The African Continental Power Systems Masterplan

Synthesis Report – Quantifying the Transformative Value of a Continent-Wide Electricity Power Network

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Introduction

In 2018, the African Energy Ministers[1] from African Union (AU) Member States formulated an ambitious vision of a continent-wide, interconnected power system capable of addressing Africa's electricity challenges while aligning with overarching goals of universal access, integrated world-class infrastructure, trade promotion within the African Continental Free Trade Area (AfCFTA) framework, and sustainable development. This vision is in line with the principles embedded in the Pan-African vision and those endorsed by the AU Agenda 2063.

Foreseeing the establishment of a Single Electricity Market for Africa (AfSEM), the energy ministers proposed unifying the power system across 55 countries to serve more than 2 billion people – an undertaking that would position Africa as one of the world's largest electricity markets, deliver universal access, create new economic opportunities, and open avenues for trade partnerships with the European Union (EU) and the Middle East.

This ambition found validation in a 2019 Executive Council Decision during the AU Summit in Niamey (Niger), affirming the AU's commitment to a continental power system. To translate this vision into reality, the African Union Development Agency – New Partnership for Africa's Development (AUDA-NEPAD) was entrusted with the development of a Continental Masterplan (CMP) for electricity.

Fifty-four African countries have signed the Paris Agreement and submitted ambitious Intended Nationally Determined Contributions (INDCs). Global commitments to curb carbon emissions have influenced the international energy landscape, investor sentiments, financial accessibility, and national priorities. The CMP emerges as an opportunity to formulate a coherent continental development trajectory cognisant of climate commitments and sustainable development goals (SDGs).

Initiated in 2020 through collaborative efforts involving the African Union Commission (AUC), African Development Bank (AfDB), United Nations Economic Commission for Africa (UNECA), regional power pools[2], the EU, and other development partners, the CMP underwent a meticulous three-year planning process. This energy plan was ratified on 15 September 2023 – reaffirming Africa's commitment to sustainable and interconnected electricity solutions.

This briefing note encapsulates key outcomes and recommendations, offering insights into the comprehensive planning process and the extensive studies and scenario analyses that mapped the course to meeting the continent's power needs. It gives insight into the current status of the power system, forecasted demand, an assessment of available resources on the continent, suitable pathways for delivery of the plan, the contribution from across the continent, the investment requirements, and the infrastructure needed to enable the required energy flows and trade.

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1 *AU Specialised Technical Committee (STC) meeting on Infrastructure (Transport, Energy and Tourism) held in Nouakchott and Cairo in 2018 and 2019 respectively. The STC is a Ministerial decision-making organ of the African Union for the energy sector.*

2 *Five power pools are operational on the continent, each serving as specialised agency concerned with the development of regional power generation and grid interconnection for their regional economic community. The five power pools are: (i) the Central Africa Power Pool (CAPP), (ii) the Comité Maghrébin de l'Electricité (COMELEC) (iii) the Eastern Africa Power Pool (EAPP), (iv) the Southern Africa Power Pool (SAPP), and (v) the West Africa Power Pool (WAPP).*

Electricity Access Status and Challenges

Africa is the world's least electrified continent. An estimated 600 million people – approximately 43% – across the continent lack access to a modern form of electricity. Sub-Saharan Africa remains the worst affected with the largest share of the global population without electricity living here.

Energy poverty often prevails when people have access to electricity but are unable to afford full use of it. Statistics for the continent suggest that usage is suppressed with per capita consumption well below the global average of 3,000 kWh per person per year. At these usage levels, only basic needs such as lighting can be serviced. It does not support the use of appliances or equipment that would markedly improve the quality of living or comfort levels, nor could it support advanced economic activity or power productive uses. This deduction is confirmed by the average Gross Domestic Product (GDP) per capita for most African countries – again well below the global average. The continent's vulnerability to climate change and the limited capacity to mitigate the impact of climate-induced natural disasters exacerbate these difficulties.

These are the challenges the CMP sets out to address with a coordinated planning effort that could result in an efficient and cost-effective continent-wide, interconnected power system capable of transforming African economies.

Approach to Developing the CMP

The CMP was developed under the governance structure of AUDA-NEPAD (development agency), with direction from ministerial committees, to ensure political and technical alignment. Development spanned two phases and was implemented over several years.

The initial phase (CMP Phase I) was completed in 2020 with the delivery of a baseline study for power generation and transmission. The baseline study established common tools, methodologies, and a database of existing and planned electricity generation projects for the continent.

The second phase (CMP Phase II) started in 2021 and was structured into five parts with 13 distinct outputs or deliverables (refer to Figure 1). It built on the baseline study with modelling, analysis, and studies to synthesise the results into a comprehensive consolidated electricity masterplan for Africa.

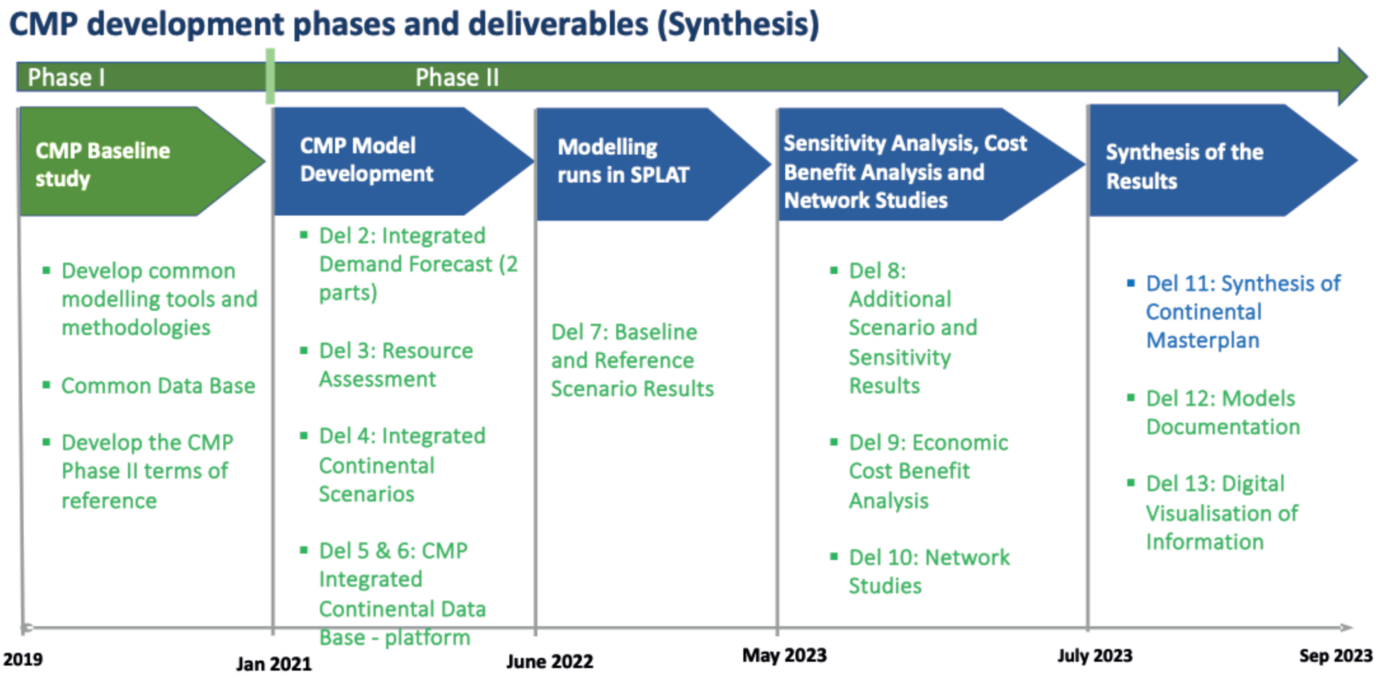
Two principles guided the development of the CMP:

