

# Economic Cost Benefit Analysis of Power Generation and Transmission Investments

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.



## OBJECTIVE

This deliverable aims to provide:

- Propose a methodology for the economic cost benefit analysis of the CMP generation and transmission projects
- Describe a methodology for Cross Border Cost Allocation in transmission projects
- Propose a set of criteria that can be used for the prioritisation of the CMP projects



## METHODOLOGY FOR ECONOMIC COST BENEFIT ANALYSIS

This analysis of costs and benefits for future generation and transmission projects centers around specific indicators, which are derived from information provided by the SPLAT-Africa / MESSAGE model and other global sources and assumptions:

Benefits based on:

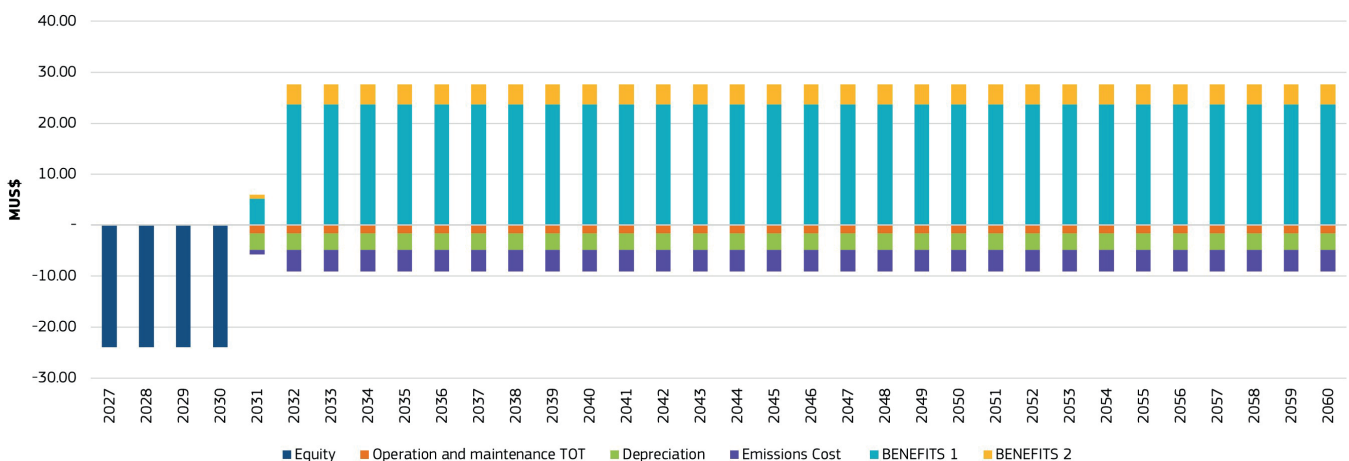
- Energy generated or transmitted
- Difference between end-use tariff and average cost of energy supply
- Difference between average cost of energy supply and cost of suppressed demand

Costs:

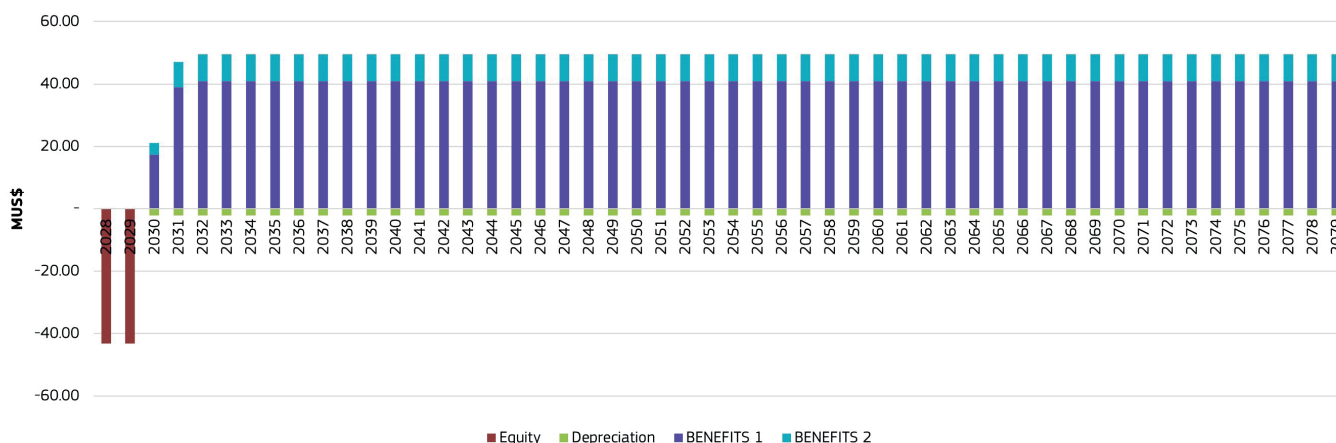
- Overnight investment costs (CAPEX)
- Operation and Maintenance costs (OPEX)
- CO2 emissions related costs

## Cashflows during the project lifetime

Cashflows during project lifetime – example generation project



### Cashflows during project lifetime – example transmission interconnection project



### Cross-border cost allocation for key transmission interconnections

In interconnected electricity systems, it is crucial to consider the potential impact on neighboring systems when building new transmission lines (cross-border or within national borders). The implementation of such projects can encounter obstacles if there is a negative net benefit for one or more countries involved. To address this, a Cross Border Cost Allocation (CBCA) framework can be employed, which takes into account a comprehensive analysis of the benefits and costs incurred by each country.

The CBCA will bring about transparency in benefits and cost allocation and is expected to alleviate any dis-incentives that may hinder the development of new transmission infrastructure. The aim is to compensate the negative net benefit of countries hosting a transmission project. The required compensation is allocated among countries exhibiting significant positive net benefits proportionately to the level of net benefits exceeding a significance threshold.

In the African context, where the cross-border interconnections are not yet strongly developed, CBCA should be based on the calculation of the national net impact applicable to each of the countries affected by the project, comprising three steps:

- (i) the analysis of costs,
- (ii) the analysis of benefits,
- (iii) the analysis of other cross-border monetary flows.

### Proposal for multi-criteria prioritization of generation and transmission investments

In addition to economic benefits, it is important to consider a range of other criteria when selecting priority projects. The aim is to choose projects that are both technically feasible and financially viable.

No.	Criteria
1	<b>Economic criteria:</b> High Internal Rate of Return or Benefit to Cost Ratio
2	<b>Financial criteria:</b> High track record of attracting private financing in the project location
3	<b>Security criteria:</b> High contribution to strengthening the security and stability of energy supply
4	<b>Development criteria:</b> Low AfDB Africa Infrastructure Development Index (AIDI) score
5	<b>Employment criteria:</b> High annual job creation per capital cost (as assessed through the PIDA Job Toolkit)
6	<b>Access criteria:</b> High contribution to increasing the level of energy access
7	<b>Corridor criteria:</b> High contribution to energy trade exchanges between countries and regions
8	<b>Climate criteria:</b> High Rio Marker and/or other climate impact
9	<b>Maturity criteria:</b> High maturity scale and quality of project preparation
10	<b>Smart criteria:</b> Display of innovative or technologically advanced features