

Integrated Continental Planning Scenarios

The **Continental Power System Masterplan (CMP)** was initiated in 2019, following a decision of the African Energy Ministers to serve as a blueprint for the **African Single Electricity Market (AfSEM)**.

The integrated planning scenarios, developed with support from the European Union - Global Technical Assistance Facility (EU-GTAF), provide an outline of credible pathways of how the electricity sector in Africa will evolve in the next 20 years, considering the unique challenges and aspirations of each of Africa's five regions and guided by the continental aspirations espoused in the AU Agenda 2063 Goals.

The synergy and complementarity of the AfSEM and CMP assignments will ensure that efficient generation facilities and resilient electricity interconnections will support adequate and efficient market-based mechanisms for trading.

Integrated continental planning scenarios



OBJECTIVE

To provide a framework through which the available energy sources will meet the future electricity demand requirements at the national, regional and continental levels.

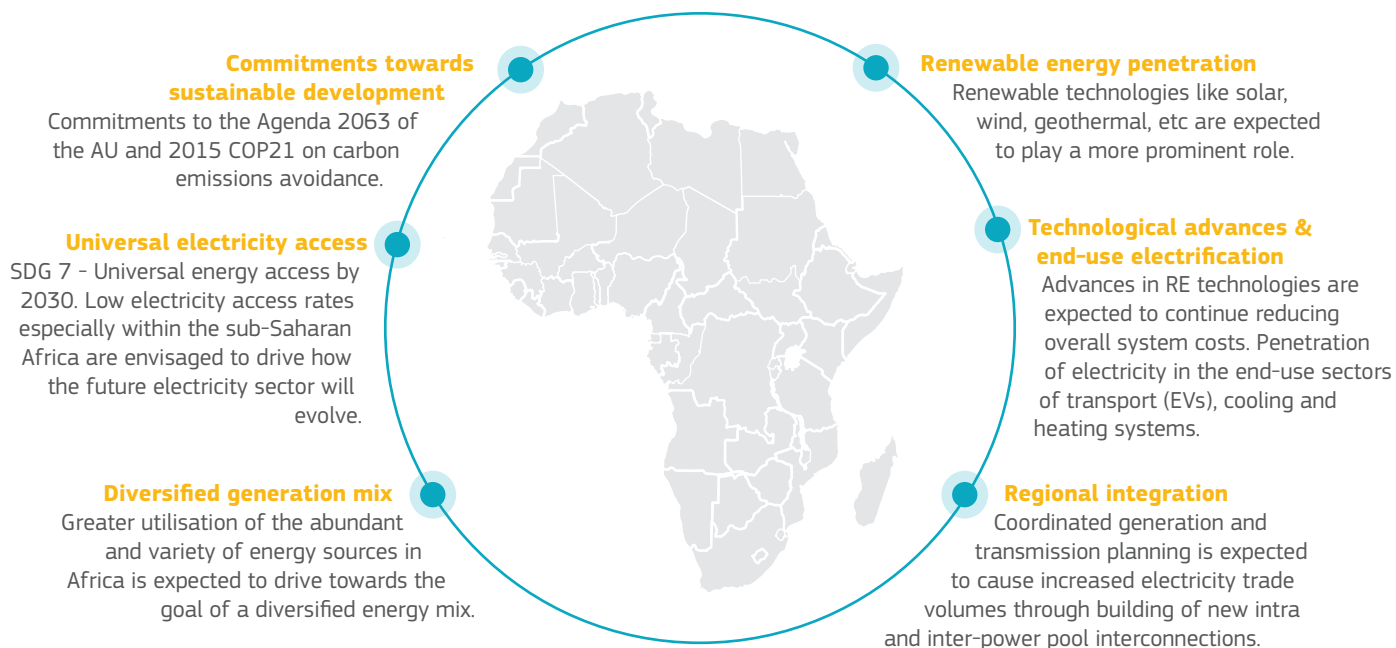


METHODOLOGY AND SCOPE

Expert analysis and stakeholder consultations with AUDA-NEPAD, Power Pools and their subcommittees, development partners and other key African institutions; Techno-economic data and assumptions.

Drivers of the future Africa electricity sector

The literature review and stakeholder consultations show the prevalence of recurring themes and key scenario drivers, which are summarized below.



Main drivers for the CMP

The CMP scenarios are built on two main drivers, which can have the largest impact on the African electricity sector.