1. A consultative and participatory approach. Active collaboration was deemed an essential requirement to ensure the CMP provides a relevant and realistic framework for electricity development. Thus, the consolidated perspective on electricity requirements and the pipeline of anticipated power projects were developed with the data collected and verified by the five regional power pools. The aggregated datasets were validated and refined during multiple engagements[3], providing a good level of confidence in the forecasts and expansion plans developed.
2. Expanding capacities for subsequent planning rounds. Internal capacities for modelling and forecasting tools are important for national, power pool, and continental planning to effectively respond to an ever-changing development and technology landscape. A prerequisite of the consultation process was to strengthen capacity for planning within national entities and power pools through training, workshops, and joint modelling.

All planning scenarios were focused on (i) the need for regional integration to facilitate the AfSEM and (ii) achieving universal access to a sustainable development path.

Initially, given the focus on an interconnected continental transmission system, priority was given

3 *Extensive consultation with the power pools included training and capacity building to grow the capacity within the power pools to use modelling and forecasting tools going forward.*



to utility-scale on-grid developments in preparing the continent-wide view. As planning progressed, the role of off-grid and mini-grids as part of the solution for achieving access and development was duly acknowledged and included in the CMP[4].

How much Electricity is needed?

Existing (baseline) plans expect the continent's electricity demand to grow from 878 TWh in 2021 to 2,368 TWh in 2040. This trajectory is based on historic growth trends and is aligned with the baseline demand forecasts contained in country documents and power pool masterplans.

Current planning does not solve the challenges of access and energy poverty (Figure 2). It will only deliver electricity to 82% of Africa's total population (2.03 billion) in 2040, making it insufficient for realising the aspirations of the AU Agenda 2063 and the energy access targets of the United Nations (UN) SDGs. At this level of access and consumption, the economies of most countries on the continent are expected to remain low or lower-middle income by 2040 (Figure 3).

Population without electricity access to 2040 in the reference case

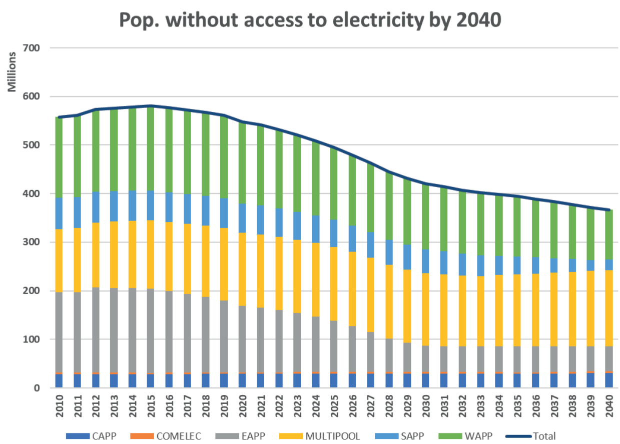


Figure 2: Anticipated change in electricity access per power pool achievable to 2040 with current planning

To satisfy the power requirements that could accelerate economic development and achieve universal energy access within the short- to medium-term, far greater investment in electricity

4 *The initial study boundaries excluded islanded countries and off-grid systems. Additional CMP demand scenarios included a high-level analysis of off-grid systems. The impact of these systems was measured by subtracting the demand allocated to them from the overall system demand to separate this from the interconnected grid demand.*

infrastructure is necessary. To more accurately determine how much electricity would be needed to successfully deliver these ambitions in the foreseeable future, three scenarios were modelled: high growth (achieving universal electricity access by 2030), medium growth (universal access by 2035), and low growth (universal access by 2040).

Electricity consumption vs GDP, 2040 in the reference case

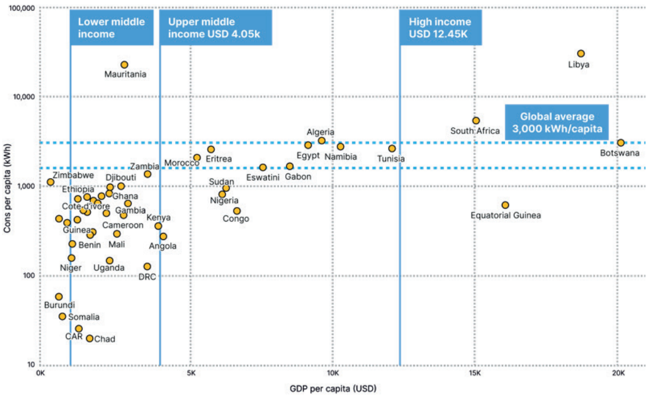


Figure 3: Anticipated change in per capita consumption and GDP by 2040 with current planning

The energy use and peak demand for each of the three scenarios, relative to 2021 levels, are shown below in Figure 4. It also shows the additional growth relative to the current planning, as projected by a CMP reference case and the power pool base case (both shown in orange).

To meet the more ambitious development goals for the continent, between 120 GW (low growth) and 280 GW (high growth) additional generation capacity will be needed by 2040, relative to the CMP reference case.

The electricity needed to power the most ambitious scenario – which would electrify all of Africa by 2030 and continue to drive economic development to 2040 – is almost five times what was consumed in 2021 (i.e. 4,283 TWh versus 878 TWh) and will have a peak demand more than four times higher than in 2021 (from 163 GW to 716 GW). When considering the increased requirements relative to current planning, as represented by the reference case (Figure 4), it is evident that existing plans fall significantly short of what is needed to unlock the continent's development goals, necessitating the realisation of the CMP.

