cooking currently accounts for around three-quarters of total final

energy consumption in Ethiopia, meaning that a shift towards modern cooking solutions will have significant implications for Ethiopia's energy system. To date, the Roadmap, Investment Plan and National Energy Compact do not quantify or discuss these wider energy impacts. Addressing this gap will be critical to ensuring the success of the clean cooking transition by effectively integrating it into broader energy planning and system development.

With the objective of providing 76% of the Ethiopian population with access to cleaner cooking solutions by 2035 – half of them through electric stoves – an estimated 70 million people are expected to cook with electricity by that date. The resulting electricity demand will depend strongly on the efficiency of the stoves deployed. Under conservative assumptions for useful cooking energy demand in Ethiopia – despite the prevalence of long-simmered dishes in national culinary practices – and assuming high-efficiency e-cooking appliances, reflecting widespread uptake of induction stoves, preliminary IEA analysis suggests that electricity demand for cooking in 2035 could reach around 18.5 TWh, equivalent to above 60% of Ethiopia's 2024 electricity generation. Under lower efficiency assumptions, combined with higher useful energy needs for cooking that may better reflect the Ethiopian cooking culture, this demand could rise to 28 TWh, or 95% total national electricity generation in 2024.

While these estimates would benefit from more detailed modelling to fully integrate the nuances of the Ethiopian cooking culture into the assumptions, they illustrate the scale of the transformation envisaged under Ethiopia's clean cooking pathway. As discussed in the Electricity access section, the national grid continues to face reliability and stability challenges, implying a need for important investment in system modernisation. Without improvements in grid infrastructure, rapidly rising electricity demand from cooking under Ethiopia's clean cooking pathway could place an additional strain on the power system, exacerbating existing reliability challenges. At the same time, unreliable electricity supply would discourage households from adopting electric solutions, given the time-sensitive and inflexible nature of cooking needs. Successfully delivering this ambitious transition will, therefore, require geospatially projecting cooking demand and integrating it into national power sector planning, enabling a co-ordinated sequencing of grid upgrades alongside the scaling up of electric cooking. Careful alignment between electrification strategies and clean cooking deployment will be essential to avoid bottlenecks that could amplify existing power system challenges, slow the adoption of clean cooking solutions and weaken long-term public confidence in the clean cooking transition.

Preliminary estimate of electricity demand for cooking in Ethiopia in 2035 under the Clean Cooking Roadmap pathway



IEA CC BY 4.0.

Notes: The conservative case assumes useful cooking energy demand of 750 MJ per capita per year and an average electric stove efficiency of 80%, reflecting a high share of induction technologies. The average case assumes useful cooking energy demand of 1 gigajoule per capita per year and an average stove efficiency of 70%, reflecting a larger share of resistive coil, hotplate and infrared radiant stoves.

Sources: IEA analysis based on IEA [World Energy Balances](#) and IEA [Global Energy and Climate Model](#).

Ethiopia has several levers to moderate the growth in electricity demand associated with the clean cooking transition. Ensuring that stoves deployed over the next decade meet high efficiency standards could play a central role, with potential to reduce additional electricity demand by around 10-30% and ease pressure on the power system. While the existing pathway places a strong emphasis on electricity and modern biomass – reflecting their suitability for injera preparation – a more diversified fuel mix could help manage system impacts. Ethiopia holds notable potential for biogas and bioethanol production that could complement electric cooking solutions. Expanded biogas deployment may support access in rural areas while ethanol solutions could prove scalable in urban settings. Although foreign exchange constraints have historically limited LPG imports, recent domestic gas discoveries and plans to develop these resources may create scope for some local LPG production as a co-product of natural gas extraction, which could help moderate growth in electric cooking demand in locations where small (depending on the volumes), targeted supply chains can be developed.

