

RES4Africa Foundation Knowledge Platform

The challenge of the future energy system and market designs to allow efficient integration of intermittent energy generation

AFRY Management Consulting

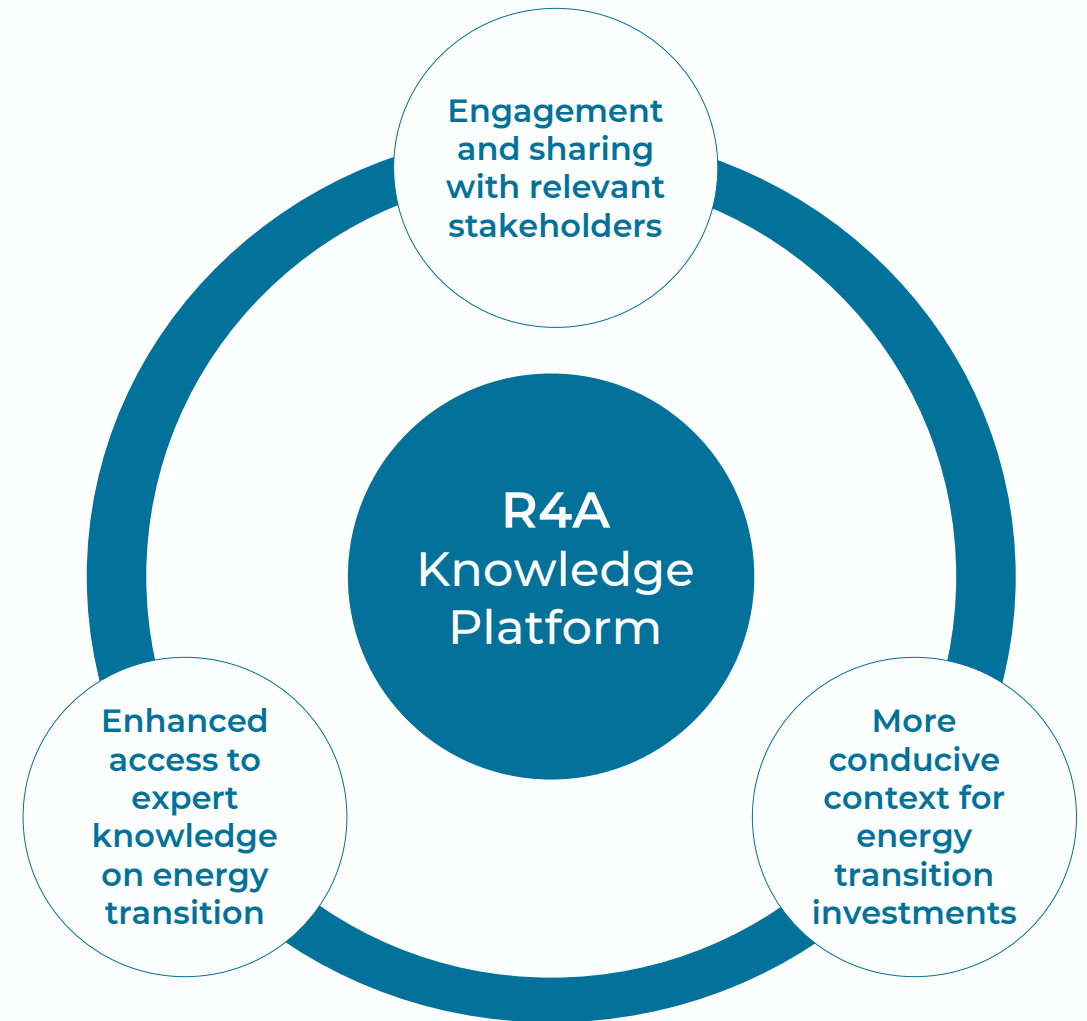


The RES4Africa Knowledge Platform offers a set of content-driven, technical-functional training