Medium-Growth Case: Targeting Universal Electricity Access by 2035

The medium-growth scenario achieves universal electricity access in 2035 (Figure 5), five years later than the highest-growth scenario. While it does not meet the UN SDG7 target by 2030, it offers a realistic pathway for the continent and was selected as the basis for further analysis and integration planning for the CMP.

Figure 4: Electricity and peak demand relative to 2021 for different planning scenarios

In this more moderate-growth case, the continent would require 3,842 TWh of electricity by 2040

Population without electricity access to 2035 in the medium-growth case

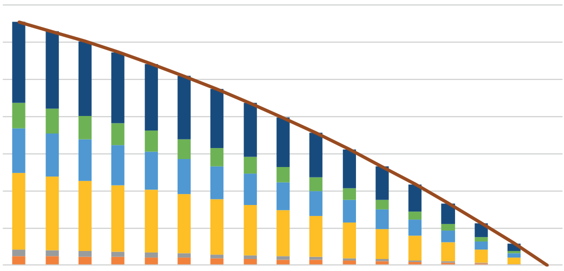


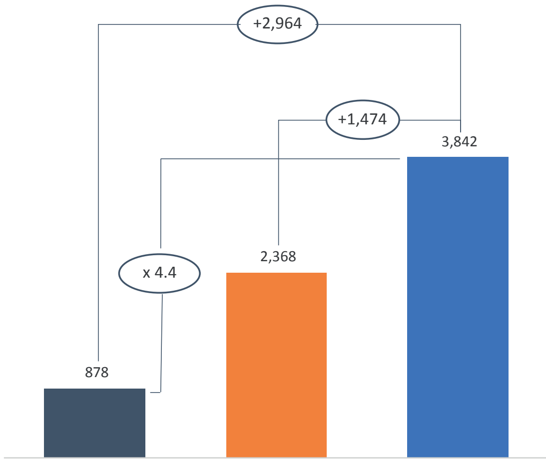
Figure 5: Anticipated change in electricity access per power pool to 2035 in the medium-growth scenario

with a peak demand of 634 GW. The reference and medium-growth cases are compared in Figure 6. Modelling showed that this electricity demand can best be met through a combination of on- and off-grid solutions. This approach has demonstrated tremendous potential to provide affordable, modern, and clean electricity to rural and remote communities. By 2040, mini-grid and off-grid solutions are expected to deliver 563 TWh, or 15%, of the power needs of the continent under the medium-growth scenario (refer to Figure 7).

This requires an increase in capacity that is nearly 100-fold the 6 TWh operational in 2021. Ethiopia and Tanzania are anticipated to lead the growth of the off-grid sector.

Expansion of national power grids remains the primary means of delivering electricity for the continent, meeting 3,280 TWh (85%) of the total electricity requirements under the medium-growth case in 2040. To achieve the goal of universal access by 2035, on-grid developments will have to ramp up to deliver 912 TWh more electricity than what is currently forecasted or planned under the reference case with a 60% increase[5].

East Africa is also expected to lead the on-grid development on the continent, outpacing development in other power pools and contributing almost 40% of the total demand in 2040 (refer to Figure 7).



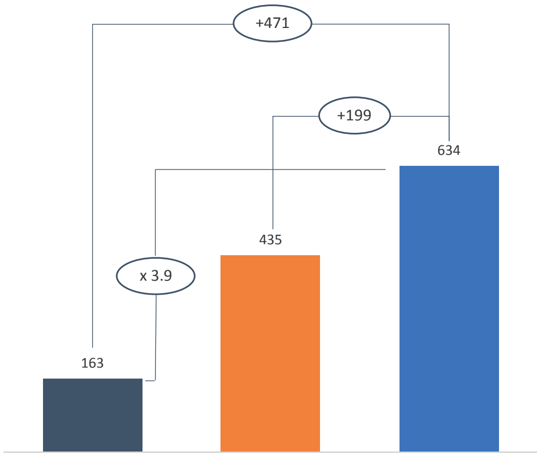


Figure 6: Medium-growth case electricity consumption and peak demand relative to 2021 and the CMP reference case

The structured planning approach revealed the need for substantial additional investment in generation capacity and infrastructure to enable the electricity-led economic transformation described by the AU Agenda 2063 and to achieve universal access to electricity in line with UN SDG7 targets.

5 *The reference case expects demand to grow by 1,490 TWh from the current 878 TWh. Another 912 TWh from on-grid sources requires a 60% increase in capacity in excess of the forecast for the reference case.*

