RENEWABLE ENERGY PATHWAYS IN AFRICA

LANDSCAPE AND SCENARIOS TO 1.5°C

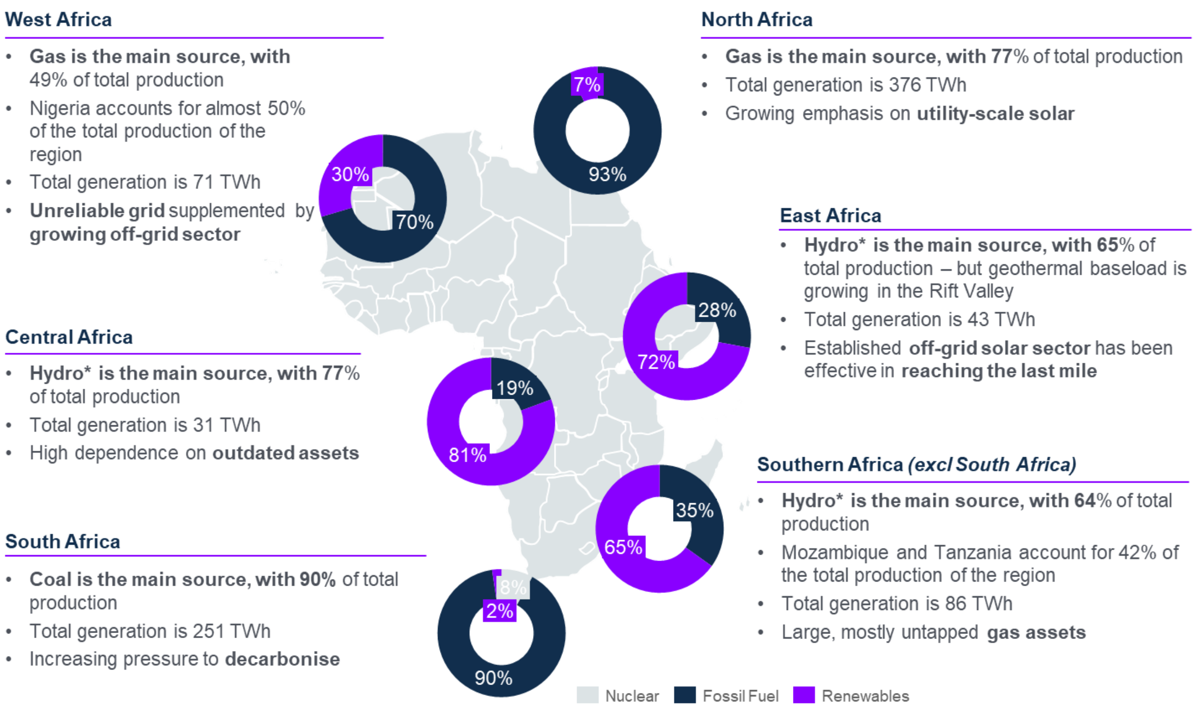
JUNE 2021

This report was created by Dalberg in partnership with the UN High Level Champions Team. We collated knowledge from across our work to present this concise view of Africa's energy landscape and the potential pathways to achieve a 1.5°C future. We spoke to leading experts and companies across the industry to understand the challenges they face and key gaps. This study synthesizes findings to offer potential areas for intervention by industry stakeholders.

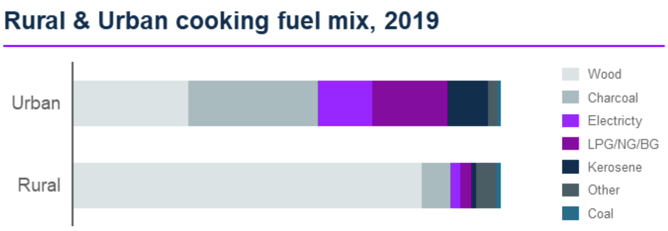
AFRICA'S CURRENT ENERGY LANDSCAPE

Africa's emissions totalled 1,233 MT in 2018, making up 6% of global emissions.[1] **Almost 40% of these were from electricity and heat production,** with residential emissions mostly from cooking making up a further 7%.[i] Africa's emissions are projected to reach 7,700 MT or 10% of the global total by 2050 under BAU scenarios – representing 18% of the total global emissions growth and posing a material threat to achieving a 1.5°C future.[2]

The electricity generation mix varies across regions of the continent; fossil fuels dominate the larger economies of South Africa, North Africa and much of West Africa, while renewables are the mainstay in East, Central and Southern Africa, mostly derived from hydroelectric plants[ii] but with growing shares of solar and geothermal.[3]



Cooking fuel is mostly sourced from wood, with growth in LPG in urban areas.[4] While there is an ongoing push for 'clean' fuels, this is largely focused on health and indoor pollution outcomes rather than an emissions perspective – e.g. low smoke biomass stoves, and LPG. Wood & charcoal burning causes carbon emissions and are only 'renewable' if biomass is replanted. The high costs of LPG and electric cooking have slowed adoption, especially in comparison to low-cost charcoal and virtually no-cost dung and wood. Only electric cooking integrates with the grid.



