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Africa Energy Security Index (AESI)



**BUILDING A RESILIENT AND
SECURE ENERGY FUTURE**



JOINT INITIATIVE

**Energy Security data webinar
9 October 2025
By Salome Maheya (SPO Energy Statistics)**

Mandate: Policy Decisions

12 May 2020: 1st Extra-Ordinary Session of the Bureau of the Specialized Technical Committee (STC) Sub Committee on Energy

28 - 30 June 2021: 3rd Ordinary Session of the STC

14 - 16 June 2022: 2nd Extra Ordinary Session of the STC

- Develop an **African Energy Security and Financing Plan** that promotes intra-African trade and increased African oil production; refining African crude oil in African refineries and pan-African storage and distribution infrastructure (ports, terminals, maritime transport, rail, etc.)
- Endorsed the **African Common Position on Energy Access and Transition**

12 - 15 September 2023: 4th Ordinary Session of the STC-TTIIIE

- The AUC, ECA, AUDA-NEPAD, AFREC, AfDB, Regional Power Pools (RPPs) and development partners to **develop a continental energy security policy framework**;
- And also develop an **Energy Security Index** and Dashboard to track advancements in achieving Africa's energy security.



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Securing Africa's Energy Future

Rising vulnerability from global fuel volatility, climate shocks, and infrastructure gaps.

Growing demand from rapid electrification and industrialization.

Need for reliable, timely, and interoperable energy security data.

AESI offers a continental approach to track and improve resilience.



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Development of the Continental Energy Security Policy Framework

- The overall objective of the energy security policy framework is to establish a continental guidance in support of member States' strategic decisions to **mitigate energy insecurity as it relates to bioenergy, electricity, and oil and gas**





Outline of the framework - Draft

1. Preamble, Executive Summary, High-level Policy Statements

- High-level policy statements, disclosure, statement from institutional leaders ...

2. Introduction

- What is energy security in the African context?
- Define energy security of biomass, electricity, oil & gas.
- Why an energy security policy framework? Why now?
- Framework development mandate, resolutions, request of member States
- Mission and vision
- Energy security initiatives of continental organizations, RECs, Power Pools, continental and regional associations and regulatory bodies, centers of excellence, member States
- Framework development process

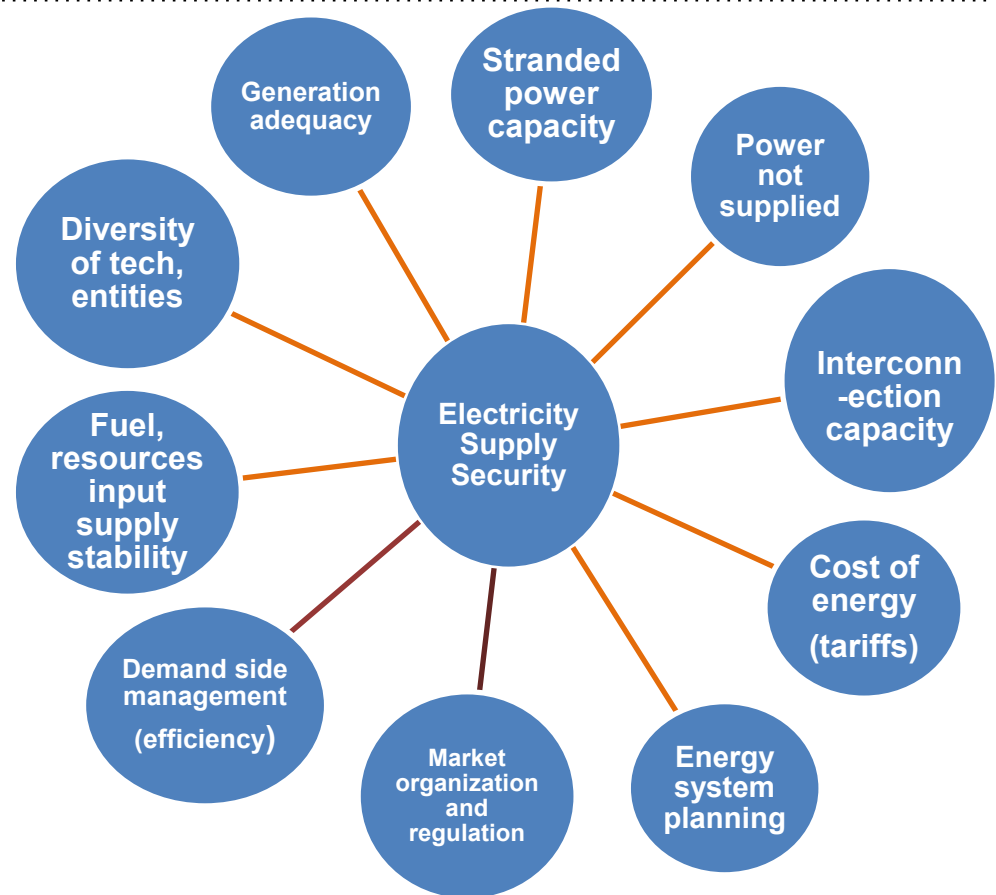
3. State of Africa's Energy Security (Biomass, Electricity, Oil, Gas) Supply Security