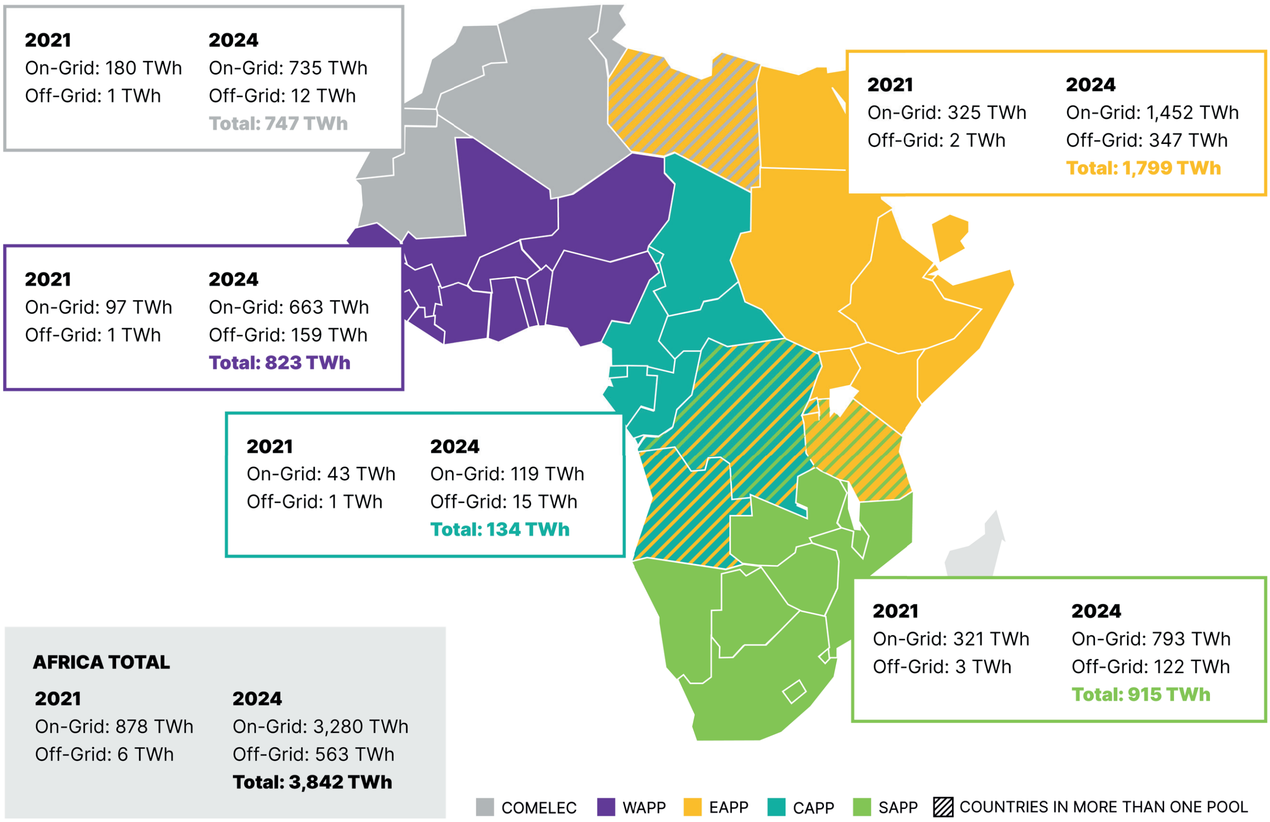


Figure 7: On- and off-grid contribution to the medium-growth scenario by 2040 across power pools

Approximately 200 GW of new generation capacity will be needed by 2040, capable of supplying 1,475 TWh more power than what is currently anticipated in the reference case. To meet this need, both on- and off-grid options (including mini-grids) must be part of the solution for Africa.

Does Africa Have Enough Resources to Meet this Need?

Through quantifying the scale of the future power demand, the CMP also assessed what energy resources are readily available to the continent and what combination of generation sources would best (and most affordably) meet the various growth paths. Africa has seen considerable growth in electricity capacity between 2010 and 2020; in this decade, generation capacity more than doubled from 100 GW to 230 GW, which corresponds with a compound annual growth rate (CAGR) of 9%. In comparison, the CAGR in the 20 years from 1990 to 2010 was 5.6% – a good growth phase relative to some earlier years. The exponential growth of the preceding three decades is evident in the gradient of the growth curve in Figure 8.

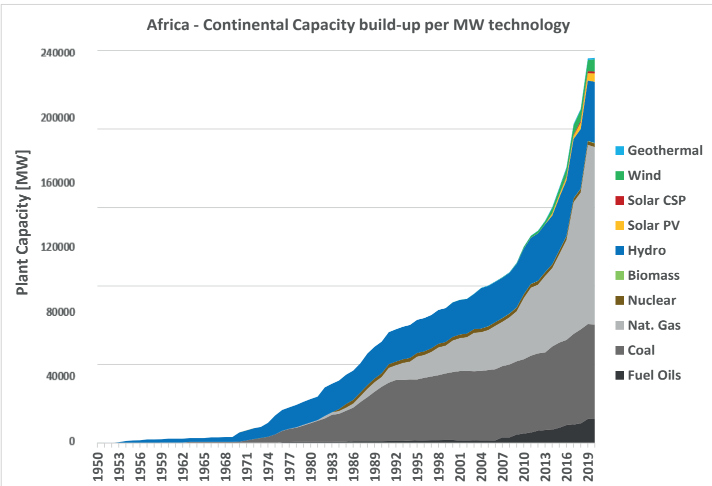
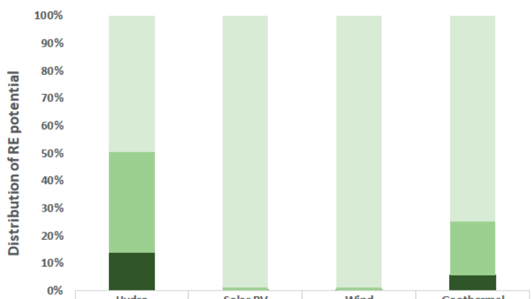


Figure 8: Africa's capacity growth per generation technology (1950–2023)

The generation fleet is also showing greater diversity. Solar photovoltaic (PV), Concentrated Solar Power (CSP), wind, and geothermal power appear in the electricity mix for the first time since 2010. Yet, greater diversification will be necessary to meet the NDC commitments and improve the resilience of the continent's power system.

The CMP assessments identified a range of readily available resources that is more than adequate to meet Africa's most ambitious development scenarios. It is known that the continent is rich in traditional fuels – including coal, oil, natural gas, uranium, and biomass. Additionally, Africa also has access to exceptional renewable resources that can be deployed to grow capacity, improve diversity, and support climate goals. Figure 9 shows the significant potential confirmed by the CMP for hydro, solar PV, wind, and geothermal power.

- At least 287 GW of hydropower potential is considered viable for development by 2040, which could deliver 45% of the peak demand of the medium-growth case.
- The assessment further revealed that Africa has barely tapped into its vast wind and solar resources. Together, wind and solar PV have the potential (7,500 GW) to meet the anticipated peak demand for the highest-growth case (716 GW) more than 10 times over. Currently, however, all planned solar and wind developments on the continent represent less than a quarter of a percent (0.24%) of their possible contribution.



	Hydro	Solar PV	Wind	Geothermal
Unexploited Potential by 2040 (MW)	142 741	4718 773	2743 599	12 496
Committed and Candidate Capacity by 2040 (MW)	104 936	42 130	25 960	3 270
Installed Capacity (MW)	39 720	9 600	8 150	934

Figure 9: Confirmed resource potential for renewable energy on the continent

- East Africa also offers sizable geothermal reserves, with the possibility to provide a consistent supply of electricity at a high-capacity factor to complement lower-cost variable renewable energy (VRE) resources such as wind and solar.

Such diverse and rich potential confirms that the continent has direct access to adequate resources to power its own development and growth objectives.

How or Where should these Resources be Developed?

The masterplan envisioned a continent-wide, interconnected power system to achieve the required electricity, economic development, and climate goals. Theoretically, interconnection can leverage the unique regional resources and the geographic range (seasonal and diurnal) to enhance system flexibility and resilience, which would be critical for both system stability and international trade.

To confirm this supposition, the impact and benefits of different levels of interconnection were evaluated for a baseline scenario, full regional integration, and full continental integration. The baseline scenario assumes integration at the levels currently being pursued. Full regional integration assumes the deliberate pursuit of integration within each power pool. The full continental scenario envisages comprehensive, continent-wide integration.

