

# **Demand-supply coordination in Sub-Saharan African electricity sector development**

**Antonio Nodari – Managing Director Pöyry (Milan)**

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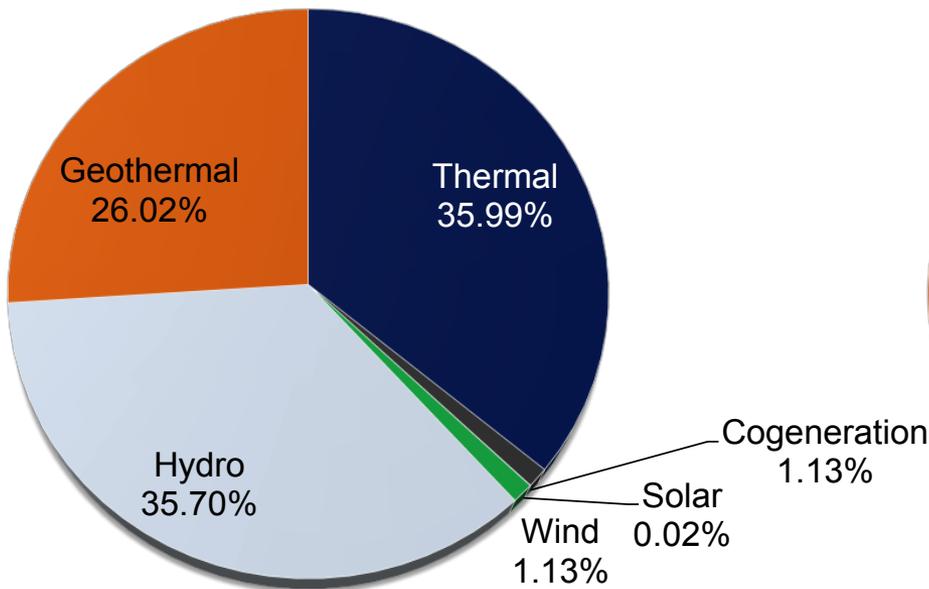
# Agenda

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- **Market context**
  - Lessons learned
  - Supply-demand coordination
  - Final recommendations

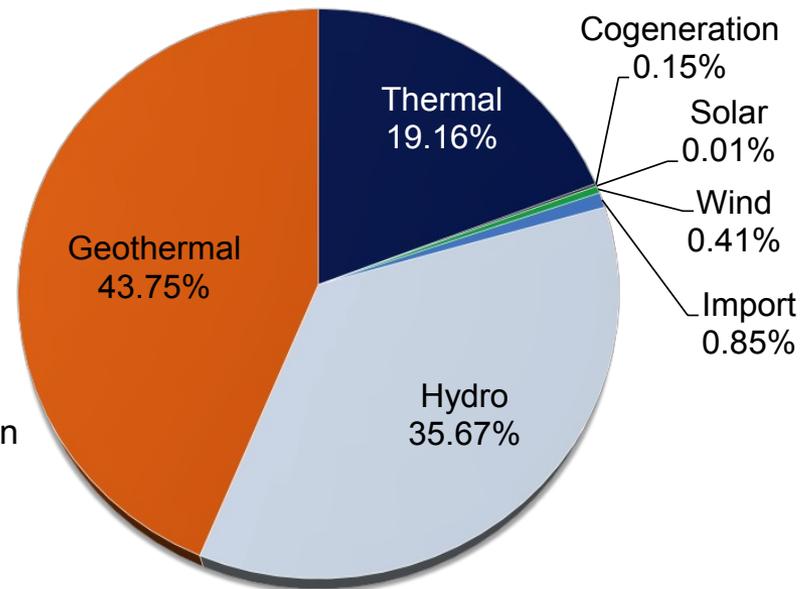
# The generation mix

Kenyan installed capacity is dominated by hydroelectric and thermal power while on the generation mix geothermal reached for the first time in 2015 a predominant position