- What is the current state of energy supply and price trends in Africa/regions?
- Demand and supply conditions in energy markets in Africa
- Drivers of insecurity on demand and supply sides
- Value chain challenges and market organization
- Regional cases from member State's consultation – what are the challenges faced?
- What are the effects of those challenges today?
- Emerging issues affecting energy – climate, finance, regulation, technology ...
- Energy supply security risks and resilience factors

Outline of the framework - Draft

The State of Africa's Energy Security
Electricity Supply Security



- Drivers of insecurity on demand and supply sides



Outline of the framework - Draft

The State of Africa's Energy Security Electricity Supply Security

- Drivers of insecurity on demand and supply sides

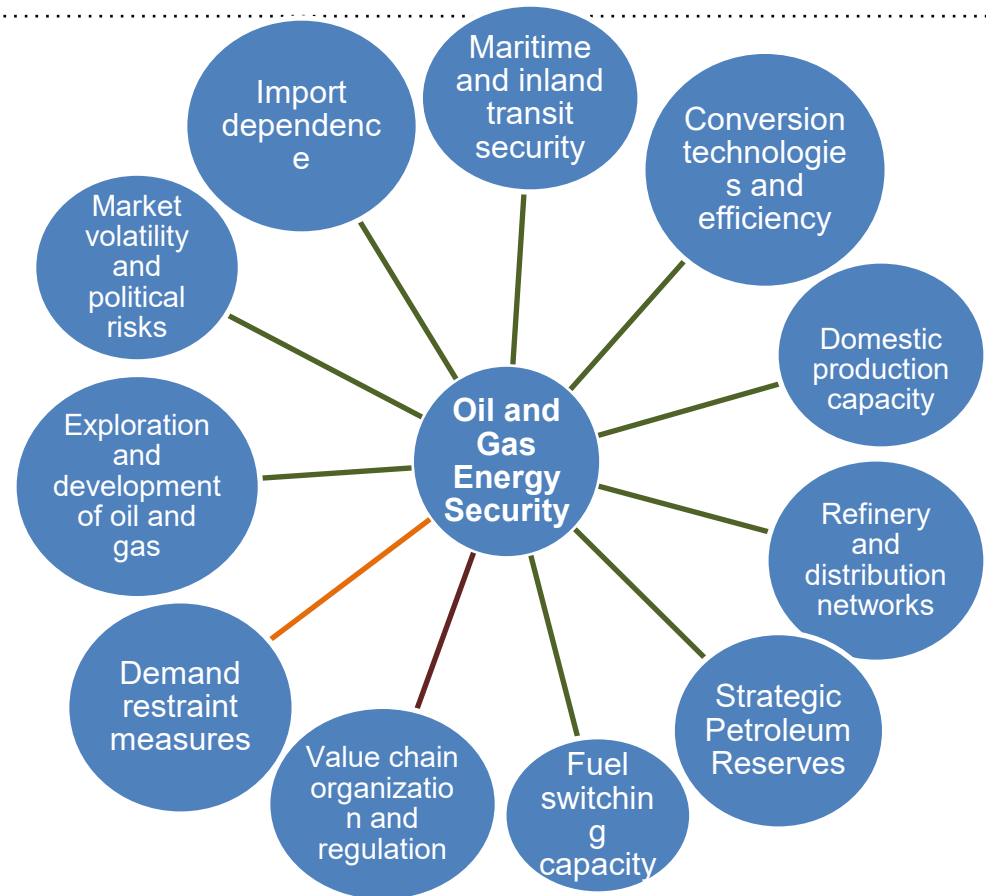
Security Factor	Indicators	Measurement	Monitoring and Evaluation	Risks	Resilience Building
Fuel, resources input supply stability 	Non-renewable fuel input (diesel, coal, gas, etc.) supply stability	Number of hours/year generation was reduced from average, or stopped, due to fuel input shortage	Assess the effect of input fuels on generation and compile periodic report	<ul style="list-style-type: none"> ▪ Limited/no national strategic reserve for fuels ▪ Limited/no power plant-level fuel stocking 	<ul style="list-style-type: none"> ▪ Institute national strategic reserve for fuels ▪ Establish plant level fuel stocking
	Renewable energy resource inputs (water, wind, etc.) supply stability	Number of hours/year generation was reduced from average, or stopped, due to fuel input shortage	Assess the effect of energy resource inputs on generation and compile report	<ul style="list-style-type: none"> ▪ Increased intermittency in renewable resources inputs ▪ Variance in hydro availability ▪ Climate change effects 	<ul style="list-style-type: none"> ▪ Strengthen hydro forecast and generation planning ▪ Manage intermittency through reliable base load
Diversity of tech and entities 	Diversity of generation technologies	Herfindahl diversity index of generation sources - measured as sum of generation share of each technology squared	Trace periodic changes in generation diversification	<ul style="list-style-type: none"> ▪ Continued reliance on hydro generation ▪ Limited generation technology diversification 	<ul style="list-style-type: none"> ▪ Prioritise generation diversification in planning ▪ Develop national atlas of energy resources and their power output potential