The baseline scenario only delivers on the current planning trajectory for the continent (i.e. the CMP reference case shown in Figure 4). Full integration was modelled to meet the medium-growth case that would enable universal electricity access to be achieved by 2035. The difference can be seen in the "sent out demand" in Figure 10. For a fair comparison, the baseline scenario was extrapolated as if to meet the medium-growth case when system costs and emissions are compared.

These key findings emerged from modelling the least-cost solutions for the different scenarios:

- All three scenarios demonstrated greater diversity in the electricity mix: hydro, VRE, energy storage, natural gas, coal, geothermal, and nuclear power all contribute to the three solutions.
- The least-cost solution for all scenarios incorporates a significant share of low-cost VRE, resulting in reduced carbon emissions for the continent.
- To meet the demand requirements of the medium-growth case, additional VRE capacity must be installed to mitigate variability (as seen in Figure 10). This additional capacity build is justified by the low cost of development and operation and the additional employment benefits offered by VRE.
- The use of renewable energy is optimised at higher levels of integration to achieve the lowest CO_2 emissions. Compared to a business-as-usual approach, this integration will generate only 60% of the resulting emissions.
- International and inter-regional trade is best supported by the regional and continental integration scenarios, with improved opportunities for trade when integration is continent-wide.

Despite the additional investment in transmission interconnectors, greater integration improves the value proposition to the continent as well as individual regions.

At a continental level, an estimated USD 1.32 trillion is needed to realise the desired growth through an integrated approach. This translates into an annual system operation cost of USD 0.079/kWh.
If the baseline scenario is extrapolated to match the electricity output of the medium-growth case in each power pool – and thus enable the same level of access and development – it will cost 47% (or USD 660 billion) more than the integrated approach. Operating a less integrated system also costs more, estimated to be around USD 0.084 for every kWh sent out.

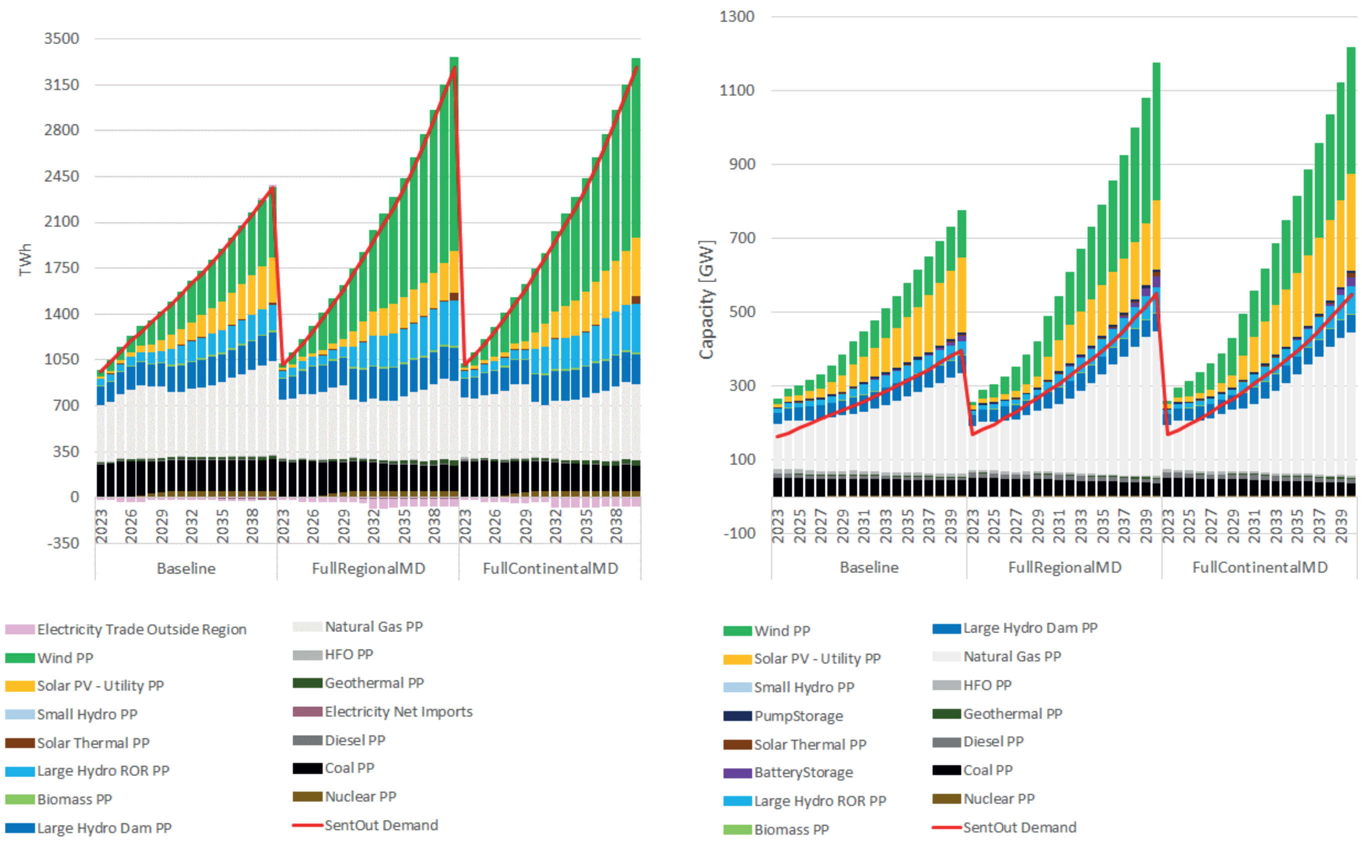


Figure 10: Electricity production and installed capacity for the baseline, full regional, and full continental scenarios (2023–2040)

The cost comparison at the continental level is shown in Table 1.

Table 1: Comparative investment and system costs for CMP scenarios (2040)

CMP Scenario	Investment cost (USD)	System costs (USD/kWh)
Baseline	777 billion	0.084
Full Regional	1.31 trillion	0.079
Full Continental	1.32 trillion	0.078
Baseline with demand corresponding to the medium-growth case	1.94 trillion	N/A

At a regional level, the same trend is observed, with system costs consistently lower when the region is part of a more integrated system.
The continental perspective is established by the modelling done at a regional level. Each region will participate uniquely in an integrated power system, adding a distinctive mix of resources and contributing to active trade in the market. The impact of accelerated growth will also vary across regions, with some regions having to double their planned development of generation and transmission infrastructure to meet the medium-demand growth objectives (refer to Figure 11).

This shortfall is most pronounced for regions where baseline planning is inadequate for the targeted growth or where the continent will rely heavily on exports from that region.