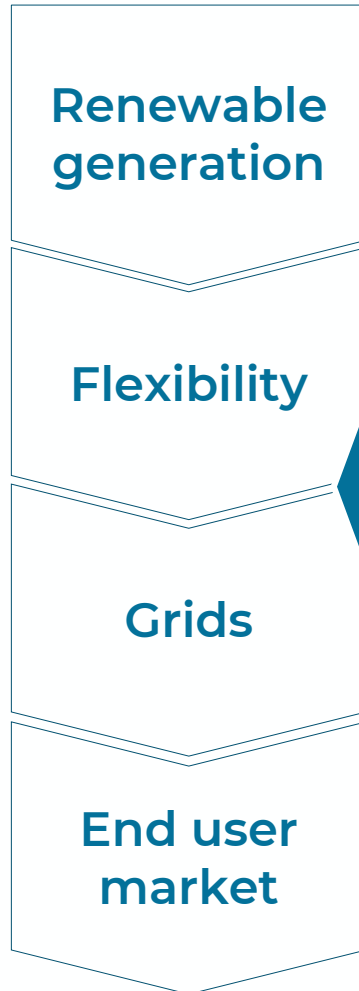
The aim of the **RES4Africa Knowledge Platform** is to establish a public platform of technical training content, usable by third parties in accordance with the Foundation's core principles of a think tank and open hub for knowledge sharing.

The purpose of the Platform is to **offer a set of technical-functional content**, organized in sharp modules covering renewable energy and more in general the key topics part of the energy transition.

The modules will be also delivered to on-request **professionals of the energy sector** (e.g., Energy Ministries, Regulatory Authority, vertically integrated incumbents, Associations, other relevant parties).



The Platform covers all the key areas of energy transition, with a comprehensive perspective across the value chain



The Platform covers the following thematic areas:

Technologies: a comprehensive understanding of different technological options and features / potential is a pre-requisite for a successful planning and implementation of fully functioning energy systems

Policies and regulations: must go hand in hand with measures ensuring that industrial and other economic capabilities are aligned with sustainable development and climate priorities

Access to market: Successful deployment of RES and flexibility technologies depends on how effectively MWh produced can be sold on the market and to what extent risk is properly hedged

Permitting: one of the key hurdles that developers face, especially for utility-scale RES projects. Key common issues can be identified, and proper management principles can be set up

Financing: bankability is one of the highest impact factors to ensure that utility-scale RES projects are successfully deployed. Compliance with requirements from international funding entities is fundamental

Operation: considering the level of maturity reached by RES technologies, a significant share of the value that can be extracted by RES projects stems from an advanced asset management approach

Sustainability: is progressively becoming a top priority for investors and energy industry stakeholders in assessing investment opportunities. A more comprehensive evaluation approach must be adopted

A market design tailor-made on Africa's specific needs and characteristics

The Platform covers the following thematic areas:

Technologies

Policies and regulations

Access to market

Permitting

Financing

Operation

Sustainability



The challenge of the future energy system and market designs to allow efficient integration of intermittent energy generation

What is the context: despite limited RES development so far (3%), Africa has the potential to lead the way to the green transition, but a RES-driven system generation will have to cope with mismatch between “where” and “when” energy is produced and consumed. Flexibility needs will increase, and a new demand will emerge beyond ancillary services on longer time frames

Why is this relevant: Africa can leverage on experiences of developed markets and implement a market design tailor-made on its specific needs and characteristics

What are the key questions:

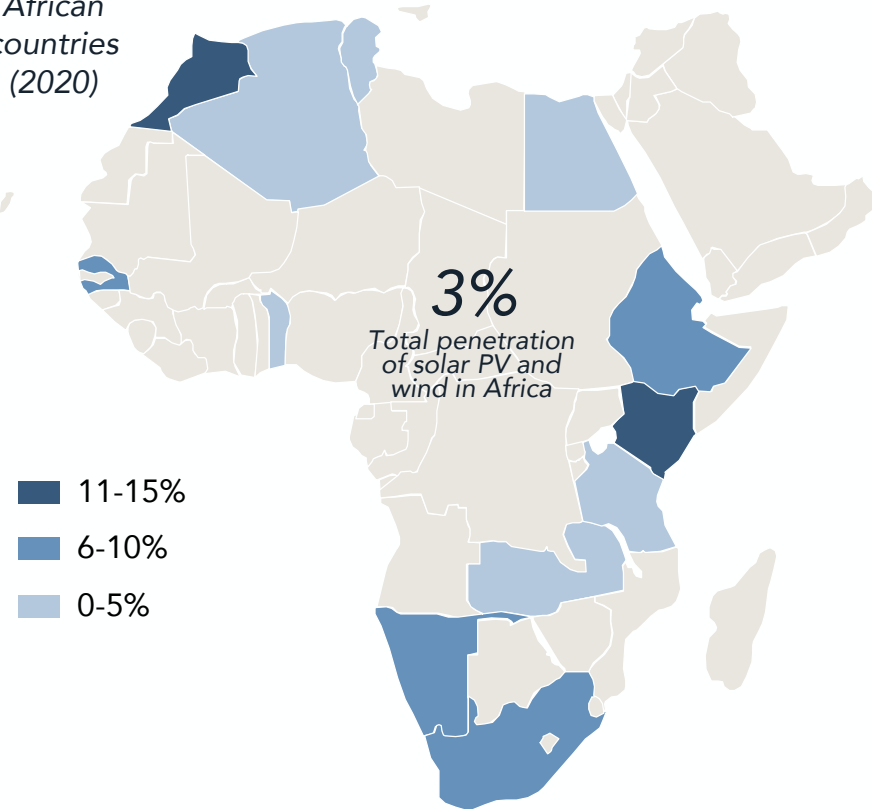
- What are the main trends in the energy markets?
- How are energy markets likely to be structured in the future?
- What are the main challenges and opportunities associated to such changes?

Despite limited RES development so far (3%), Africa has the potential to lead the way to the green transition

SOLAR AND WIND ON GENERATION MIX

% on total country generation

Selected
African
countries
(2020)



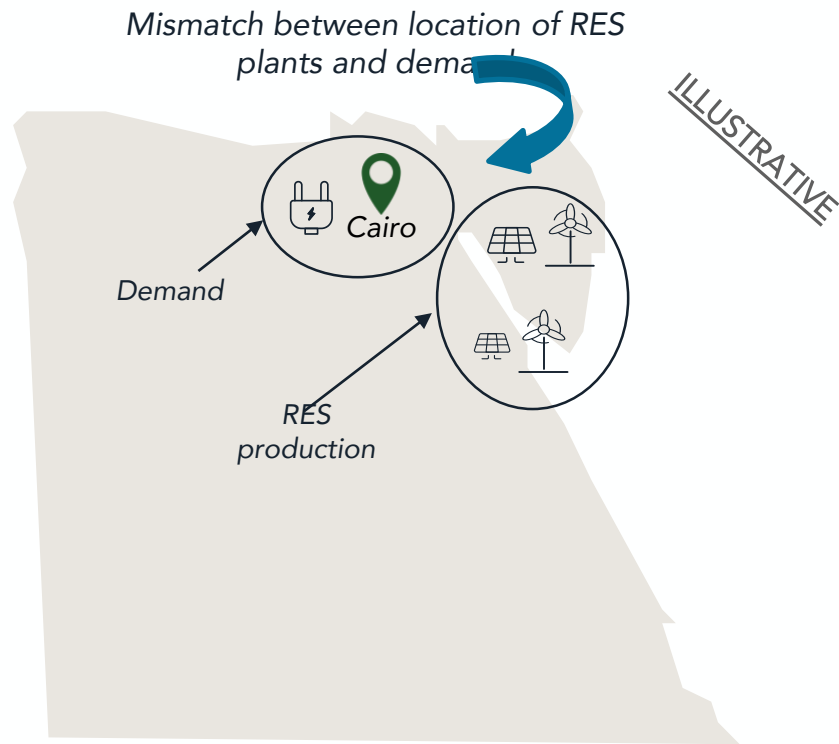
KEY DATA ON AFRICAN GREEN TRANSITION

- Africa has a huge domestic potential for renewables but, while there are differences among countries, the total penetration of solar PV and wind in 2020 accounted to 3%
- Morocco and Kenya registered the higher, but still limited, penetration of solar PV and wind in the generation mix, ranging from 11-15%
- In 2020 fossil fuels accounted 81% of the total resources in Africa
- Hydropower covered almost entirely the remaining share of flexible resources (16%)
- Storages and H2 electrolyzers in bundle with RES would help addressing the time-shift challenge