Affordability and availability of clean cooking solutions

Affordability remains the primary barrier to the adoption and sustained use of clean cooking solutions in Ethiopia. The upfront cost of clean cookstoves, as well as investments in equipment such as household biodigesters for biogas production, represents a significant challenge for many households. Beyond the initial purchase, households may also face recurring expenditures for modern cooking fuels, including electricity, processed biomass fuels such as wood chips or pellets, LPG and bioethanol, which can discourage a transition from freely collected traditional biomass. The affordability of clean cooking solutions depends on household income levels; fuel availability; and the robustness of the production, import, transport and distribution infrastructure required to ensure a reliable supply.

To better understand local affordability dynamics, the IEA conducted a geospatial analysis comparing clean cooking costs with household income at a 1 km² resolution across Ethiopia. Clean cooking costs were estimated spatially based on existing infrastructure conditions. The analysis highlights not only the affordability range associated with each technology, but also the locations where policy support could most effectively expand access. Given that upfront investment remains a significant barrier to adoption, affordability is assessed as the ratio of the cost of a stove and one year of fuel to household income. An affordability ratio above 10% is considered unaffordable, values between 5% and 10% indicate limited affordability, and ratios below 5% are regarded as affordable.

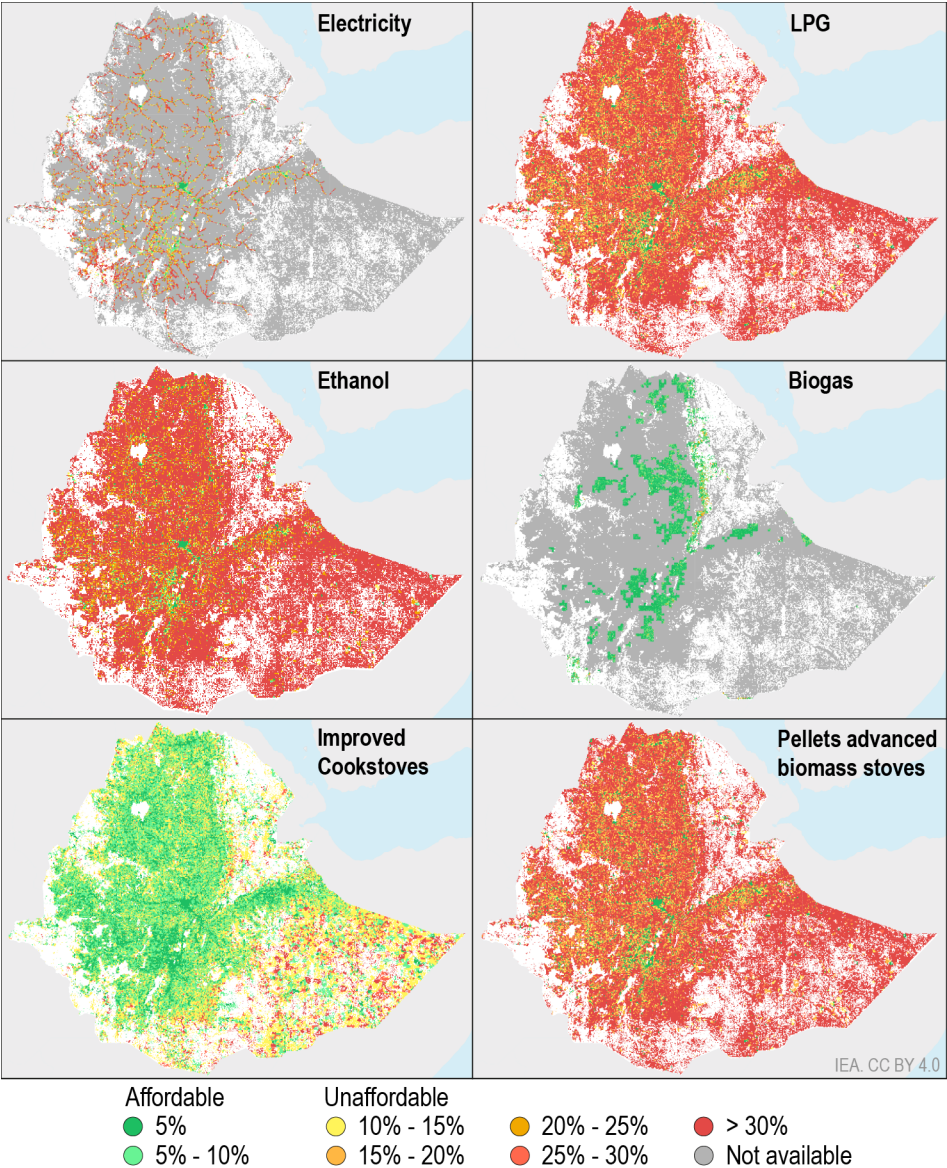
The analysis indicates that ICS are the most affordable cleaner cooking options in Ethiopia. Their relatively low upfront cost, combined with continued reliance on freely collected biomass or agricultural residues in some areas, contributes to comparatively low overall expenditure for households. Geospatial results suggest that ICS are affordable for around 45% of the population and almost affordable for a further 30%. Although these stoves are typically classified as Tier 3 and therefore fall short of the IEA definition of clean cooking, they can still deliver meaningful efficiency gains and significant reductions in particulate matter emissions, helping to mitigate forest degradation, save households time for fuel collection and reduce adverse health impacts. However, ICS are often limited to one or two burners, which may not fully meet Ethiopian households' cooking needs. Multiple devices may be required to reduce fuel stacking and achieve the full benefits of deploying this solution. In addition, these stoves are generally not suitable for injera baking and need to be complemented by a dedicated mitad stove. Several initiatives have focused on