	Diversity of generation players	Herfindahl diversity index of generation players - measured as sum of generation share of each generation company squared	Update national database on the number of players	<ul style="list-style-type: none"> ▪ Small scale development of renewable energy resources ▪ Participation of few players in generation 	<ul style="list-style-type: none"> ▪ Enable participation of the private sector in generation ▪ Establish grid accessibility through FIT and, where appropriate, net metering



Outline of the framework - Draft

The State of Africa's Energy Security Oil + Gas Supply Security

- Drivers of insecurity on demand and supply sides



Outline of the framework - Draft

**The State of Africa's Energy Security
Oil + Gas Supply Security**

- Drivers of insecurity on demand and supply sides

Security Factor	Indicators	Measurement	Risks	Resilience Building
 <p>Market volatility and political risks</p>	Oil price volatility in global markets	Quarterly variance of oil prices	<ul style="list-style-type: none"> ▪ Lack of action on changing prices and full exposure. ▪ Concentration of oil import countries 	<ul style="list-style-type: none"> ▪ For bulk procurement, provide participation in oil market hedging ▪ Diversify oil import countries
	Diversity of oil import countries	Herfindahl diversity index		
 <p>Import dependence</p>	Domestic petroleum products consumption met by imports	% consumed met by imports	<ul style="list-style-type: none"> ▪ Above 85% import share ▪ Total reliance on consumption on imports ▪ Exposure to external changes, such as prices 	<ul style="list-style-type: none"> ▪ Develop domestic bio-energy sources ▪ Diversify import sources ▪ Strengthen domestic strategic stocks build-up
	Domestic natural gas consumption met by imports	% consumed met by imports		
 <p>Maritime and inland transit security</p>	Maritime corridor security	Number of reported security incidents per year	<ul style="list-style-type: none"> ▪ Lack of storage capacity expansion relative to growing demand ▪ Lack of investment in port capacity expansion ▪ Evacuation inefficiency for unplanned reasons ▪ Interplay between electricity supply insecurity and evacuation performance ▪ Lack of addressing reported transit security incidents 	<ul style="list-style-type: none"> ▪ Expand storage capacity dynamically based on anticipated regional demand ▪ Improve on port services efficiency ▪ Address electricity outages impact on petroleum evacuation ▪ Share transit corridor security information in the region, and build law enforcement capacity to ensure secure transit passage ▪ Strengthen regional review of transit security
	Port handling and facilitation efficiency	Average delay time at ports and average demurrage costs		
	Port storage facility and evacuation	% deficit in storage capacity relative to total demand; % per month optimal evacuation could not be met for non-planned reasons		
	Inland transport corridor security	Number of reported security incidents per year		