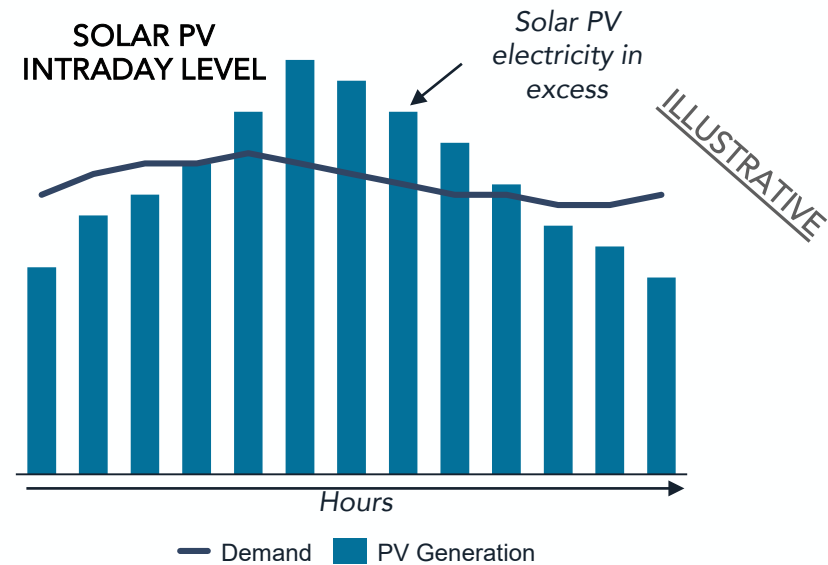
...but a RES-driven system generation will have to cope with mismatch between “where” and “when” energy is produced and consumed