Electricity access across Africa reached 56% in 2020, including on-grid, mini-grid and off-grid solutions. Regional disparities exist – from North Africa at 99% access to Central Africa at just 24%, with 8.5% growth in East Africa to reach 47%. 579 million still lack access - two-thirds of the global total without access.[5]

[i] Residential refers to all emissions from fuel combustion in households, for which stove emissions are a key driver.
[ii] Whilst Hydro is a renewable resource, there are environmental concerns associated with large-scale hydro due to disruption to communities and natural ecosystems. As a negligible proportion of production (outside SA), nuclear energy is excluded.

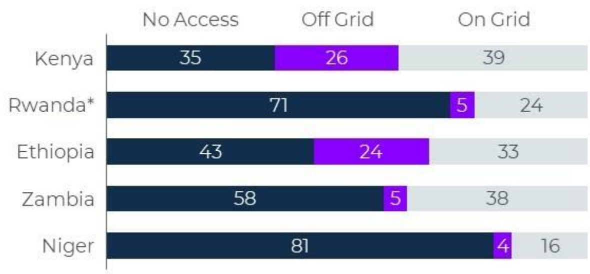
Grid reliability, 2019

153 million Africans have an unreliable grid connection, relying on alternative sources to meet their needs.[6] Statistics on energy access do not paint a full picture of the access challenges on the continent, due to variations in the quality of access. Measures of access range from a fully reliable, affordable and quality connection, down to decreasing hours of connection, reliability and capacity of connection. To supplement poor service, customers often rely on multiple sources to provide a more consistent connection – and supplementary sources include polluting diesel generators that are neither regulated nor reflected in official statistics.

231 million people globally access electricity via off-grid solar (OGS) devices, and in 2018, 52% of sales were in Africa.[7] OGS varies in the capacity of its offering. Starting from portable solar lanterns (not technically included as 'access'), through to complex solar home systems with multiple appliances including televisions and even fridges and fans.

The OGS market is particularly strong in East Africa, where competition among companies is vibrant and distribution networks in Kenya and Uganda are well established.

Access to electricity via off-grid and mini-grids, 2019



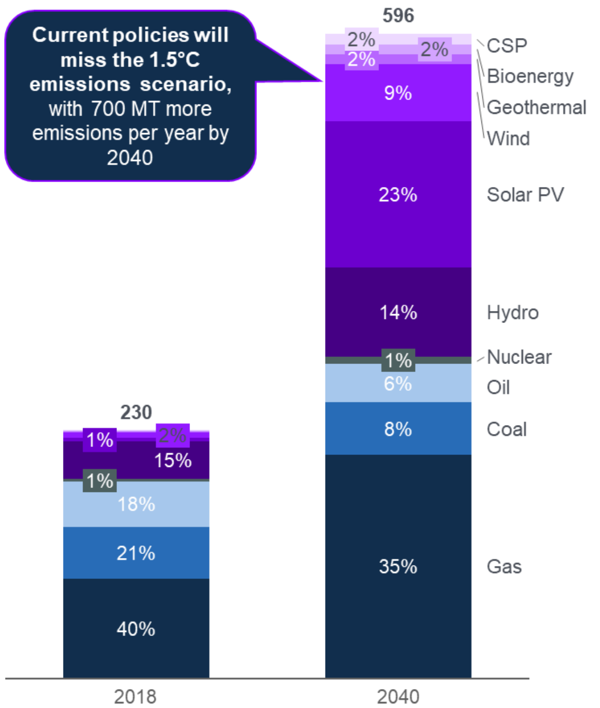
~900 million people in Africa lack access to clean cooking, and population growth is outpacing efforts to provide access, with only 4.5 million people gaining access annually.[8] Growth is mostly in urban areas; rural access has increased by just 0.7% since 2013. The price of fuel is a key factor driving access. In rural areas traditional fuels such as charcoal are cheap and widely available; wood collection has no direct cost. Behavioural norms can slow the adoption of alternative fuels. Local dishes (e.g. ugali) are traditionally cooked on charcoal or wood, with strong cultural preferences around taste that perpetuate the use of wood fuels.

AFRICA'S FUTURE ENERGY LANDSCAPE

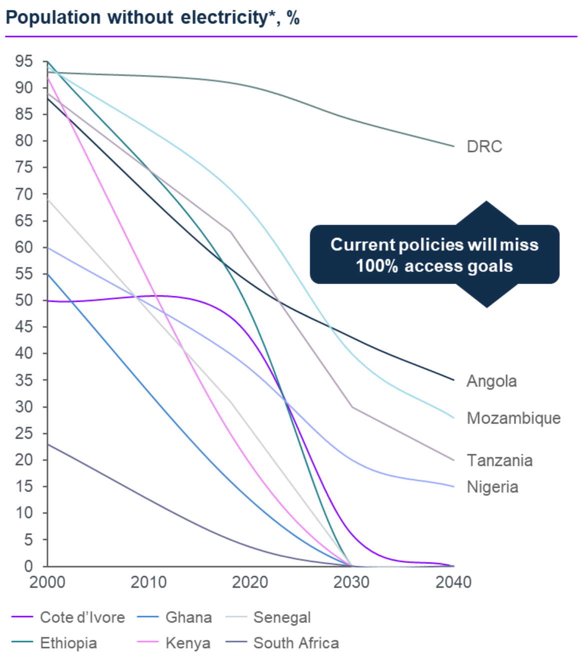
The technical potential of renewable energy is sufficient to power Africa's energy needs to 2050 and beyond. Africa has an annual estimated solar energy potential of 660,000 TWh and over 460,000 TWh of wind.[9] Together, these two resources alone have potential far in excess of any current or estimated future energy demand on the continent.

