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Welcome word

Overview of the status quo of Kenya's energy sector

Understanding the energy planning processes

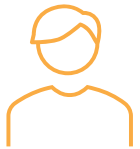
An outlook on the energy transition in Kenya

Training and Capacity Building on Energy Policy and Communication in Kenya

- "Power System Readiness for Integration of Variable Renewable Energies (VRE)" and "Promotion of Climate-Friendly Cooking" projects
- National key actors and relevant energy stakeholders. Public agencies, civil society organizations, journalists, the private sector and academic institutions
- Equip stakeholders with the knowledge, tools and skills to undertake effective strategic communications and policy translation
- Sustain energy investments, and enhance consumer adoption variable renewable energy sources and climate-friendly cooking technologies

Webinar 2

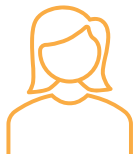
Understanding the energy sector in Kenya



Brian Nyaware
Energy Specialist – Kenya



Eng. Nickson Bukachi
Energy and Petroleum
Regulatory Authority



Priya Behrens-Shah
Team Leader and RE expert

1. Introduction to renewable energy systems

30 Nov 2022

3. Key energy issues, trends, and policy objectives

30 March 2023

4. Understanding needs in energy reporting

27 April 2023

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How do you feel today?



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Introduction to the advantages and challenges of Kenya's energy system

Overview of the energy growth in Kenya

Understanding status quo of Kenya's energy production

Perspective on the energy exchange



Brian Nyaware

Energy Specialist - Kenya

Energy importance and sector advantages

Importance:

- an **enabler** in realizing **Kenya's development agenda** (Vision 2030)
- **powers various industries** (e.g. agriculture, transport) and **day to day activities** (e.g. cooking), eventually contributes to economic growth.

In Kenya, the energy sector has seen vast growth over the years due to **advantageous factors** like:

- Great **resource potential** e.g. land, geothermal energy
- **Geographical location** and **favourable climate** (e.g. solar and wind potentials)
- National and International **programmes and collaborations** (e.g. SE4All, Power Africa)
- **Political goodwill** and **commitment**
- Government **incentives** and **Supporting policies**
- **Global price reductions** of energy equipment like solar PVs
- **Short construction/ installation periods** (eg off grid solar)

Energy sector challenges

The sector still faces numerous **challenges** that prevent it from reaching its full potential, among them being:

- **Environmental, social and land issues** e.g pollution and land wayleaves
- **Long construction periods**
- **Intermittency** of weather patterns by some energy sources
- **Weaknesses** in some **policy frameworks**
- **Susceptibility** to global oil prices and foreign exchange rate fluctuations
- **Institutional and governance challenges** like corruption and lack of human capital
- **Shocks**. E.g: COVID-19, sudden changes in policies
- **Unwillingness** and **inability of customers to pay** for energy
- **Lack of finances**
- **High cost** of electricity
- Poor energy infrastructure, power interruptions and losses
- **Theft and vandalism** of equipment

Energy sector growth

Kenya's Petroleum Supply and Demand, 2017-2021

'000 Tonnes

Petroleum Fuels	2017	2018	2019	2020	2021*
DEMAND -					
Liquefied Petroleum Gas	189.3	222.3	312.1	326.2	371.4
Motor Spirit (Premium)	1,267.4	1,359.0	1,434.3	1,395.3	1,554.4
Aviation Spirit	3.8	18.8	10.2	1.9	1.4
Jet/Turbo Fuel	649.7	674.4	699.4	394.8	506.8
Illuminating Kerosene	448.0	339.4	168.3	127.0	111.3
Light Diesel Oil	2,086.2	2,173.1	2,198.7	2,157.6	2,305.7
Heavy Diesel Oil	1.2	0.2	1.3	1.8	0.8
Fuel Oil	525.0	402.0	382.8	273.9	340.3
TOTAL DOMESTIC DEMAND	5,170.6	5,189.2	5,207.1	4,678.5	5,192.1
Exports of petroleum fuels	6.4	8.4	7.0	2.3	0.4
TOTAL DEMAND	5,177.0	5,197.6	5,214.1	4,680.8	5,192.5
SUPPLY					
Net imports of petroleum fuels	5,524.2	5,396.3	5,682.2	4,920.4	5,827.6
Adjustment [†]	347.2	198.6	468.1	239.5	635.1
TOTAL SUPPLY	5,177.0	5,197.6	5,214.1	4,680.8	5,192.5