**2015 Installed capacity mix**



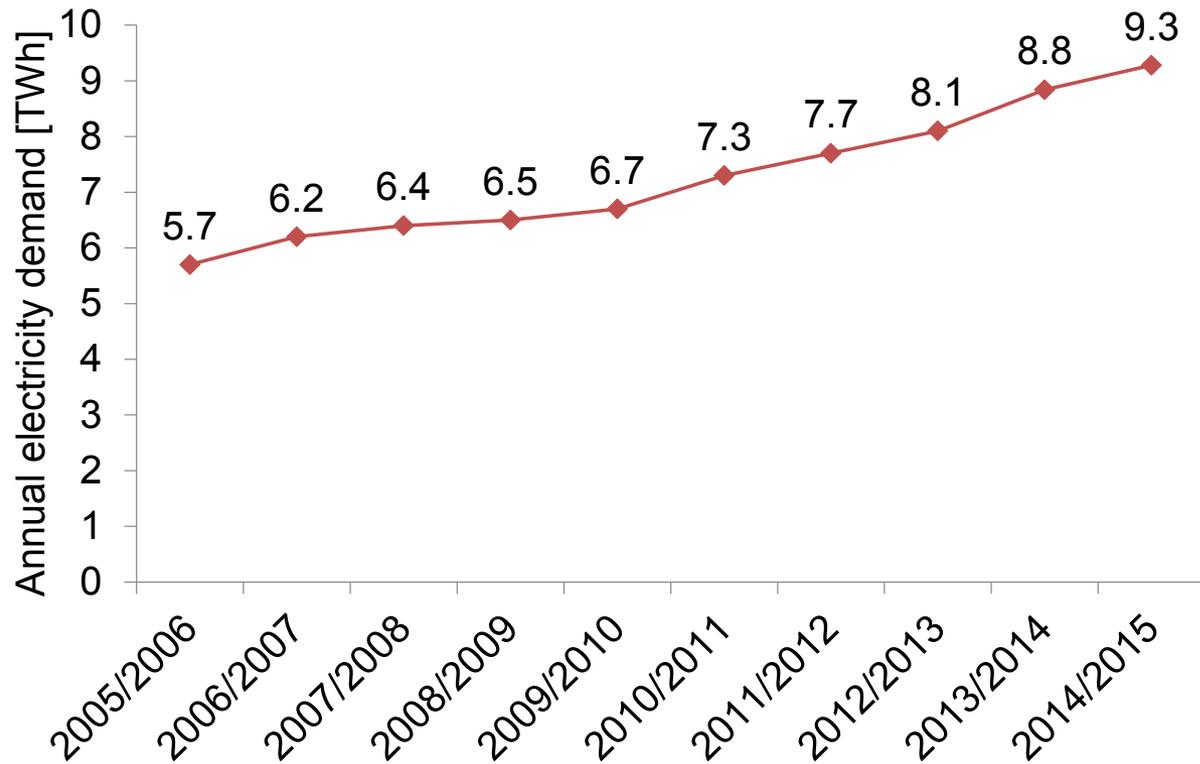
**2015 Generation mix**



# The electricity demand