The Transmission Network is the Backbone of a Continent-Wide Power System

The network linking electricity resources and infrastructure across country and regional borders is the backbone of a continental power system. This enables national and regional surpluses and deficits to be leveraged through cross-border power exchanges and inter-power pool trade. It also allows localised resources to be shared across geographies (e.g. geothermal and hydro) and mitigates seasonal and diurnal variability of resources – such as stretching a solar day to 15 hours of productive sunlight. The network integration can leverage synergies between national and regional systems to diversify resources and demand patterns.

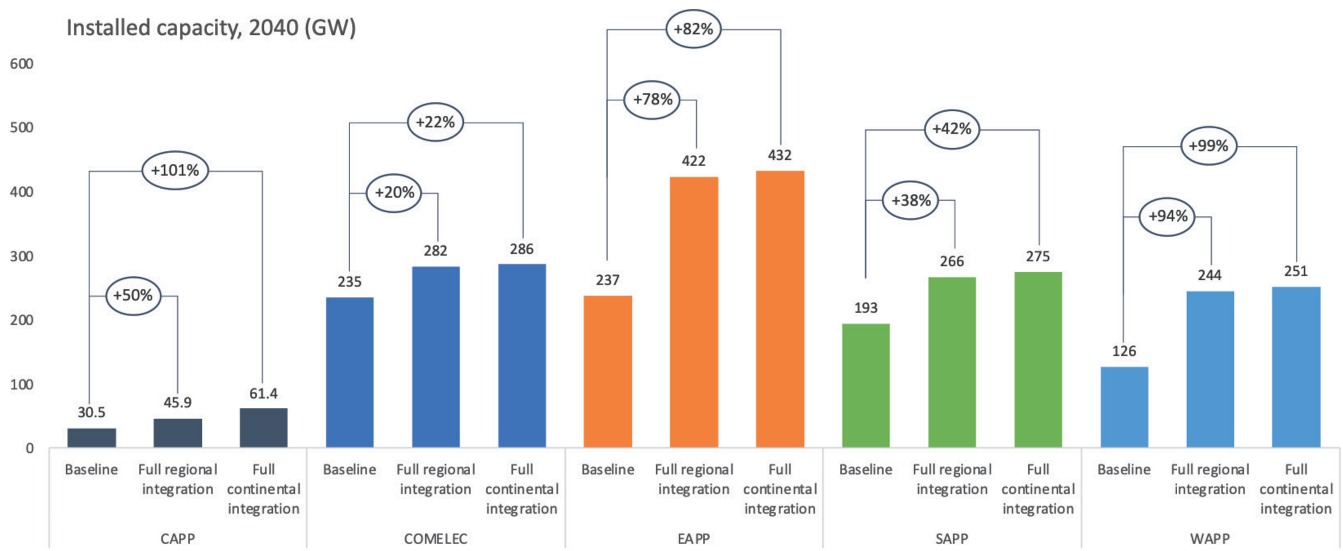


Figure 11: Capacity increases needed for each region to meet the medium-growth objectives through integration (2040)

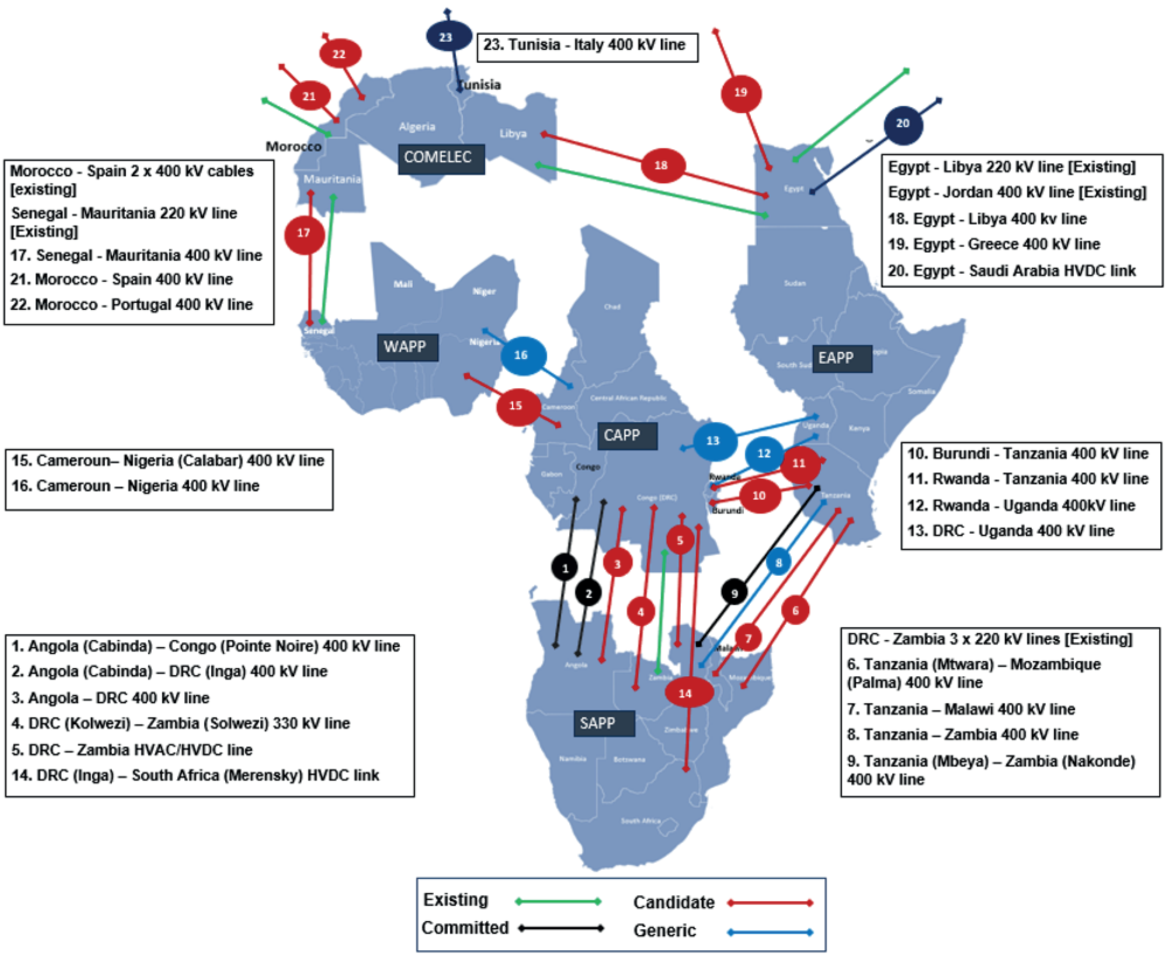


Figure 12: Inter-regional connectors foreseen by the CMP

Where “Candidate interconnectors” are those identified as existing specific projects, which can be implemented in the CMP planning horizon due to their maturity and/or proximity to secured financing, and “Generic interconnectors” refer to any other potential interconnection between neighbouring countries that are not yet site-specific.