THE “WHERE” CHALLENGE

AN EXAMPLE OF EGYPT

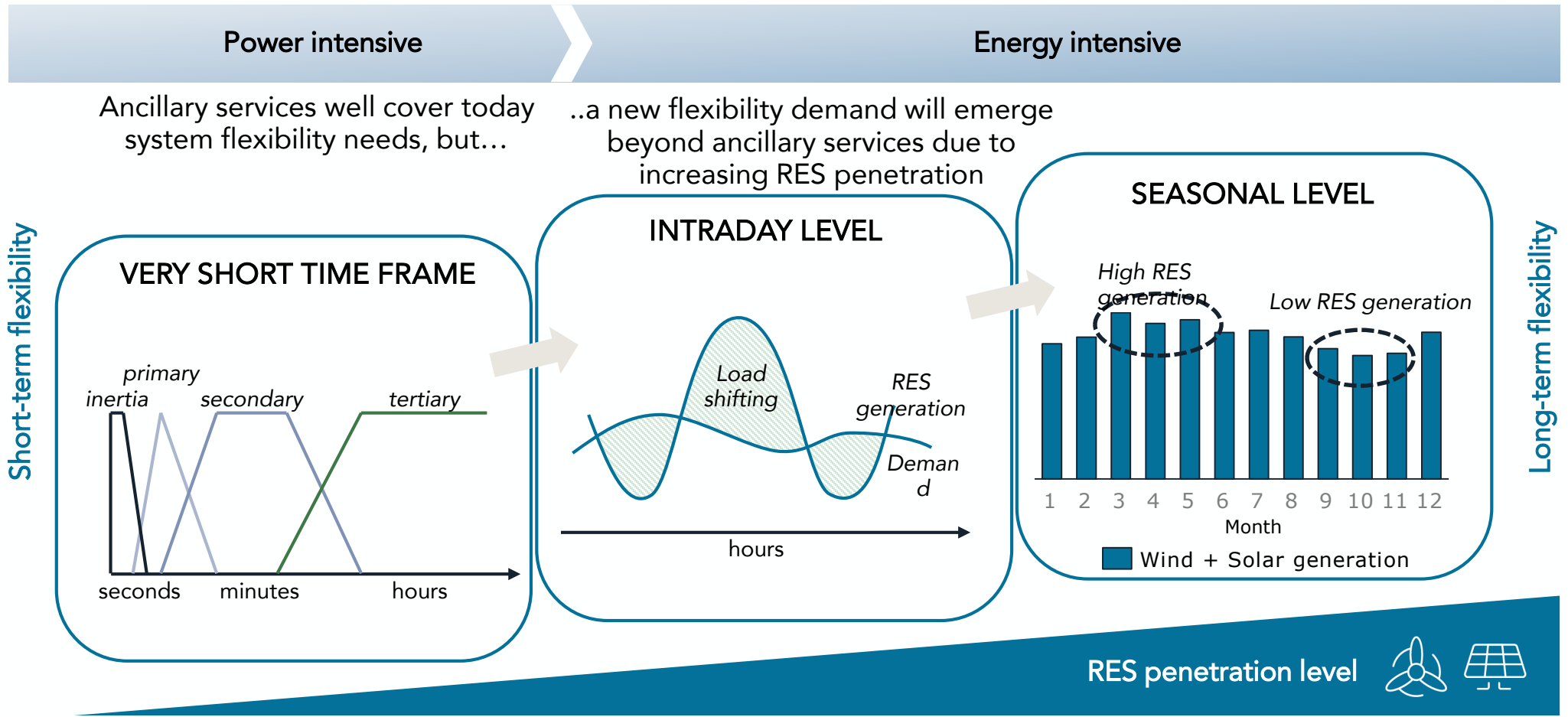


THE “WHEN” CHALLENGE



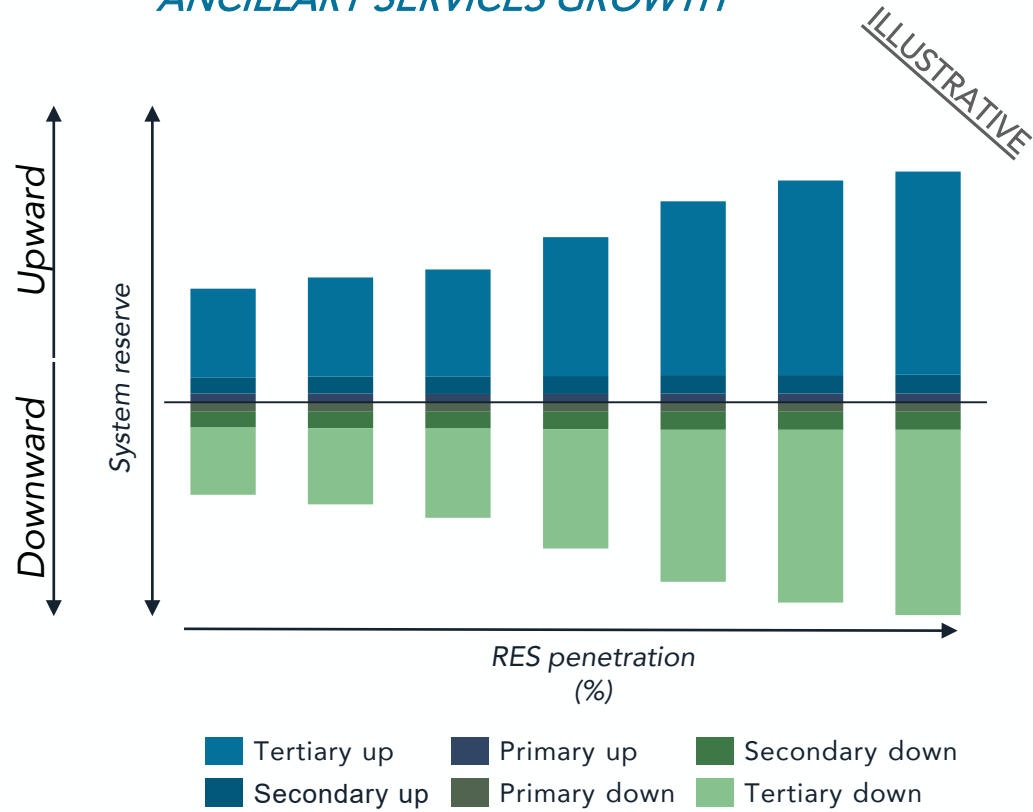
- The deployment of intermittent RES brings the need to manage the daily mismatch between production and consumption of electricity
- Solar PV producers, as well as producers of other intermittent technologies, together with grid and network stakeholders will have to address the time-shift challenge