improving the performance of biomass mitads; the enhanced design of the Mirt stove, for example, is estimated to reduce fuel consumption by more than 80%, carbon monoxide emissions by around 90% and particulate matter emissions by roughly 83%. Combining improved biomass cookstoves with improved biomass mitads can, therefore, provide a relatively affordable and culturally appropriate transitional solution for many Ethiopian households. However, improved cookstoves remain an interim measure and will ultimately need to be replaced by clean cooking alternatives as Ethiopia progresses towards universal access to clean cooking.

By contrast, ABS – typically Tier 4 and classified as clean – remain unaffordable for most rural households without targeted affordability support. Many ABS models rely on pellet fuels to achieve Tier 4 performance, increasing ongoing costs compared with transitional improved cookstoves that can use freely collected biomass. As a result, only around one in four households would need to allocate less than 10% of their disposable income to switch to ABS for cooking. In addition, developing pellet supply chains may not be economically viable across all regions of Ethiopia. Further innovation enabling consistent Tier 4 performance using freely collected biomass could significantly improve the affordability outlook.

Electricity – which is at the centre of Ethiopia’s national clean cooking pathway – was found to be relatively affordable where available, largely due to relatively low electricity tariffs in Ethiopia. The analysis shows that around 30% of grid-connected households can afford electric cooking, while a further 20% would need to allocate less than 10% of their disposable income to make the switch. These results assume households acquire basic electric appliances, including resistive coil, hotplate and infrared radiant stoves. Deploying more efficient induction stoves could typically double the upfront cost, reducing affordability for many households despite the efficiency gains. However, a grid connection alone is not sufficient to enable electric cooking. Electricity supply must be reliable and available at the times households need to cook. Current reliability challenges on the national grid could, therefore, constrain the uptake of electric cooking, underscoring the need to modernise infrastructure to support the clean cooking transition.

Affordability of clean cooking solutions in Ethiopia, 2024



Source: IEA and KTH Royal Institute of Technology analysis based on the [OnStove model](#).