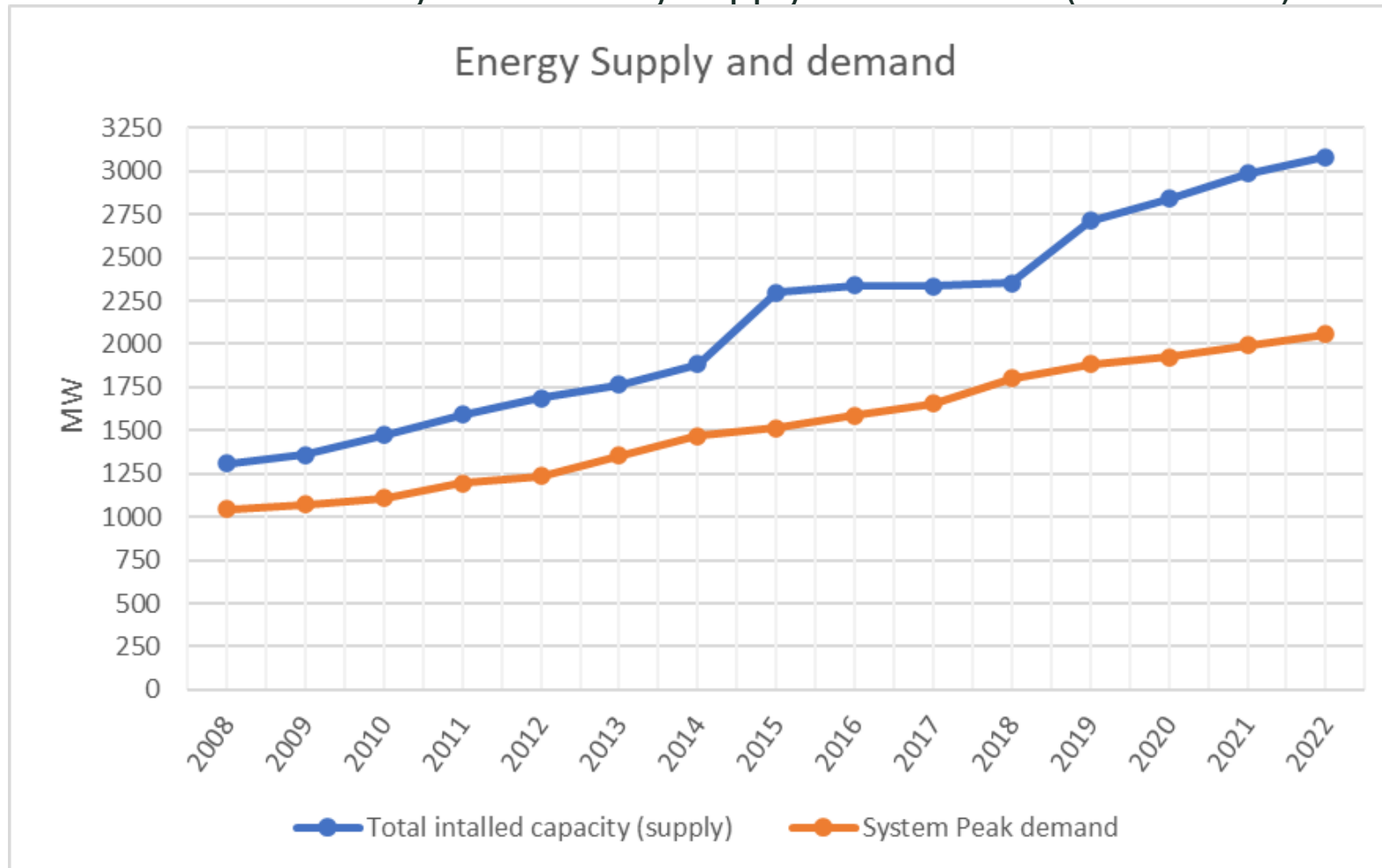
Source: Ministry of Petroleum and Mining; and **Energy** & Petroleum Regulatory Authority

* Provisional.