Flexibility needs will increase, and a new demand will emerge beyond ancillary services on longer time frames

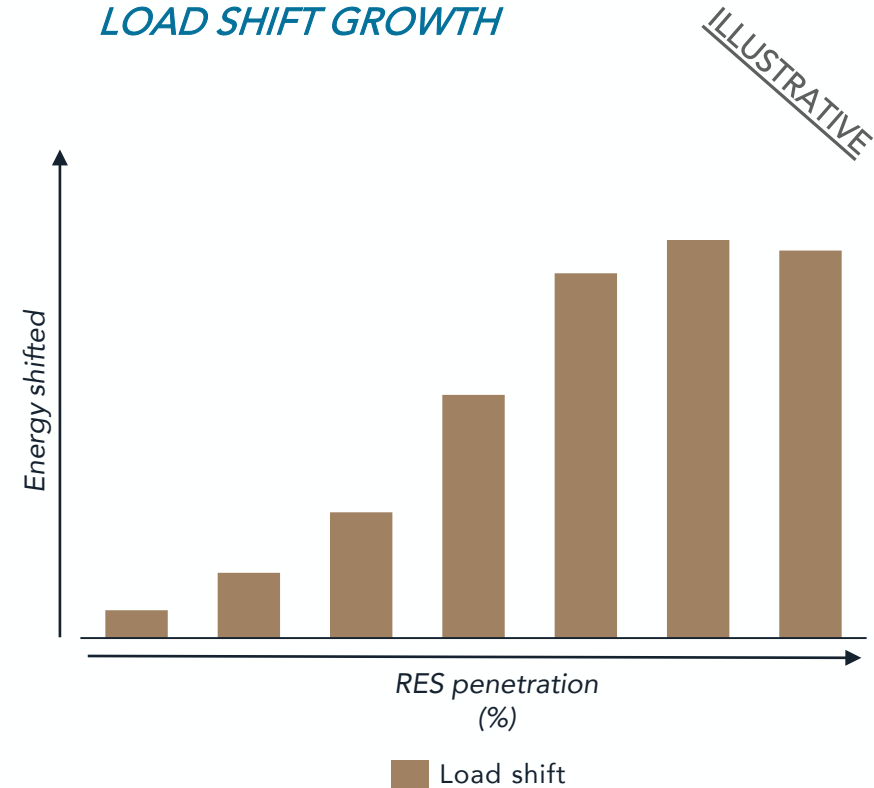


Larger growth will regard energy intensive services such as tertiary reserve, balancing and energy load shifting