1

Regional (intra/inter) integration (coordinated transmission & generation planning)

2

Universal access & sustainable development (SDG 7, Agenda 2063 of the AU)

• Universal electricity access and sustainable economic development

The UN SDG 7 of universal access by 2030 is an ambitious target that is aligned with Agenda 2063 of the AU. Low electricity access levels are still a major challenge in most of Sub-Saharan Africa and, to be able to accelerate electricity access, deliberate efforts through policy interventions should be considered and the investments required to achieve the set targets need to be determined. In the developed regions of Africa, increased electricity access is envisaged in transport (electric vehicles), heating and cooling systems. The AU Agenda 2063 aspires to facilitate electricity access through the creation of environmentally sustainable and climate-resilient economies that are supported by the sustainable exploitation of Africa's diverse and vast renewable energy resources.

• Regional integration through coordinated planning

Regional integration is the bedrock of a functional Africa Single Electricity Market and is aligned with the AU's vision of an integrated Africa where increased regional electricity trade enables the efficient utilisation of the continent's diverse and abundant resources regardless of their location. Regional integration can contribute significantly to energy security in the electricity sector by providing flexible support to interconnected networks in the event of sudden demand-supply imbalances.

The various combinations of the two key drivers provide insights into how energy security can be achieved within the Africa electricity sector.

Proposed scenarios

The CMP scenarios are an output of the key combinations between the demand-side and regional integration scenarios.

The **demand-side scenarios** include the reference (business as usual), low economic development, medium economic development and accelerated economic development scenarios.

The **regional integration scenarios** are based on how regional integration of transmission interconnectors is envisaged to evolve. The regional integration scenarios describe the level of integration of transmission interconnectors starting from low to full integration.

● Low regional integration

- Low intra-power pool interconnections are envisaged, but not yet new intra and inter-power pool interconnections.
- The scenario is based on interconnectors that are already built and committed within the latest regional power pool master plans.

● Full regional integration

- High intra-power pool interconnections are envisaged, but not yet new inter-power pool interconnections.

- New intra-power pool interconnectors in addition to those that are built and committed are included in an optimal manner in this scenario.

● Full continental integration

- High intra and inter-power pool interconnections are envisaged.
- New intra and inter-power pool interconnectors in addition to those that are built and committed are included in an optimal manner in this scenario.
- Fully continental integration is expected to result in additional cross-border interconnectors that will make it possible for countries to take advantage of complementarities between national systems, with surplus generation from one country and region offsetting deficits in another, by maximising on national and regional diversity in resources and demand.

Main scenario driver matrix table

Demand-side Scenarios	Regional integration scenarios		
	Low regional integration	Full regional integration	Full continental integration
Reference (Business as Usual)	*	*	
Low economic development	*	*	*
Medium economic development	*	*	*
Accelerated economic development	*	*	*

Key Messages

The current development trajectory of the African electricity sector is not yet conducive to the future aspirations outlined in the AU Agenda 2063. A paradigm shift is therefore imperative if the energy challenges in Africa are to be addressed.

The objectives of the integrated continental planning scenarios are to:

- Address the challenges and aspirations of the five regions in a way that maximises the economic use of available resources across the continent regardless of their location;
 - Meet the national government policy commitments & targets and align with the continental vision expressed in the Agenda 2063 of the AU;
 - Establish a basis for a just energy transition in Africa in alignment with the electricity sustainability goals set by international organisations such as the United Nations Sustainable Development Goals (SDGs) and 2015 Paris COP21 Agreement;
 - Establish the basis upon which the timing, sizing and location of the generation resources and the associated transmission interconnectors will be determined; and
- Identify generation technologies and transmission networks that should be implemented to meet the continent's development needs and determine their associated least-cost plans.

There are interdependencies amongst the various drivers, for example:

- Increased volumes of trade through intra and inter-regional interconnections are expected to result in accelerated and sustainable economic development while driving universal electricity access by transmitting energy from generation sources to load centres at affordable prices;
- Increased penetration of renewable energy has been identified as one of the key actions towards meeting the AU vision of achieving environmentally sustainable climate and resilient economies and communities in line with the Agenda 2063, UN SDGs and commitments of African governments towards NDCs; and
- Technological advances in renewable energy technologies that are causing a gradual reduction in overall system costs will drive increased penetration of renewable energy shares and result in a diversified generation mix thus enhancing electricity supply security.