Whilst the actual economic potential is lower than estimated technical potential, it is still sufficient to meet needs. Economic potential accounts for minimum revenue requirements as well as the upfront costs and storage and intermittency challenges of a renewable system. Across the continent, decreasing infrastructure costs and technological advances continue to increase the economic potential of renewables, presenting a leapfrog opportunity to expand capacity and generation to meet energy needs and access goals. While the full extent of the economic potential for renewables is not yet fully defined, it is more than sufficient to cover future demand.

Africa's Electrical Capacity Forecast, GW



Africa will miss 1.5°C pathways under current policies, with a forecast 60% rise in fossil fuel capacity and a 45% increase in emissions. Fossil fuel capacity is projected to increase from 182 to 291 GW, with production growing from 688 TWh to 980 TWh in 2040. This is largely driven by gas, with coal capacity remaining constant and oil capacity falling. Current policies forecast 253 GW of new installed renewable capacity by 2040, increasing the share of renewables in the electricity mix from 21% in 2018 to 50% in 2040.[10]



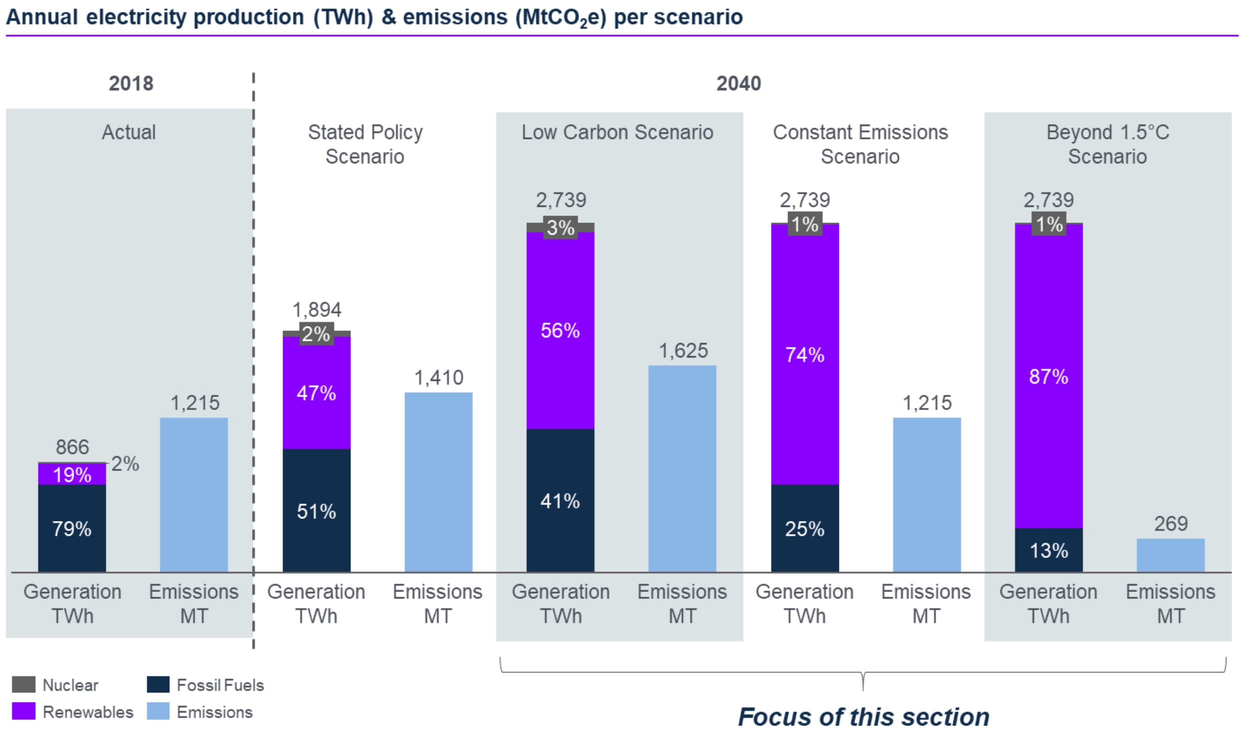
Under current policies, Africa will also miss the 100% access goal by 2030 and fail to ensure a just transition. Energy access is projected to reach 68% by 2030, with an additional 415 million connected. However, due to the forecasted population increase of 30% across the continent, the sub-Saharan region still shows 530 million people without access by 2030 – almost the same number that lack access today.[11]

Reaching 100% access to electricity requires not just increased generation capacity, but also diverse and decentralised solutions in order to reach the last mile. Mini grids and standalone systems offer a smart-integrated, less infrastructure-intensive and more cost-effective way to connect rural areas, often catalysing innovation and investment from the private sector. However, renewable mini-grids face challenges of load balancing and storage given capacity and intermittency constraints without the flexibility of a larger grid connection. Sparse populations with low per capita consumption make it difficult for mini-grid developers to reach viable returns.