ANCILLARY SERVICES GROWTH

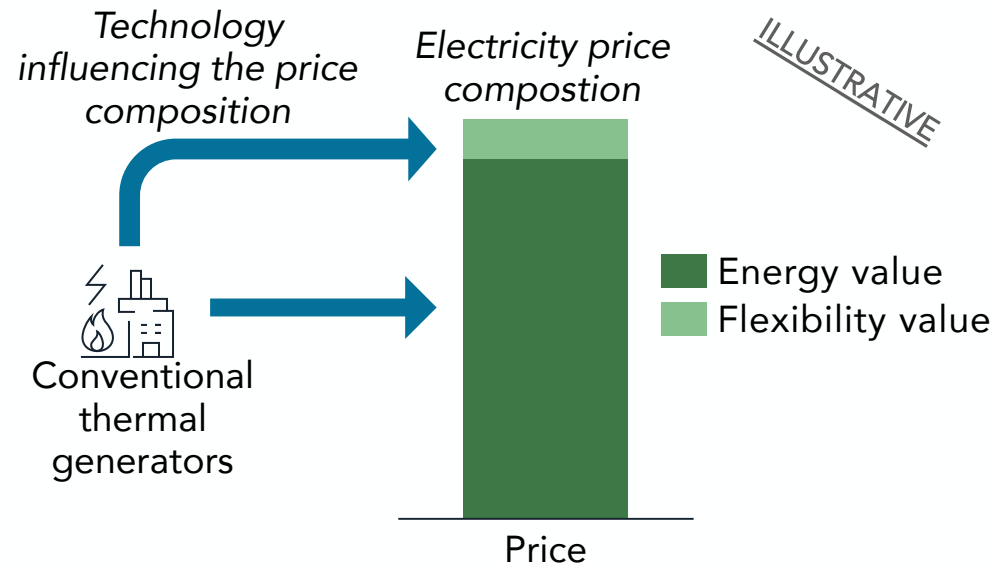


LOAD SHIFT GROWTH



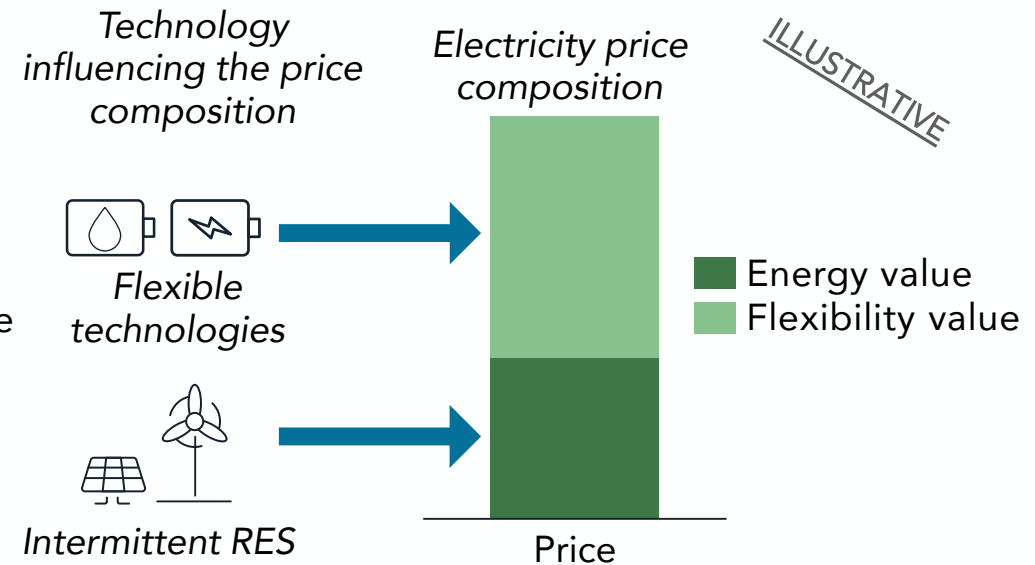
Intermittent RES will cause an energy dichotomy, where price will include production and flexibility contributions