To assess the affordability of biogas cooking solutions, the latest IEA geospatial modelling of global biogas potential – drawing on datasets covering agricultural output, water resources, biowaste generation and forestry residues – was applied to Ethiopia to estimate the country's resource potential. The analysis indicates that several regions, including Oromia; Amhara; Afar; Tigray; and Southern Nations, Nationalities and Peoples, have significant biogas potential. Overall, biogas could be a viable cooking option for around 20% of the Ethiopian population. Among these households, around 85% would need to allocate less than 10% of their disposable income, suggesting that biogas could be an affordable solution where resource availability allows. The cost structure of biogas differs from other clean cooking options. Biogas systems have no operating fuel costs, as households can produce gas directly from organic waste. However, costs are concentrated upfront in the purchase of the biodigester, which remains an affordability barrier for many households. Policy measures such as reducing import tariffs on biodigesters; lowering taxes, including VAT; or enabling financing models that allow households to spread payments over several years could improve affordability.

The Clean Cooking Roadmap currently envisages biogas providing around 2.5% of the population access to cleaner cooking solutions by 2035. Given Ethiopia's resource potential and the relatively favourable affordability profile where biogas is viable, a higher deployment level might be considered. Expanding the role of biogas would help diversify the clean cooking mix, reduce pressure on the electricity system, increase the deployment of Tier 4 cooking solutions and support the successful implementation of the clean cooking transition. It is important to note, however, that evidence from research programmes suggests that biogas may be less suited to certain Ethiopian cooking practices, particularly injera baking. The concentrated heat profile of biogas flames, combined with the high and sustained fuel demand required for frequent baking, can exceed the production capacity of standard household biodigesters. Similar constraints may arise for dishes requiring long simmering times. These characteristics suggest that some households may need to combine biogas with other transitional or clean cooking solutions to enable a sustained shift away from traditional biomass use.

LPG consumption remains very low in Ethiopia, reflecting the absence of domestic production and past foreign exchange constraints that have limited import capacity. Although several LPG companies operate in the country, use remains highly localised and the infrastructure and distribution networks limited. The analysis suggests that, if LPG infrastructure were expanded and the fuel became widely available, around 15% of the population could afford LPG for cooking, while a further 10% would need to

allocate less than 10% of their disposable income to make the switch. LPG has proven to be a scalable clean cooking solution across parts of Asia and other sub-Saharan African countries, yet it is absent from the clean cooking pathway prioritised by the Ethiopian government. Recent natural gas discoveries and plans for their development could provide an opportunity to reassess the role of LPG. Evaluating the LPG production potential of domestic gas resources – including propane and butane yields – could clarify whether a local supply for cooking is feasible. If viable, integrating LPG into the clean cooking mix could help ease pressure on electricity infrastructure and increase the number of households gaining access to Tier 4 cooking solutions. LPG may, however, face comparable technical constraints to biogas for injera baking.

Despite domestic bioethanol production, its use for cooking remains very limited in Ethiopia. Recent developments across sub-Saharan Africa suggest that bioethanol can represent a scalable clean cooking solution in urban areas. However, it remains relatively expensive. Only a small share of Ethiopian households would be able to afford it, while almost 20% fall within the 5-10% affordability threshold. Bioethanol would, therefore, likely require targeted policy support – such as subsidies or carefully designed results-based financing mechanisms, including carbon finance where appropriate – to become affordable and achieve meaningful uptake. Nevertheless, it represents a potential option to diversify the clean cooking mix and support progress towards universal access.