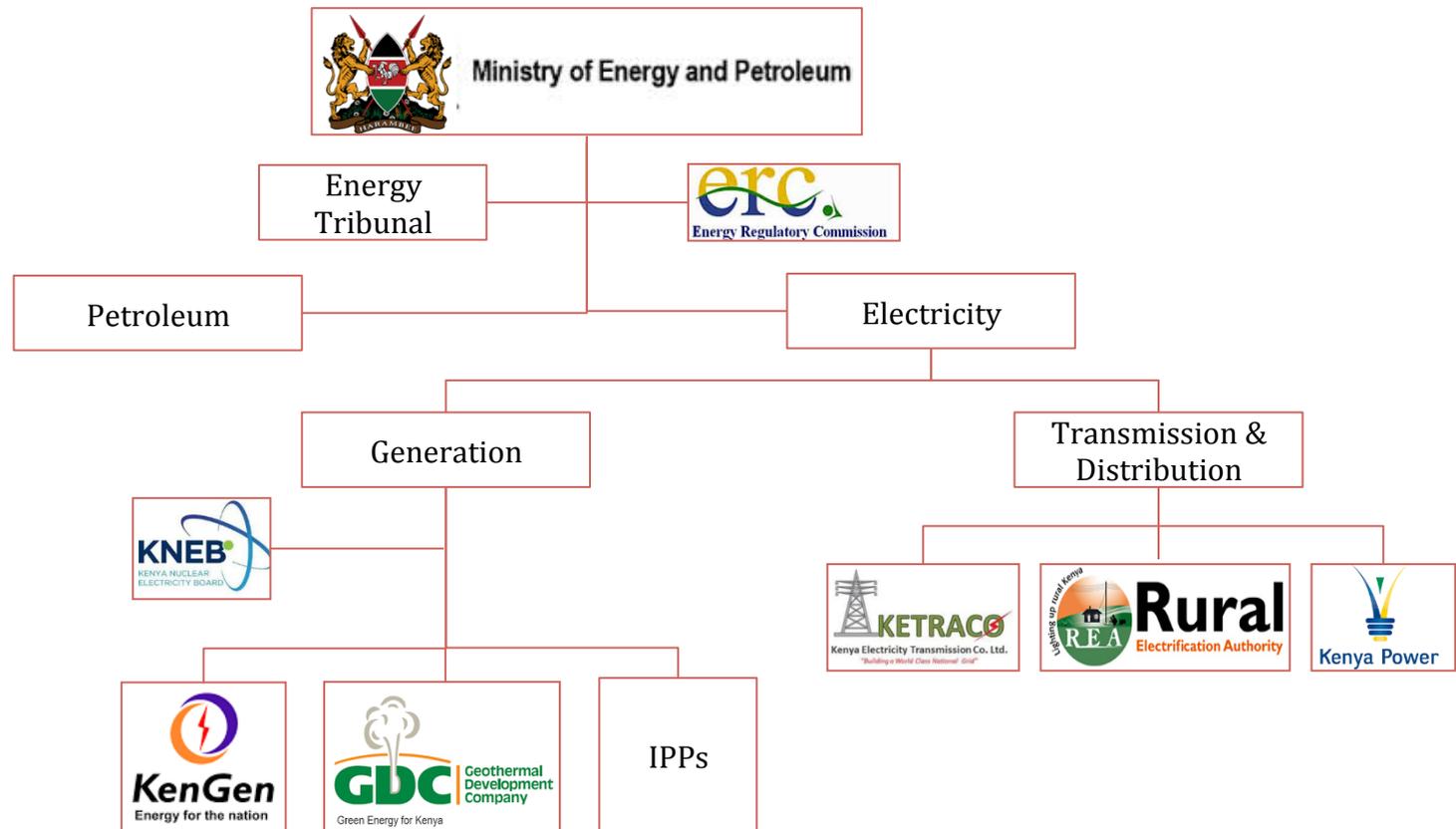
Electricity demand has almost doubled in the last ten years (+5% CAGR), reaching an all-time high of 9.3 TWh in 2015