TODAY PREVAILING CONVENTIONAL GENERATION



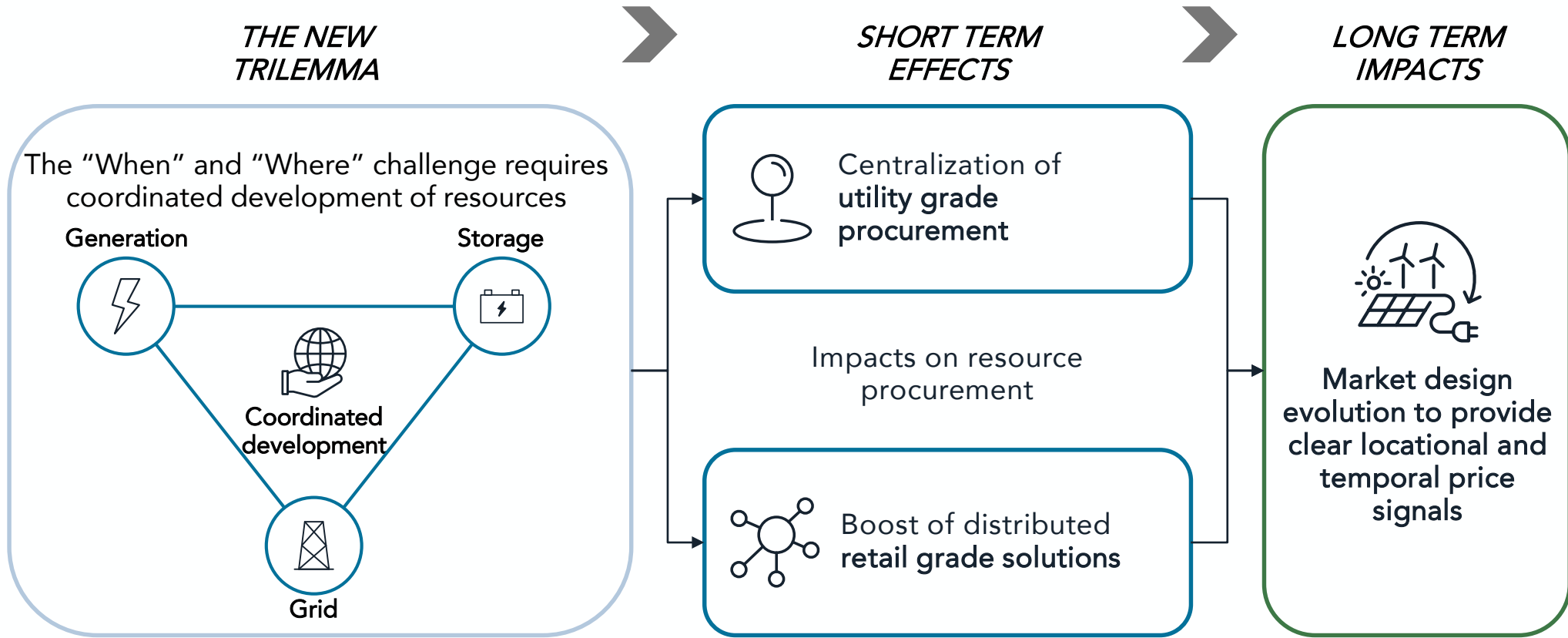
In electricity systems that strongly rely on **conventional generation** (e.g. gas, coal), the **electricity prices reflect mostly the value of the commodity**, with the value of flexibility potentially ignored

LONG TERM HIGH-RES PENETRATION



- In **low-carbon** electricity systems, the **value of flexible** power sources will need to be better captured in the markets
- At the same time, there will be a need for the **introduction of long-term hedging for system services provision** to de-risk investments

The need for a coordinated development of RES, storage and grid will impact on Gov strategies and market designs



Africa can implement a tailor-made market design based on experiences of developed markets

Developed markets' struggle

The market designs of developed country has been typically implemented to meet system requirements and stakeholder needs that today are no longer, or partially, valid

Such countries are currently struggling to efficiently address accelerating energy transition



Africa can leverage on experiences of developed markets and implement a market design tailor-made on its specific needs and characteristics



Africa's leapfrog opportunity

The promotion of a sustainable future and the improvement of Africa's energy independence rest on the ability of Africa to leapfrog leveraging on:

- Attract private investments efficiently providing the correct price signals (locational and temporal), e.g.:
- Consolidate a procurement system that ensure coordination between renewables storage and grid development
- Value through short-term instruments (e.g. markets) the flexibility needed to manage intermittent generation
- Promote (long-term) renewable energy exchange (e.g. market) to transfer RES affordability to consumers

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