Reaching 100% access to clean cooking is likely to require a mix of fuels and cookstove solutions. LPG and biomass are often touted as clean solutions. Whilst they provide benefits from a health perspective by driving consumption away from other fossil fuels, they do not serve the purpose of making cooking 'green' by eliminating emissions or ending deforestation. Improved biomass stoves are more efficient and thus require less fuel, but increased population is still likely to drive an overall increase in fuel needs, even if all households had access to an improved stove. Clean access options include both electricity and ethanol, yet together they account for just 18% of the mix. Whilst electrification of cooking can enable decarbonisation, electricity is only renewable if the grid it relies on is renewable-powered.[12]

WHAT COULD A 1.5°C SCENARIO LOOK LIKE?

Achieving a 1.5°C scenario in Africa's energy sector does not require sole dependence on renewables. It is possible to shut down highly emitting fuels to reach emissions targets and meet 100% access goals.[iii]



[iii] The scenarios outlined here do not include generation and emissions from cooking, with the exception of electric cooking

We built on the IEA's 'Low Carbon Scenario' to create two further emissions scenarios for 2040.[13] One holds 2018 emissions constant, with no future growth in fossil fuels; the other includes a decommissioning of coal and oil, plus constant gas capacity to reduce in emissions by 78%, going beyond 1.5°C pathways.[14]

IEA Low Carbon Scenario

- Greater access and lower emissions future than current policy projections, but fossil fuels still increase
- Almost half of the energy will be produced by fossil fuels in 2040
- Does not meet the Race to Zero breakthroughs target of 60% renewables share
- 34% increase in emissions from 2018

Constant Emissions Scenario

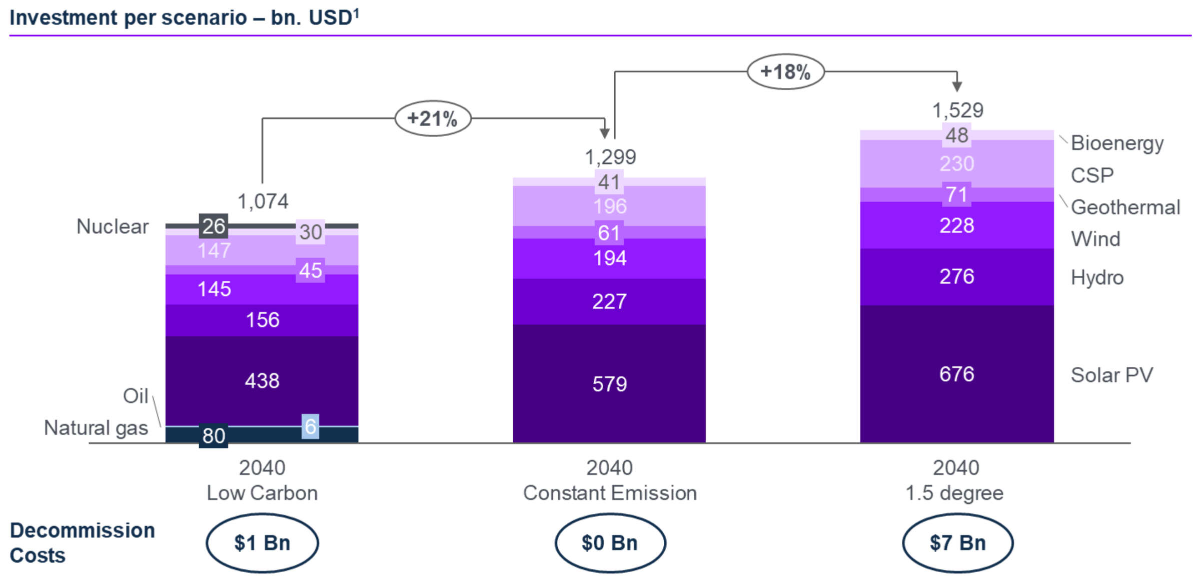
- Maintains fossil fuels from 2018
- Nuclear energy is constant vs. 2018
- Exceeds the Race to Zero breakthroughs target of 60% renewables share
- Renewables make up the gap in the same proportion as IEA scenarios
- 0% increase in emissions from 2018

Beyond 1.5°C Scenario

- Reduces high emissions fossil fuels first, requiring a total shut down of coal and oil in electricity generation
- Nuclear energy and gas are constant at 2018 capacity
- Exceeds the SBTi median target of 4.5% annual emissions reduction; in line with the UN Climate Change Conference at Marrakech
- 78% decrease in emissions from 2018 – Beyond a 1.5 °C scenario

A 'Beyond 1.5°C' scenario outlines a path for Africa's energy sector to do more than its 'fair share' of emissions reduction. This provides leeway for other sectors of the economy – which may be harder to decarbonise – to have smaller emissions reductions and still reach 1.5°C overall. Alternatively, African countries can seek additional compensation for carbon mitigation through mechanisms such as internationally transferred mitigation outcomes (ITMOs) under the Paris Agreement.