Outline of the framework - Draft

6. Cross-Cutting and Emerging Issues and their Implications

- Generation, network and off-grid technologies and energy security
- Regional infrastructure integration, trade and energy security
- Cross-continental energy trade and energy security
- Energy transition, critical minerals and energy security
- Climate change and energy security
- Financing energy security
- Gender, social inclusion and energy security
- Energy information systems, AI, cyber security and energy security
- Peace, security, transit and energy security
- Partnerships for energy security



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Outline of the framework - Draft

7. Framework for strengthening continental energy security

- Strategic goals, actions & expected outcomes - bioenergy security
- Strategic goals, actions & expected outcomes - electricity security
- Strategic goals, actions & expected outcomes - oil and gas security









8. Monitoring and Evaluation Energy Security Index

- Monitoring approach for biomass supply security
- Monitoring approach on electricity supply security
- Monitoring approach for oil and gas supply security



Outline of the framework

8. Monitoring and Evaluation Energy Security Index

<p>Fuel, resources input, supply stability</p>	 <ul style="list-style-type: none"> Non-renewable fuel input (diesel, coal, gas, etc) supply stability Renewable energy resource inputs (water, wind, etc) supply stability <ul style="list-style-type: none"> Review the number of hours per year generation was reduced due to fuel inputs shortage Review the number of hours per year generation was reduced due to fuel inputs shortage 	<p>Diversity of tech and entities</p>	 <ul style="list-style-type: none"> Diversity of generation technologies Diversity of generation players <ul style="list-style-type: none"> Trace periodic changes in generation diversification Update national database on the number of players
<p>Generation adequacy</p>	 <ul style="list-style-type: none"> Generation spinning reserve Capacity to meet peak demand Unreserved energy need (cost of unreserved energy need) <ul style="list-style-type: none"> Compile data on reserve capacity and prepare report Review energy demand and supply conditions and evaluate trends Estimate and share the cost of unreserved energy 	<p>Stranded power capacity</p>	 <ul style="list-style-type: none"> Locked-in generation capacity not evacuated <ul style="list-style-type: none"> Conduct periodic review of stranded power capacity and share analysis
<p>Energy not supplied</p>	 <ul style="list-style-type: none"> Integrated system power loss <ul style="list-style-type: none"> Compile data and analyse trends in integrated system power loss 	<p>Interconnection capacity</p>	 <ul style="list-style-type: none"> Availability of cross-border(s) interconnection Power import/export capacity of interconnection <ul style="list-style-type: none"> Review the number and capacity of interconnections Review the import / export capacity of interconnections
<p>Cost of energy</p>	 <ul style="list-style-type: none"> Cost of energy for end users True cost of energy <ul style="list-style-type: none"> Review regulator decision on tariffs by end user Generate information on the true cost of energy 	<p>Energy system planning capacity</p>	 <ul style="list-style-type: none"> Duration of energy system planning Institutional capacity - human capital Institutional capacity - planning tools and utilization <ul style="list-style-type: none"> Review energy system planning cycles and delays Review human capital with planning skills Compile information on the planning methods used and the tools employed

Outline of the framework

9. Institutional Framework

- Governance of energy supply security and its impacts
- Industry best practices and institutional approaches to energy security management
- Inter-institutional approach for coordination, decision making and management
- Institutional framework for monitoring and evaluation
- Continental and regional coordination and cooperation framework



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Why an Energy Security Index?