The CMP simulated a progressive extension and strengthening of inter-regional connectors to deliver a comprehensively interconnected network by 2040. Figure 12 shows the extent of the network development necessary to facilitate the required energy flows.

These investments are already incorporated in the comparative costing (refer to Table 1) and are offset by the optimisation of the power system on a continental scale.

How much Electricity will be Traded?

Greater interconnection, as envisaged by AfSEM, offers immense technical and economic opportunities[6], while a fully integrated and competitive market will accelerate development and energy access across the continent.

Modelling reinforced this expectation, with trade at continental level[7] confined under the less-integrated

6 *Benefits include increased system reliability; access to more diverse generation resources; enhanced security of supply; improved system flexibility, redundancy, and resilience; reduced or deferred capital investments; diversified loads and improved load factors; and operational and maintenance efficiencies gains, among others.*

7 *This analysis focuses on continental trade and does not include trading outside the continent.*

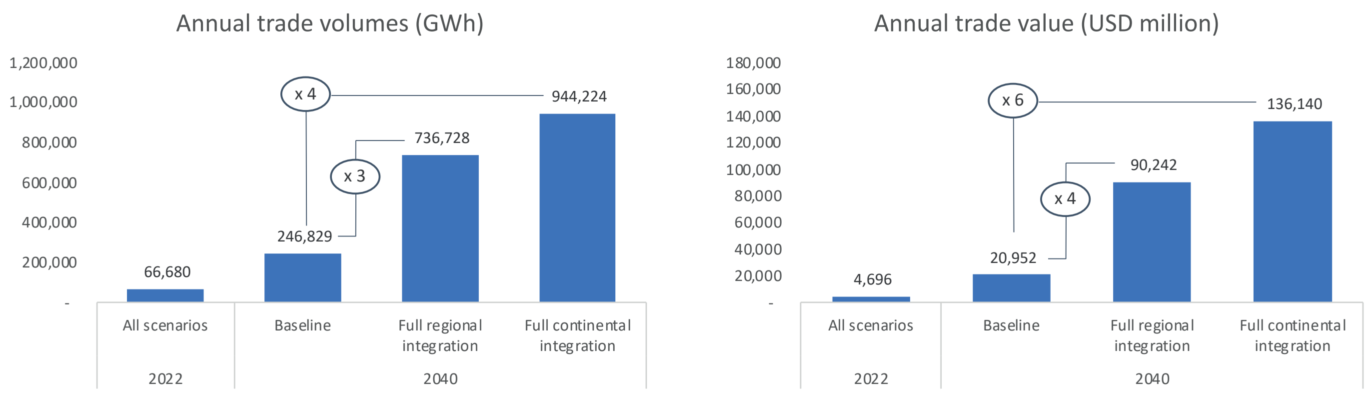


Figure 13: *Comparison of trade volumes and value for different scenarios (2040)*

baseline scenario when comparing the volumes and value of trade projected for 2040. The baseline scenario would realise only one-third of the trade volumes possible with full regional integration and a quarter of what can be achieved under full continental integration (refer to Figure 13). As expected, full continental integration enables the most active trading among countries and between regions, with current trade volumes (2022) increasing more than 14 times by 2040.

Trade value is expected to grow spontaneously under the baseline scenario to USD 20 billion per year. With enhanced integration, the value of trade can be multiplied at least four times to USD 90 billion and potentially reach USD 136 billion by 2040 if full continental integration is implemented. This would be nearly 30 times what was estimated in 2022.

These values consider only continental trade. However, the opportunity for trading extends beyond the borders of the continent, as illustrated by the mapping of trade pathways in Figure 14. Interconnection can support a vibrant market for electricity trading, offering significant business opportunities for producers, traders, and utilities.

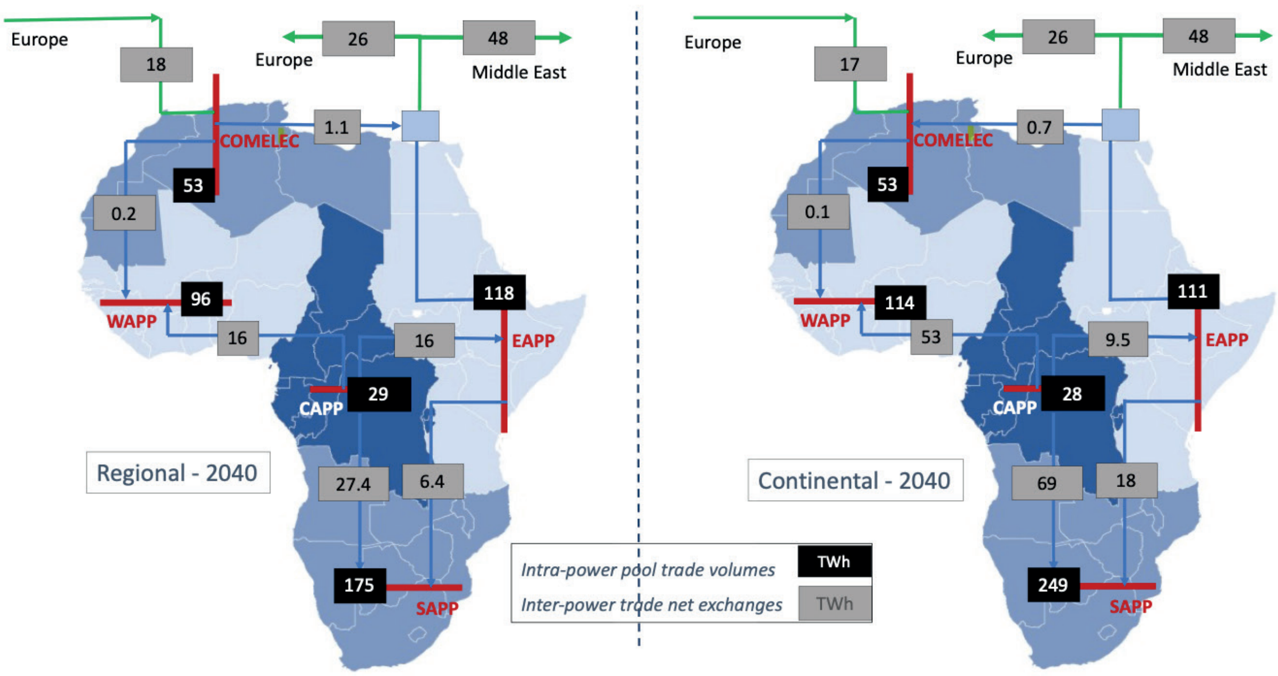


Figure 14: Intra- and inter-regional trade volumes (2040)

How Sensitive is the Planning to Changes in the Environment?