**Historical demand evolution**



# The structure of the energy sector

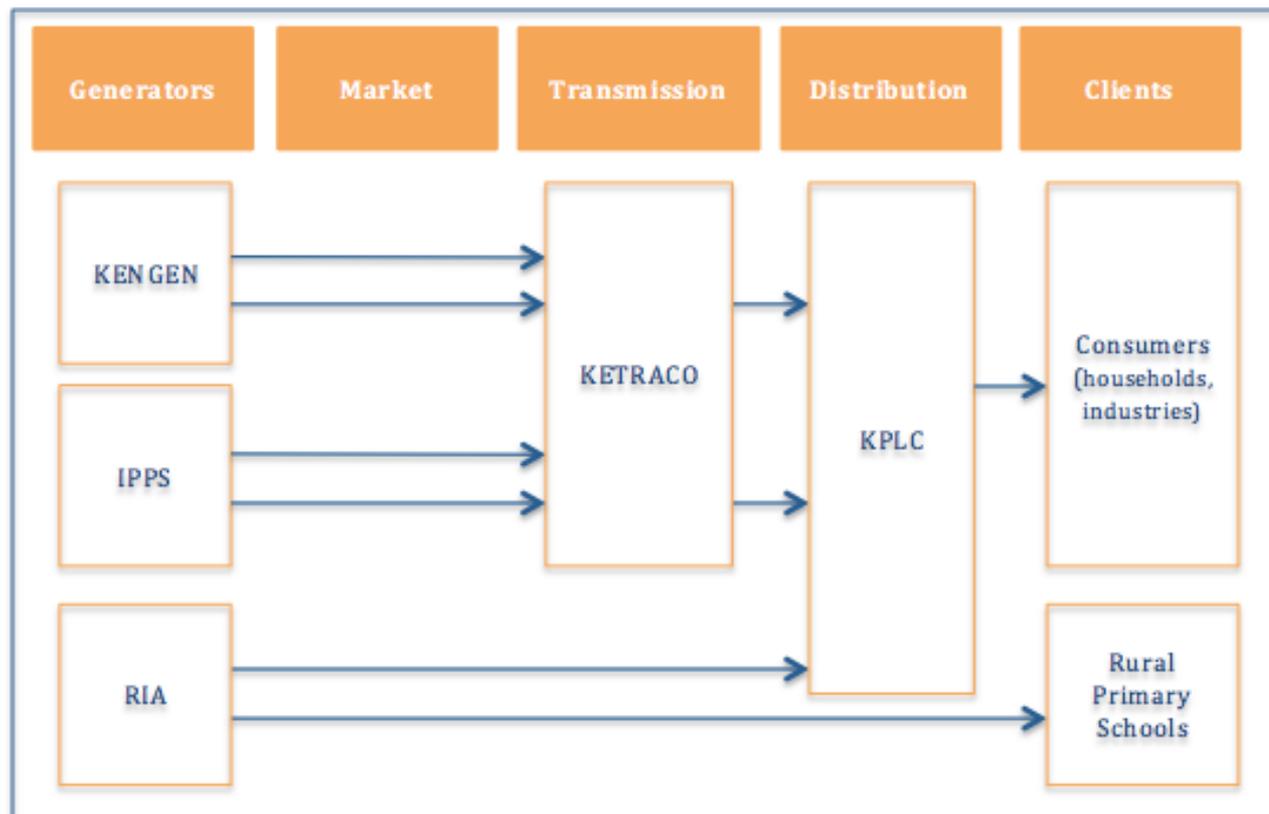
The Ministry set the policies and the strategic direction of the energy sector, while ERC is responsible for the regulation. Generation is unbundled from transmission and distribution.



# The structure of the electricity market

KenGen is the main player in generation while Ketraco and KPLC manage the transmission and distribution network

**Structure of the electricity market**



# Plans and incentives for renewables

Three main policy tools have been introduced in Kenya in order to promote and attract investments in renewables

## Feed-in Tariff (FiT) with PPA

- Power Purchase Agreement (PPA) enables Independent Power Producers (IPP) to sell electricity to KPLC at the FiT fixed price for 20 years from the commissioning date
- Provide investment security and market stability together with transaction and administrative cost reduction
- Available for wind, solar, geothermal, hydro, biomass and biogas

## 0% import duties

- 0% import duties on all renewable energy sources (RES) equipment and accessories (compared to an average of 25%)
- The Value Added Tax (VAT), equal to 16%, is removed for RES power plant related materials and equipment

## VAT exemption

- Both instruments will ease the financial burden for company investing in RES generation capacity in the country

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# Lessons learned from mature markets