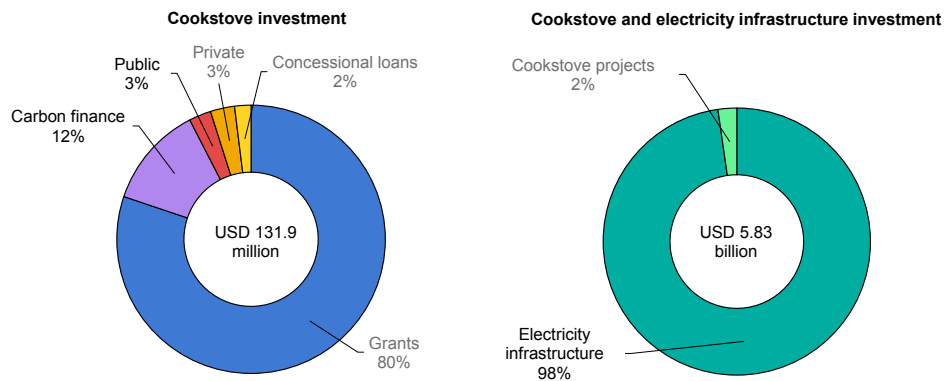
Clean cooking investment

Between 2004 and 2024, cookstove initiatives across Ethiopia mobilised around USD 132 million, supported by a broad range of development partners and delivered through 23 major programmes. Although a large share of the stoves deployed fell below the IEA definition of clean cooking, these programmes went beyond stove distribution to help build and strengthen institutional capacity at the local, national and regional levels; develop market systems; support supply and demand; foster research and innovation; and deliver awareness campaigns.

More than 80% of total funding was provided in the form of grants, with bilateral development partners accounting for roughly 60% of external financing and multilateral institutions around 40% – both supported a comparable number of projects. These contributions were complemented by private sector investment, philanthropic capital and carbon finance, although public and private capital played only a modest role overall. Carbon finance represented approximately 12% of total funding, with 7 of the 23 programmes relying, at least in part, on revenues from carbon

credits. Its role has become more prominent in recent years as the emissions-reduction potential of clean cooking projects has gained wider recognition.

Historical investment in cookstove programmes and electricity infrastructure in Ethiopia, 2004-2024



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Source: [National Clean Cooking Energy Sector Investment Plan of Ethiopia](#) (2025).

Compared with the sums channelled into electricity infrastructure over the same period, investment in clean cooking remains modest, representing less than 2% of total efforts to expand electricity infrastructure in support of reliable energy access in Ethiopia. More recently, financing patterns have begun to evolve, with the sector relying less on single bilateral or multilateral channels and increasingly adopting more sophisticated blended finance structures that combine multiple sources of funding. This shift is reflected in the Clean Cooking Roadmap, where concessional loans are expected to play a greater role, rising from around 2% of historical clean cooking investment to 20% of projected financing needs.

Although the government began promoting electric cooking more than half a century ago through government-led programmes, public investment in clean cooking between 2004 and 2024 accounted for around 3% of the USD 132 million mobilised in the sector, reflecting the historically limited role of domestic public financing within the overall funding landscape. This pattern suggests that clean cooking has historically occupied a more limited place within broader national energy planning, which may help explain Ethiopia’s comparatively low access rates relative to other sub-Saharan African countries. As discussed earlier in this chapter, however, the

government has recently renewed political momentum around clean cooking, elevating it to a national priority and integrating it into broader energy and development strategies. The intention to increase the government's contribution to around 10% of the investment required to deliver the Clean Cooking Roadmap signals a growing commitment to the transition.

At the same time, total investment in clean cooking programmes between 2004 and 2024 represents only around 4% of the USD 3.38 billion required over the next decade to achieve the Clean Cooking Roadmap's objectives. Bridging this gap will require the creation of a supportive enabling environment capable of mobilising significantly higher levels of public and private finance.

Major cookstove projects in Ethiopia, 2004-2024

Cookstove project	Key partners	Reliance on carbon credits
Energy Access Household Efficiency	MoWE, World Bank	No
National Improved Cookstove Program	MoWE, UNDP, BARR Foundation	No
National Biogas Program of Ethiopia (NBPE)	MoWE, SNV, DGIS, European Union, Hivos	No
Ethanol Cooking	Gaia Association, SNV	No
Sustainable Rural Energy Technology	MoWE, UNDP	No
Biogas, Biomass and Solar Trilateral	UNDP	No
Clean Cooking Entrepreneurial Ecosystem	GIZ, SNV, RVO	No
EnDev Ethiopia Clean Cooking Access	SNV, RVO	No
Mimi Moto Biofuel Production	Soil and More Ethiopia	No
Modern Energy Cooking Services	UK Aid	No
Electric Cooking Outreach Pilots	UK Aid	No