Several factors may materially influence the cost and composition of the CMP. The three most critical are:

1. The impact of a higher discount rate on the least-cost modelling. A 10% discount rate was used to develop the least-cost plans for the regions and the continent. Higher interest rates, higher inflation, higher risk associated with future cashflows, or a combination of these, would increase the discount rate and would adversely impact the overall cost of delivering electricity. At a 15% discount rate, each kWh sent out would cost consumers 5% more.

   It would also inform the choice of generation options for a least-cost solution, favouring investments with lower upfront costs, but higher operational costs; a higher discount rate would thus encourage more investment in coal and natural gas. At a 15% discount rate, the impact is observable but small as the total share of coal in the capacity mix increases by less than one percent.

2. Delay of key projects. The continental masterplan relies on defined regional contributions. For CAPP, this includes the Grand Inga: a key project for the Democratic Republic of Congo (DRC), the Central African region, and the continent. Delays in developing this important hydro plant will significantly reduce the share of hydropower in the electricity mix and shrink the electricity exports of the CAPP region. This will reduce the cost-effectiveness of the plan, increasing the system operating cost by USD 2 for every MWh sent out at the continental level. Coal and natural gas are the most likely alternative technologies, but these would also increase carbon emissions. A delay with Grand Inga is predicted to increase emissions and carbon intensity by 33%, threatening carbon commitments and sustainability goals.

3. Impact of droughts on hydropower production. Hydro facilities are vulnerable to extreme droughts. Several African countries have already experienced extended dry periods that have limited the electricity output from hydropower plants. Prolonged dry periods could prompt additional investment in wind, solar thermal, and coal power plants. This scenario may require fewer natural gas facilities and transmission interconnections, with more reliance on localised development. As with the delay in Grand Inga, less hydropower will increase the carbon intensity of electricity for the entire continent.

High cost of capital, delays with the development of Grand Inga, and extreme droughts are realistic risks that will require concerted, multi-pronged mitigation efforts from all stakeholders to deliver a robust, resilient, and cost-effective power system to Africa. These are the key ingredients for an affordable, secure electricity supply, without which the developmental objectives of the continent will remain improbable.

Conclusion and Recommendations

Agenda 2063 expressed[8] a commitment to realising inclusive and sustainable socio-economic development over a 50-year period. This future is founded on world-class infrastructure and electricity-led economic transformation. The establishment of a continent-wide electricity transmission network is central to this vision – a bold initiative that holds the key to unlocking unparalleled socio-economic benefits and sustainable development.

The structured planning approach of the CMP underlines the shortfalls of isolated planning: current development trajectories are inadequate to unlock the continent's growth potential and will only provide around a quarter of 2040 consumption and peak demand requirements. It also highlights the importance of coordinated and accelerated delivery of electricity infrastructure to support the desired development objectives.

Integration is necessary to facilitate the seamless movement of power across borders, enabling the optimisation of Africa's diverse energy resources and thus strengthening power system stability. Crucially, the transmission network allows the continent's abundant renewable energy resources to be harnessed more effectively. The efficient sharing of surplus renewable power across regions enhances the consistency of a clean energy supply while contributing significantly to global (and national) climate commitments and NDCs – positioning Africa as a leader in sustainable development. CMP modelling demonstrated 40% less emissions from an integrated power system.

The interconnected grid enhances energy security by diversifying resources and creating a robust infrastructure, reducing vulnerability to disruptions. It also delivers the power system more cost-effectively than isolated developments, requiring a USD 660 billion, or 32%, lower capital investment. The cost of electricity supply is similarly reduced, improving the affordability of delivering electricity to every African household.

Continent-wide integration will greatly enhance trade, within and between regions, as well as beyond the borders of the continent. Continental trade volumes were shown, in both investigated integration options, to increase three to four times relative to an organic growth rate. It also has the potential to grow the annual trade value to USD136 billion by 2040 (compared to ~USD 20 billion projected for business-as-usual).

Regional collaboration is key. The promised benefits of an integrated power system are unlocked through a collective commitment towards realising the investment requirements and mitigating the hurdles that would delay or hinder implementation.

The CMP planning underscored the significance of the direction set by the AU. It confirmed a coherent electricity development approach as the pathway for inclusive development, regional cooperation, and a sustainable energy future. It also reinforced the potential for addressing energy poverty by efficiently delivering power to underserved regions and catalysing economic growth by providing a reliable and cost-effective energy supply, fostering job creation, and attracting investment.

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8 Agenda 2063, Paragraph 72 (g). Energy: harnessing all African energy resources to ensure modern, efficient, reliable, cost-effective, renewable and environmentally friendly energy to all African households, businesses, industries and institutions, through building the national and regional energy pools and grids, and PIDA energy projects.

Comprehensive set of CMP documents / for further reading

This briefing note provides a summary of the extensive analysis that went into the development of the CMP. Additional detail per region and per topic is available for consideration at https://cmpmwanga.nepad.org. Additional material and comprehensive studies include:

Topic or scope	**Description**
Synthesis of the comprehensive CMP	A synthesis of the findings and outputs from all aspects of analysis and planning into a consolidated continental perspective. Deliverable 11 of the CMP outputs.
Network studies	An analysis of the required network expansion and interconnectors that would best support the delivery of secure, sustainable and affordable electricity to the continent. The analysis considers and recommends the timing of network development. Deliverable 10 of the CMP outputs.
Specific Support Studies to assess the availability and suitability of new energy resources: 1. Solar 2. Wind 3. Hydro Pumped Storage 4. Geothermal 5. Battery Energy Storage 6. Green Hydrogen	Detailed analysis of the resource potential and technical suitability of different energy sources to supplement and diversify generation capacity yon the continent. Additional deliverables developed in parallel and as input to the CMP planning approach. Summary reports and factsheets are also available for each of these specific support studies (refer to https://cmpmwanga.nepad.org/SSS)
Baseline and reference planning scenarios	Consolidation of current planning data and projections per region that informed the baseline and reference case scenarios for the CMP. Deliverable 7 of the CMP outputs.
Scenario development and sensitivity analysis	Assessing options for meeting the desired growth objectives for the continent through scenario modelling i.e. how to achieve the development and access goals within different timeframes and doing so with the most appropriate mix of resources. The development of the growth scenarios and analyses of sensitivities to external parameters is Deliverable 8 of the CMP outputs.

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