Global definitions of energy security overlook Africa's realities.

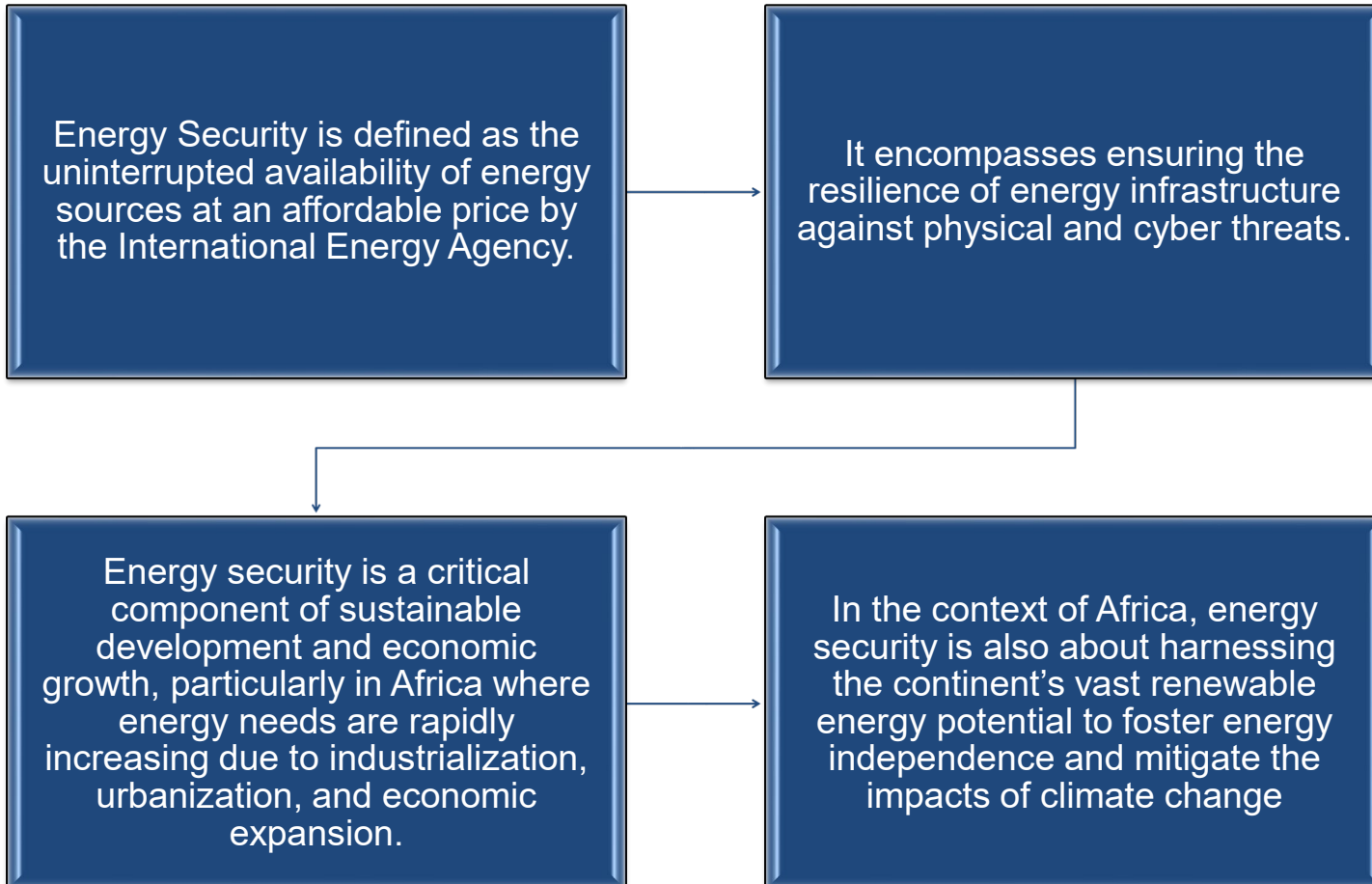
Africa needs a contextual framework combining security, access, and affordability.