Cookstove project	Key partners	Reliance on carbon credits
Anega Energies – Plan International	P4G	No
Displacement Settings Energy	GIZ, UNHCR, ARRA, MoWE	No
Covid-19 Relief Fund for Cooking Energy	GIZ, Development Bank of Ethiopia	No
Interfaith Forest Conservation and Cookstove Initiative	Norwegian Church Aid	No
Oromia Cookstove Distribution	Horn of Africa Regional Environment Centre and Network	Yes
Energy-Efficient Cook Stoves	World Vision, Sweden Enerav Agencv	Yes
Vita Partnership SNNPR	Vita Impact	Yes
Fuel Efficient Stoves Ethiopia	World Food Programme	Yes
Improved Cookstove Project	Mekane Yesus Cookstov	Yes
NBPE – Phase 1	MoWE and SNV	Yes
NBPE – Phase 2	MoWE and SNV	Yes

Notes: ARRA = Agency for Refugees and Returnees Affairs; DGIS = Dutch Ministry of Foreign Affairs; UNDP = United Nations Development Programme; UNHCR = United Nations High Commissioner for Refugees.

Source: [National Clean Cooking Energy Sector Investment Plan of Ethiopia](#) (2025).

Recommendations

16. Develop a comprehensive implementation plan for the Clean Cooking Roadmap, aligned with the National Electrification Program, that sequences grid modernisation and expansion with households' ability to adopt and afford clean cooking solutions

Ethiopia has made substantial progress on clean cooking policy in recent years and has firmly positioned clean cooking as a national priority.

The Clean Cooking Roadmap sets an ambitious trajectory: by 2035, around 76% of the population is expected to gain access to cleaner cooking solutions, with half adopting electric stoves and the remainder primarily relying on advanced biomass cookstoves. This pathway, centred on electric cooking, is broadly aligned with Ethiopian cooking practices but could place significant additional pressure on the power system. Under the Roadmap, electricity demand for cooking by 2035 could match – or potentially significantly exceed – Ethiopia's total current electricity generation. Moreover, ensuring widespread adoption will also require reliable electricity supply, given the time-sensitive and inflexible nature of cooking needs. However, as discussed in the Electricity access chapter, the national power system continues to face important reliability challenges and would require a large investment in modernisation to ensure reliable service at today's demand levels. While the Roadmap outlines a phased implementation strategy, the scale of the transition and prevailing system conditions point to the need for a more comprehensive and robust implementation plan.

To achieve the ambition of the Clean Cooking Roadmap, the government could consider developing a comprehensive implementation plan, underpinned by detailed geospatial modelling, to carefully sequence grid modernisation, grid expansion and household affordability. Such an approach would help ensure that electric cooking solutions are deployed where households can afford them and where reliable electricity supply is available. Strengthening clean cooking demand modelling would also be beneficial, ensuring that projections fully reflect the specificities of Ethiopian cooking practices, the performance characteristics of the stoves envisaged for the transition, and the geospatial distribution of demand. More broadly, strengthening

economy-wide energy demand modelling to better understand future energy needs, aligned with electrification strategies and a wider development plan, would support more robust system planning and policy implementation.

17. Consider broadening the mix of clean cooking solutions and prioritising high-efficiency stoves to help meet the Clean Cooking Roadmap's access rate targets

In parallel with the need for a comprehensive implementation plan outlined in the previous recommendation, the government of Ethiopia could consider additional levers to reduce pressure on electricity infrastructure, accelerate the uptake of Tier 4 cooking solutions, and support the achievement of the 58% access target by 2030 and 76% by 2035.