Upfront costs in the 'Beyond 1.5°C' scenario are higher due to the weighting of more renewables, plus decommissioning costs.[15] There is an increase in investment needed for scenarios with lower emissions since they require more renewable capacity. Renewables have a higher upfront investment for installation, but lower operation and maintenance cost. However, after 13 years, the lower running costs of the 'Beyond 1.5°C' scenario mean that this scenario breaks-even with the low-carbon scenario, and thereafter makes annual savings.[iv]

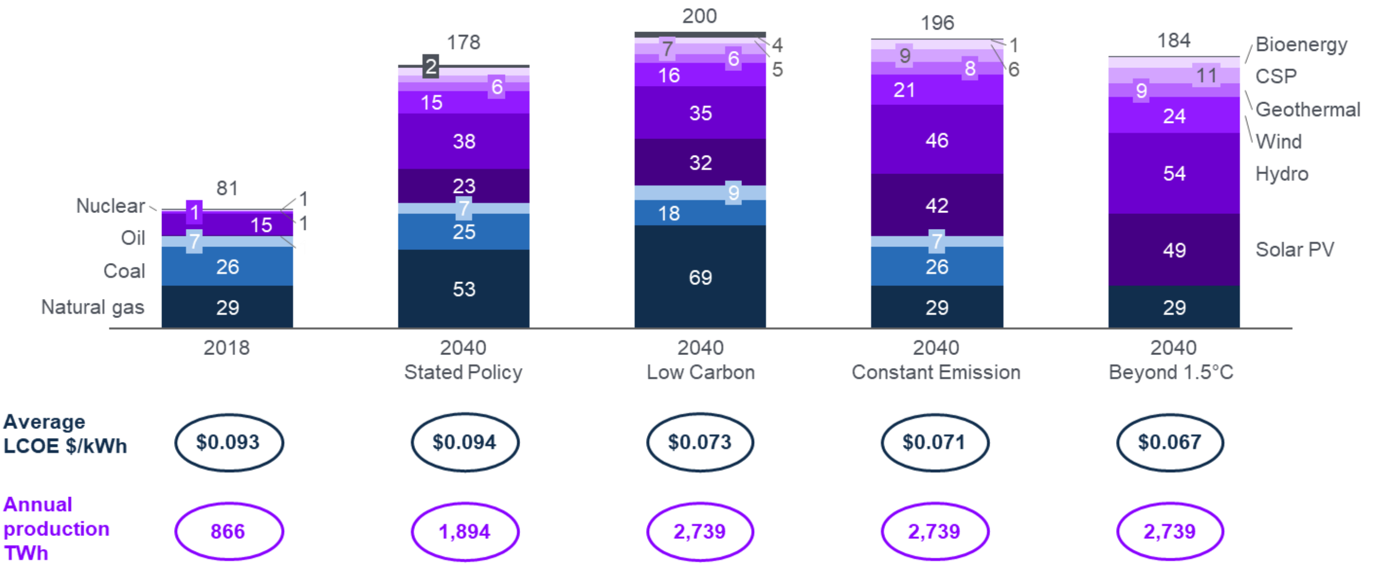


Across all three low carbon future scenarios, generation increases to meet 100% access goals, from 866 TWh in 2018 to 2,739 TWh in 2040. This drives up the overall annual cost compared to 2018, but the levelised cost of energy (LCOE) is in fact lower in a 'Beyond 1.5°C' scenario than in a 'low carbon' scenario.[v] LCOE is lower across the 'Beyond 1.5°C' scenario due to (a) the different energy mix including lower nuclear capacity, (b) a 37% price decrease in LCOE for renewable energy, and (c) removing coal and oil.[16] **By 2040, it is more cost effective to pursue a 'Beyond 1.5°C' scenario than to continue with current policies, whilst achieving a fair and just transition to 100% access.**

[iv] Investment costs have been discounted to 2018 values in line with the IEAs 2018 baseline scenario. Break-even analysis assumes linear investment in new capacity to 2030, not incorporating any discounted cash flow

[v] Annual cost of electricity calculation based on levelised cost of energy (LCOE), the ratio of lifetime costs to lifetime electricity generation. Both are discounted back to a common year using a discount rate that reflects the average cost of capital

Annual cost of electricity per scenario – bn. USD in 2040



This model uses a conservative price decrease for renewables and does not incorporate the potential impact of new technologies that could accelerate progress. The model is limited in its use of the renewable mix from IEA scenarios rather than a bottom-up calculation. It does not incorporate fossil fuel pipelines that already feature heavily in country development plans. Halting all fossil fuel production could meet with strong resistance, especially given the role gas exports could play a role in supporting a global transition to low-carbon fuels whilst supporting development. Yet continued policy support for fossil fuels often lags behind private sector interest in renewables, and risks creating stranded assets and higher decommission costs by 2050.