AESI will:

- Identify vulnerabilities and resilience factors.
- Enable early-warning and policy intervention.
- Support Agenda 2063 and AfCFTA objectives.



Defining Energy Security Index





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Dimensions of Energy Security

1. Availability –
Reliable supply,
domestic
capacity.

2. Accessibility –
Physical &
geographic
energy access.

3. Affordability
– Energy cost
vs. income.

4. Sustainability
& Resilience –
Environmental
integrity &
system
adaptability.



ESI COMPONENTS

Components	Quantitative Assessment	ESIs
Development of domestic resources	1. Self-sufficiency resources	1-1. TPES self-sufficiency ratio (including nuclear) 1-2. Reserve/production ratio 1-3. Reserve/consumption ratio
Acquisition of overseas resources	2. Diversification of import source countries 3. Diversification of energysources 4. Dependence on Middle East	2. Diversity of import source countries (oil, gas and coal) 3. Diversity of energysources of TPES / electricity 4. Middle East dependence for oil and gas
Transportation risk	management	-
Securing a reliable domestic supply chain	5-1. Reliability of energy supply 5-2. Build supply infrastructure	5-1-1. Reserve margin of generation capacity 5-1-2. Power outage frequency / duration 5-2. Commercial energy access ratio
Management of demand	6. Energy efficiency	6-1. TPES/GDP ratio 6-2. TFEC/GDP ratio
Preparedness for supply disruptions	7. Strategic reserves	7. Days of on-land oil stocks
Environmental sustainability	8. CO ₂ intensity	8-1. CO ₂ emissions/TPES ratio 8-2. CO ₂ emissions/Fossil fuel ratio 8-3. CO ₂ emissions/GDP ratio 8-4. CO ₂ emissions/Capita



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AFREC–AUDA-NEPAD Partnership

AFREC: Continental mandate for energy data and policy coordination.



AUDA-NEPAD: Expertise in indicator frameworks, integration, and monitoring.



Alignment with:

- African Energy Information System (AEIS)

- PIDA and CMP frameworks

- AU Agenda 2063 targets.



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From Concept to Measurement



1. Scoping &
Conceptual Design



2. Stakeholder
Consultations



3. Indicator
Selection &
Weighting



4. Pilot Testing



5. Integration into
AEIS



How We Measure Energy Security



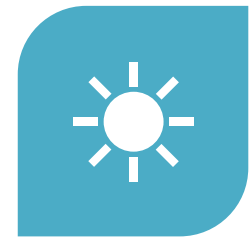
AVAILABILITY: IMPORT
DEPENDENCY RATIO;
GENERATION ADEQUACY



ACCESSIBILITY: ELECTRICITY
& CLEAN COOKING ACCESS
RATES



AFFORDABILITY:
HOUSEHOLD ENERGY
EXPENDITURE SHARE

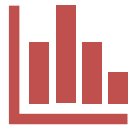


RESILIENCE: RENEWABLE
SHARE; FUEL MIX DIVERSITY;
STORAGE CAPACITY.



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Building on AFREC's Data Infrastructure



Data sourced from AFREC Annual Energy Statistics Questionnaire (AESQ) and energy balances.



Complemented by socio-economic, climate, and geospatial datasets.



Standardized methodology for comparability and transparency.



Output: Interactive online dashboard for policymakers.



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Deliverables and Outputs

1. Africa Energy Security Index Report

2. Country and Regional Profiles

3. Interactive Dashboard Tools

4. Policy Briefs & Training Materials

5. Integration with AU frameworks (Agenda 2063, CMP, SDGs)



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From Data to Policy Impact



Evidence base for national energy planning and investment prioritization.



Strengthens regional coordination across power pools and corridors.



Supports early-warning and crisis response (supply, price, access).



Empowers data-driven policymaking across Member States.

Thank You



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Merci