## Unexpected demand fall and uncoordinated generation growth lead to oversupply in several mature markets

Market	Context	Complication	Lesson Learned
EU countries (Germany, Denmark, Spain and Italy)	Strong RES incentives due to political willingness, increasing emphasis on offsetting climate change together with a stable and growing electricity demand	<ul style="list-style-type: none"> <li>• Demand plunged after the world economic crisis leading to oversupply</li> <li>• Displacement of conventional flexible generation</li> <li>• Higher costs for grid enhancement and RES integration</li> <li>• Incentives cut (also retroactively)</li> <li>• Loss of credibility for foreign investors</li> </ul>	<ul style="list-style-type: none"> <li>• Costs for consumers and grid-related costs must be properly assessed in setting up RES incentive policies</li> <li>• Energy policies should aim at coordinating energy supply with demand.</li> </ul>
Chile	Set up of the country's generation mix with construction of CCGTs to exploit the import of natural gas from Argentina	<ul style="list-style-type: none"> <li>• Internal crisis in Argentina</li> <li>• Cut-off of gas supply</li> <li>• CCGTs in Chile replaced by fuel-oil</li> <li>• Dramatic and unexpected increase in energy production cost</li> </ul>	<ul style="list-style-type: none"> <li>• Change in energy policy moving to a more diversified energy mix (coal, hydro, wind and solar)</li> <li>• Set up of pre-defined target levels of capacity for each technology and grid section</li> </ul>
Chile	Set up of the 4 years transmission system and generation investment plan, pushed by many new consumption projects	<ul style="list-style-type: none"> <li>• Most of the consumption projects were cancelled or delayed</li> <li>• Oversupply situation</li> <li>• Inefficient transmission system</li> <li>• Unexpected cost increase</li> </ul>	<ul style="list-style-type: none"> <li>• Introduction of a yearly review of the plan</li> <li>• New investments introduced only if its importance for the transmission system it is clearly demonstrated</li> </ul>

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# Which demand to avoid oversupply?

Off-grid generation and the agro-food chain development are the most promising solutions to avoid oversupply

## Small scale off-grid generation

- Electricity access through the expansion of the national grid requires large investments, small and diffused generation could be the key to solve the issue
- RES are the best suitable technologies for off-grid solutions (e.g. solar PV with batteries, AC solar micro-grids, small wind turbines and bioenergy)

## Development of agro-food chain

- Better understanding of the local activities and economics can help increase economic growth and thus electricity demand
- The agro-food chain has a great development potential and its modernization could result in additional electricity demand

## Replacement of other energy sources

Replacement of lighting systems based on kerosene and biomass or the replacement of open fire and burning biomass with electrical stove and heaters will increase electricity demand but also security and quality of life

# Regional cooperation: a risk mitigation tool

Regional cooperation could help to provide low cost power, triggering the economic growth

Empowering the grid and extending the interconnections and trades with neighboring countries has significant positive effects that include:

- Higher security of supply and system stability through an increased and more differentiated generation mix
- Lower level of reserve margins required that could be shared
- Capital saving, as the need to invest in new power stations is reduced
- Higher level of competition
- Cheaper tariff for end users
- Higher electrification rates of remote areas
- More organic development with greater integration of intermittent RES.

In order to exploit these benefits in 2005 was established the Eastern Africa Power Pool (EAPP), however total power trades were limited so far between EAPP members due to still no sufficient transmission capacity between countries.

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# A coordinated approach

RES could play an important role in the electrification but consumption must be properly coordinated and stimulated

- RES, that currently do not enjoy a prominent role in the energy mix (especially wind and solar), could have a great potential for the off-grid electrification of rural an isolated area, as the most suitable substitute of biomass and fuels
- Electricity access must be linked with properly stimulated electricity consumption
- The agro-food chain potential should be exploited together with the continuation of the industrial and enterprise development
- Long term planning with a real coordination between supply and demand, fostered by the increase of regional cooperation and power trades, are essential to avoid unnecessary investments and waste of resources
- A coordinated approach could lead to sustainable demand growth for the future.

# Thank You!