Setting an ambitious agenda could bring these scenarios forward, making a 1.5°C pathway possible even by 2030. A 2040 target is outside many policy planning timeframes and does not compel immediate action. Policymakers may be tempted to plan for half this capacity by 2030 and half in the next decade, relying on future technologies to fill the gap. However, to meet 100% access goals by 2030, the majority of this infrastructure needs to be built by 2030. The urgency of the climate crisis and the risk of locking into fossil fuel pathways highlights the need for ambitious goals within the next decade.

LEVERS TO REACH 1.5°C

In order to achieve a 1.5°C pathway, Africa needs to overcome five key challenges in the energy landscape.

Renewable Energy

Increase the share of renewables as a proportion of total electricity capacity mix, in line with the need for emissions cuts to reach a 1.5°C pathway

Load Balancing

Switching to renewables can cause **load balancing challenges** for a grid system without a reliable baseload

Last Mile

Lack of user-centric last mile solutions to provide electricity to remote households

Bankable Demand

Lack of "bankable" future demand across the continent raises the need for anchor energy offtake

Clean Cooking

Polluting cooking fuels continue to dominate – Wood, charcoal and kerosene continue to dominate cooking fuels without sufficient alternatives

For each challenge, we have identified key levers for the energy industry to address:

Renewable Energy	• **Map and scope the renewable potential in specific countries,** outlining a clear pathway to increase renewable generation whilst ensuring returns for renewable energy developers • **Articulate the business cases** and promote innovative business models that help to **increase the deployment of proven technologies** that accelerate renewable grid capacity • **Identify missing workforce skills** (e.g., installation and maintenance) and connect with key players to integrate renewable energy needs in the **future workforce skills agenda** • **Work with civil society** and development organisations to wrap the **decarbonisation agenda** into the policy and social impact agenda
Load Balancing	• **Map and prioritise potential sources of renewable baseload** per country to identify the **optimum renewable energy mix** by location, e.g. geothermal, hydro • **Map the distribution and transmission requirements** for grid stability to build consensus towards a **decentralised, diverse and interconnected grid** at the regional and national level • **Identify and forecast the optimal storage solutions** by country and context, including pumped hydro, batteries and green hydrogen • **Identify high potential energy sinks that can support intermittency balancing** (e.g., green hydrogen, direct air capture, green ammonia) and how to attract emerging players to the market
Last Mile	• **Build the evidence base of last mile solutions** to enable policy makers to select the **optimal solution to reach remote areas**, regardless of connection type (main grid, mini-grid, off-grid) • **Align financial incentives and policies to support a wider range of technology options** (e.g. connection subsidies, CAPEX reimbursement, tax exemptions) that enable mini and off-grid providers to reach the last mile • **Build partnerships and cooperation across the off-grid sector** to share learnings that accelerate the **uptake of productive use appliances**, thereby raising demand at the last mile • **Build connections across geographies** to transfer learnings and **mainstream the uptake of efficient appliances** across African markets to reduce energy requirements

Bankable Demand	• Identify **high potential opportunities, emerging players and key mechanisms** to attract:
	  • Industrial parks (e.g., Green Heart of Kenya, Kilifi; Hawassa Industrial Park, Ethiopia)
	  • Big energy sink industry (e.g., e-hydrogen, direct air capture, green ammonia, e-fuels and electric transport)
	  • Digital infrastructure (e.g., data centres)

Clean Cooking	• **Outline the standard business case** and support businesses to prove the additionality and viability of clean cooking to **unlock carbon market finance** that subsidises the price of green fuels • **Outline and understand the optimal cooking fuel mix** in different locations that ensures access to clean cooking (e.g., biofuels, biomass, electric), alongside a low-emissions pathway • **Identify potential anchor clients** for clean cooking fuels to provide 'baseload' demand for clean cooking providers (e.g., industrial furnaces in tea factories) • Design **marketing initiatives** that either (a) shift meal preferences or (b) shift cooking behaviours onto green fuels (e.g., promoting pre-cooked staples)

Many of these levers overlap, helping to address multiple problems. We have prioritised three key groupings for next steps: (1) 1.5°C pathways planning, (2) bankable energy demand, and (3) climate accelerator.

1.5°C PATHWAYS PLANNING

Reaching 'Beyond 1.5°C' requires investments of USD ~1,529 bn in renewables by 2040 – but just USD 13 bn was invested in 2018.[17] By 2040, there will be a USD 910 bn funding gap,[vi] held back by barriers including:

① Misconceptions around emissions growth	② Lack of information	③ Poor enabling environment
Assumptions that sustainable development requires fossil fuel-based emissions growth limits focus on expanding zero emissions energy projects.	**Absence of country-level information on the potential of renewable resources** hinders the ability of policy makers and developers to plan within a 1.5°C framework.	**High import tariffs, ambiguous and lengthy regulatory policies, and limited tax incentives act as entry barriers** for new investors looking to enter the market.