The current Roadmap is strongly centred on electricity and advanced biomass cookstoves, with alternative solutions accounting for only around 5% of new access by 2035 – split between biogas (2.5%) and solar cooking (2.5%). As discussed in this chapter, Ethiopia could also leverage its significant biogas potential, domestic bioethanol production and recent natural gas discoveries, which may create opportunities for local LPG supply to diversify the clean cooking technology mix. Greater diversification could help ease pressure on the power system while reducing reliance on Tier 3 transitional solutions in favour of cleaner alternatives.

At the same time, maximising adoption will require recognising that some fuels may not fully align with local culinary practices. In regions where injera baking remains central to daily cooking, complementary deployment of improved biomass mitads or electric mitads may be needed to enable cleaner injera preparation while limiting strain on electricity infrastructure.

Given the scale of the clean cooking transition for Ethiopia's energy system, the efficiency of deployed stoves will be a critical factor. Introducing minimum energy performance standards for clean cooking technologies, alongside prioritising high-efficiency appliances in programme design, could help limit additional pressure on energy infrastructure.

18. Create an enabling environment for clean cooking that attracts the investment required for the transition, strengthens local market actors and drives household adoption

Achieving the pathway outlined in the government's Clean Cooking Roadmap would require around USD 3.38 billion in investment by 2035 – more than 25 times the total invested in clean cooking between 2004 and 2024. Establishing a supportive policy and regulatory framework will, therefore, be essential to mobilise this scale of finance. The robust implementation plan proposed in recommendation 16 could help strengthen the credibility of the transition and provide greater certainty for investors.

Incentivising local manufacturing and assembly of clean cooking technologies could also link the transition to broader economic development, reinforce public support and improve the resilience of supply chains.

Affordability constraints, limited awareness of the health and economic benefits of clean cooking, and challenges related to the availability and reliability of technologies and fuels continue to slow adoption. Expanding consumer financing options, including through microfinance institutions and results-based mechanisms such as carbon finance, alongside targeted fiscal measures such as reduced duties or VAT and well-designed subsidies, could help address affordability barriers. Awareness campaigns and community-level outreach will be key to bridging knowledge gaps and building confidence in new technologies. Ensuring that reliable fuel supply chains are established alongside stove deployment will also be critical to sustaining adoption and maintaining positive public perception of clean cooking solutions.

Annexes

Acknowledgements, contributors and credits

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Syrine El Abed designed and directed the report. Matthew Van der Beeuren and Jenny Birkeland co-ordinated the report and wrote the chapter on general energy policy. Fabian Burkard wrote the chapter on the power sector; Elisa Asmelash wrote the chapter on renewable energy; Arthur Rogé wrote the chapters on access to electricity and access to clean cooking; and Adam Ward wrote the analysis on energy investment.

The main contributors to the report are Nouhoun Diarra (access), Arthur Jongejans (geospatial), Martina Lyons (geothermal), Pietro Rinaldi (research) and Alessia Stedile (investment).

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Astrid Dumond and Isabelle Nonain-Semelin managed the editing and publication process. Clara Vallois managed the translation process. Jennifer Allain edited the report. The graphic design of the report was undertaken by Poeli Bojorquez.

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Abbreviations and acronyms

ABS	advanced biomass cookstove
ADELE	Access to Distributed Electricity and Lighting in Ethiopia
ASCENT	Accelerating Sustainable and Clean Energy Access Transformation
COP	Conference of the Parties
EAPP	Eastern Africa Power Pool
EEA	Ethiopian Energy Authority
EEP	Ethiopian Electric Power
EEU	Ethiopian Electric Utility
EIC	Ethiopian Investment Commission