[vi] Assuming cumulative renewables investment at global 2008-2018 CAGR

Whilst several studies project 2030 Renewable Energy generation and capacity shares for different countries, few make the case for a 1.5°C target, or provide a clear breakdown of the required capacity and costs to achieve it. Outlining a pathway to reach the 1.5°C target alongside the associated costs and revenues will help guide country, developer and investor decision making toward renewables. 1.5°C pathways must consider renewable potential, baseload, distribution & transmission and storage requirements, including activities that:

- Scope the **renewable potential** by source, enabling countries to align with a pathway to reach 1.5°C
- Identify the balance of sources, storage and load balancing options (e.g. geothermal, hydro) to build **grid stability**
- Map the **distribution and transmission** requirements for a decentralised, diverse and interconnected grid at the regional and national level
- Identify and forecast the optimal **storage solutions** by country and build effective systems to incorporate them

Climate change, decarbonisation, and the 1.5°C target need to be front and centre of all initiatives and country development plans. Achieving a 1.5°C pathway requires a systemic effort beyond just decarbonising electricity generation. Building connections across economic actors that addresses the holistic problems is essential to addressing emissions both within electricity & cooking and more broadly.

The COP26 Energy Transition Council's (ETC) work is already developing a country-level 1.5°C report to guide policymakers, investors and other stakeholders on the path forward in South Africa, Nigeria, Morocco and Kenya. Industry stakeholders can support their efforts and begin engaging secondary focus countries. Further, there is a need for a concise guide for policy makers to help (a) align national energy & development plans with climate policies and (b) create an enabling environment for business needs.

BANKABLE CLEAN ENERGY DEMAND

Bankable clean energy demand is the increase of energy consumption through creating new economic activities that have high energy intensity. Industries with high energy intensity and consumption requirements include sustainable industrial parks, data centres and emerging climate technologies. Consistent, high levels of energy demand provides energy suppliers with security of offtake and a guaranteed revenue stream, giving them the security and confidence to invest in expanding capacity. Some energy-intensive industries also have the capacity to switch off or highly reduce their consumption when needed to support load balancing of the grid.

	Definition	Examples
1 Sustainable Industrial Parks	• **Concentrating green & sustainable businesses in a specific area** to increase energy demand in a cluster – including **data centres**, which have high energy requirements	• Africa already has numerous examples of SIP like **Hawassa Industrial Park** (Ethiopia), **Green Heart of Kenya**, (Kenya), and **Epping Industria** (South Africa). Data Centres such as the **Microsoft Data Centres** in South Africa
2 Emerging Climate Technologies	• Innovations that help to **address climate change and avoid emissions through new technologies** that store energy and/or CO_2 emissions using renewable power	• **E-transport:** vehicles that use electric batteries • **Green-Hydrogen & Ammonia:** using renewables to power electrolysis and split hydrogen for use as a fuel, or create ammonia for use as a fertiliser • **Direct Air Capture:** capturing CO_2 from the atmosphere and storing it in mineral form
3 Off-grid productive use	• **Productive use appliances** increase off-grid energy consumption **through enabling income-generating activities,** bringing revenue for users and encouraging further energy use	• "Productive use" is a broad category with diverse applications across **agricultural, industrial, commercial, and public sectors.** Examples include solar powered irrigation pumps, refrigeration units, sewing machines and carpentry tools
4 Anchor Clients for Clean Cooking	• Industrial agro-processing players **currently using non-renewable cooking fuels,** who could switch to using cleaner fuels, greening their operations and providing baseload demand for clean cooking providers	• There are many agro-processing companies on the continent, but **no known examples** of industry acting as an anchor client for clean cooking. Examples could include **factories that dry tea leaves or pre-cook beans and other staples**

Bankable demand can boost GDP, scale the potential of renewable energy, accelerate decarbonisation and increase SMEs productivity. For example, productive use appliances can provide livelihoods and income-enhancing opportunities for off-grid households across the continent, as well as supporting government's transformation agendas such as food security and employment. The total addressable market for three key applications – irrigation pumps, cooling & refrigeration and agro-processing – is USD 11 billion.[18]

However, there is little investment on the continent and a lack of understanding about applications in African markets. The range of applicable industries that can be used to create bankable demand for different types of energy supply are not well understood in the African context, particularly those that can serve to support grid load balancing. Newer industries, particularly in emerging climate technologies, are still in the early stages of development and adoption. Most research and development for these technologies has been invested by global players. There are few projects considering Africa as a potential location for testing and deployment. Creating large-scale bankable demand that can provide a viable energy base for supply is likely to require heavy upfront investment. A lack of contract assurance, confidence in geopolitical and macroeconomic security and ease of import and other regulations can disincentivise investment by both global and local players.

To promote the development of bankable energy demand, there is a need to map opportunities, engage with potential players and identify key mechanisms to attract them.

Map potential bankable demand	Engage potential players	Identify mechanisms
• Map **specific countries and regions** for the development of **sustainable industrial parks**, as well as possible private industry developers	• Engage with **governments** to understand the **political will to develop bankable demand**	• Identify the **necessary legislations and frameworks** needed, as well as the energy requirements for the private sector
• Identify key **emerging technologies** and the **requirements for development**, and identify key markets for implementation	• Engage with local **project developers** to understand **the regional viability** and requirements **from a business perspective**	• Understand the project development **timelines and financing** needed for implementation
• Identify **key agro-processing industries** that could switch to clean, renewable cooking fuels	• Engage with **global players** to understand their **appetite and key requirements for commencing operations**	• Work with governments to **create and adapt mechanisms** to attract new project developers

ACCELERATING VIABLE BUSINESSES

A centralised, utility-led energy system does not work for a renewable energy system or a 1.5°C pathway. Compared to other regions, Africa has a small legacy of '*Old energy systems*', with just 7% of the required renewable energy capacity existing today.[19] There is the potential to develop *'New energy systems'* based on diverse and decentralised sources, where off-grid and mini-grids connections are part of the solution.

	Old Energy Systems	New Energy Systems
Production	Few power plants with one major source (e.g. coal)	Many small producers with different sources (e.g. hydro, solar, wind)
Management	Centralised	Decentralised
Market dynamics	Utility led	Private sector led
Transmission	Based on large power lines and pipelines	Including small-scale transmission and regional supply compensation
Distribution	One way - from a power plant to a use	Both directions – From prosumers to other consumers
Consumers	Paying customers	"Prosumers" – Both produce and consume

However, there is a continuous narrative that fossil fuels and utilities are the preferred route for African systems. The demand for new generation capacity to meet access goals is causing many governments to opt for short-term, carbon-intensive solutions to the energy problem based on the argument that African countries did not contribute to historical emissions. The financial viability of investment in fossil fuel power plants is called into question as future high prices on carbon could cause the price of electricity from fossil fuels to rise, rendering such investments obsolete. If Africa continues on this path, it will be locked into a fossil fuel future and miss the opportunity to meet 1.5°C pathways with renewable energy. A shift to renewable energy will allow African countries to take advantage of their growing energy demand - a unique opportunity to power its economic development and demonstrate global leadership in the space.

Businesses can help create an innovative, diverse & decentralised and user-focused energy system – but need support from industry stakeholders across three levers listed in the section above: (i) deploying proven technologies, (ii) optimising last mile solutions, and (iii) unlocking carbon finance for cooking fuels.

Business incubators, accelerators and advisors can play a key role in building the renewable energy and climate technologies ecosystem, creating a pipeline of opportunities for investors and governments to work with towards 1.5°C pathways and 100% access goals.

Incubator	Scale-up supporter	Advisor
• Support renewable energy and emerging climate technology innovators to **develop their technologies targeted to the African context** • Help innovators to **build deployment strategies** to apply proven technologies in the continent • Improve the **incubation of optimal solution to reach different areas,** regardless of connection type (main grid, mini-grid, off-grid)	• Address the **technology "scaling gap"** and remaining technical risk of successful technologies • Translate the performance achieved at the lab-and bench-scale to **commercially viable versions of the technology** • Organise **competitions to support the most promising business cases** to deploy proven technologies building grid capacity, provide last mile solutions and emerging climate solutions for different contexts in Africa	• Advise innovators and business on different **strategies to improve their business model and profitability** (e.g. increasing the participation in carbon markets) • Outreach players providing access to modern energy cooking services to understand their **presence and main barriers to participate in carbon markets** • Help to **align players in the carbon market field** to improve the efficiency of the market in general, beyond cooking stoves

Africa can lead the world in deploying a just, clean energy system that meets access goals and aligns with a 1.5°C pathway

A fossil-fuel driven, centralised, utility-led energy system does not work for a renewable energy system and is incompatible with reaching net zero and a 1.5°C pathway. Yet there is a continuous narrative that fossil fuels and utilities are the preferred route for African systems in order to meet development goals. Continuing on this path will only lead to more emissions, more climate damage, and more stranded fossil fuel assets in future – ultimately putting development goals further out of reach.

The transition to net zero and building an innovative, diverse and decentralised and user-focused clean energy system renewables is a major opportunity for Africa. Africa has enough renewable energy to power the needs of the entire continent. Choosing a 1.5°C pathway is more cost-effective in the long run and technology costs are expected to continue to decline as new applications and innovations transform the global economy.

The private sector has a key role to play in deploying low-carbon infrastructure and new technologies that meet Africa's access goals for both large-scale on grid projects but also innovations that reach the last mile. Forward-thinking governments can facilitate this transition, helping to leapfrog legacy energy systems by outlining the path to a low-carbon future, setting the appropriate policy framework and attracting the right players and projects for deployment.

Achieving a 1.5°C pathway will enable Africa to demonstrate global leadership in the energy transition – broadening access with a just transition and increasing energy security whilst decreasing emissions. At the same time, a 1.5°C pathway will power economic development, build more robust economies and lead to the creation of green jobs and sustainable livelihoods.

The 1.5°C pathway outlined in this report is both feasible and affordable – but is just one part of the systems transition needed. Further research and analysis is needed into the outstanding levers not prioritised in this report. In particular, we need to build a better understanding of what a decarbonised, high access cooking sector looks like for Africa. A true 1.5°C pathway needs to include all sectors and all society in a **holistic and systems-wide transition to a just and low-carbon future.**

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