ELEAP	Ethiopia Electrification Program
ETB	Ethiopian birr (currency)
EV	electric vehicle
FY	fiscal year
GDP	gross domestic product
GERD	Grand Ethiopian Renaissance Dam
ICE	internal combustion engine
ICS	improved biomass cookstove
IDA	International Development Association
IEA	International Energy Agency
IMF	International Monetary Fund
IPP	independent power producer
LNG	liquefied natural gas
LPG	liquefied petroleum gas
MEPS	Minimum Energy Performance Standards
MoWE	Ministry of Water and Energy
MTF	Multi-Tier Framework
NDC	Nationally Determined Contribution
NEP	National Electrification Program
PEA	Petroleum and Energy Authority
PPA	power purchase agreement
PPP	public-private partnership
PRIME	Power Sector Reform and Modernization Program
PV	photovoltaics
REF	Rural Electrification Fund
SAF	sustainable aviation fuel
SOE	state-owned enterprise
TFEC	total final energy consumption
USD	United States dollar (currency)
VAT	value-added tax
WHO	World Health Organization

Units of measurement

GW	gigawatt
GWh	gigawatt hour
kV	kilovolt
kWh	kilowatt hour
MJ	megajoule
Mt	million tonnes
Mt CO ₂ -eq	million tonnes carbon dioxide equivalent

MW	megawatt
MWth	megawatt thermal
MWh	megawatt hour
PJ	petajoule
TWh	terawatt hour
Wp	watt-peak

See the [IEA glossary](#) for a further explanation of many of the terms used in this report.

Infographic sources

Total energy supply: IEA (2026), [World Energy Balances](#).

Installed renewable capacity: IEA (2025), [Renewable Energy Progress Tracker](#).

Access to clean cooking: Targets from Ethiopia (2025), [Ethiopia National Energy Compact](#); Ethiopia, Ministry of Water and Energy (2025), [National Clean Cooking Roadmap](#).

Electricity-sector investment: IEA analysis based on data from [IJGlobal \(2025\)](#), Project Finance Transactions Database; World Bank (2025), [Private Participation in Infrastructure \(PPI\) Database](#); OECD (2025), [Creditor Reporting System \(CRS\)](#); AidData (2023), [AidData's Global Chinese Development Finance Dataset, Version 3.0](#); GOGLA (2024), Investment Data; Cleantech Group (2025), [i3 Market Intelligence](#); BNEF (2025), [Renewable Energy Transactions](#) (database). All databases and datasets accessed on 12 January 2026.

2030 EV targets: Ethiopia, Ministry of Transport and Logistics (2025), [E-Mobility Strategy and Implementation Plan](#); Electrive (2024), [Ethiopia exceeds import targets for electric vehicles](#); Climate Policy Database (2024), [Electric vehicle import mandate and ICE vehicle ban](#).

Electricity access by 2030: Targets from Ethiopia (2025), [Ethiopia National Energy Compact](#); Ethiopia, Ministry of Water and Energy (2025), [National Electrification Program 3.0](#).

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Ethiopia 2026

Energy Policy Review

Ethiopia is one of Africa's largest and fastest-growing economies, with increasing regional influence and a growing global presence. The country has set out an ambitious development vision, supported by major infrastructure investments that are transforming its energy landscape. Landmark projects such as the Grand Ethiopian Renaissance Dam have significantly expanded power generation capacity, strengthened energy security and reinforced Ethiopia's role in regional electricity trade.

Ethiopia's predominantly renewable power system, major investments in generation capacity and far-reaching energy sector reforms provide a strong foundation for meeting growing energy demand. The energy sector will play a central role in advancing Ethiopia's development ambitions and strengthening its regional leadership.

This *Energy Policy Review* of Ethiopia was prepared in collaboration between the Government of Ethiopia and the International Energy Agency (IEA), building on their growing partnership and as Ethiopia prepares to host COP32 in 2027.

Following an in-depth review mission conducted with the Government of Ethiopia in Addis Ababa, this report assesses the country's energy policies, progress and remaining challenges. It provides policy recommendations to strengthen implementation, mobilise investment, expand access to electricity and clean cooking and support Ethiopia's goals for a transition towards a secure, sustainable, affordable and inclusive energy future.