† Adjustment for inventory changes and losses

Energy sector growth

Kenya's electricity supply and demand (2008-2022)



Energy capacity and sources

Kenya's total **installed capacity was 3081MW** and the **effective capacity was 2926MW**, generated capacity (KPLC, 2022). In this case:

- **Installed Capacity** refers to the cumulative maximum amount of energy that all the generating stations are able to produce
- **Effective capacity** is the total contracted Capacity for the all Power Plants on their Energy Power Purchasing Agreements (PPAs) with the off-taker (KPLC), usually lower than installed capacity

Examples of sources include: solar, geothermal, wind, thermal, biomass, co-generation, among others

Averagely 90.5% of the total energy mix over the last three years was **renewable energy** (KPLC, 2022).

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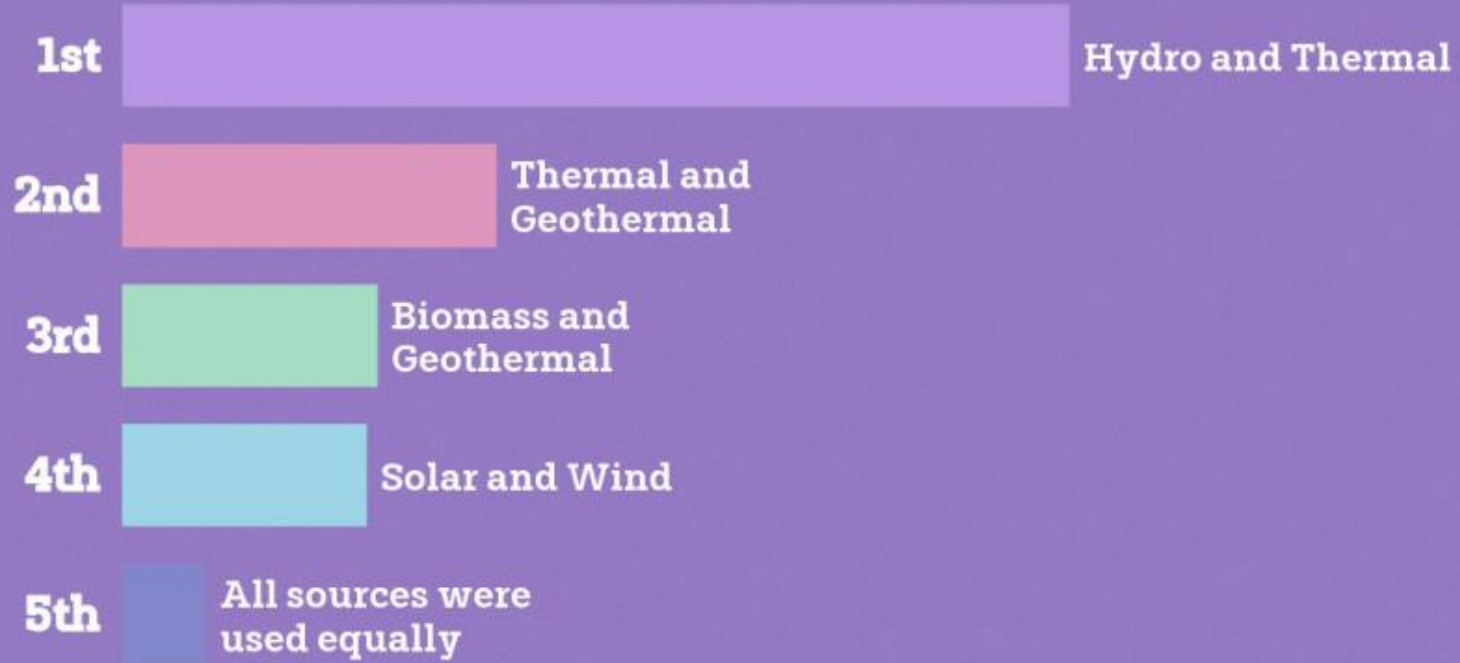
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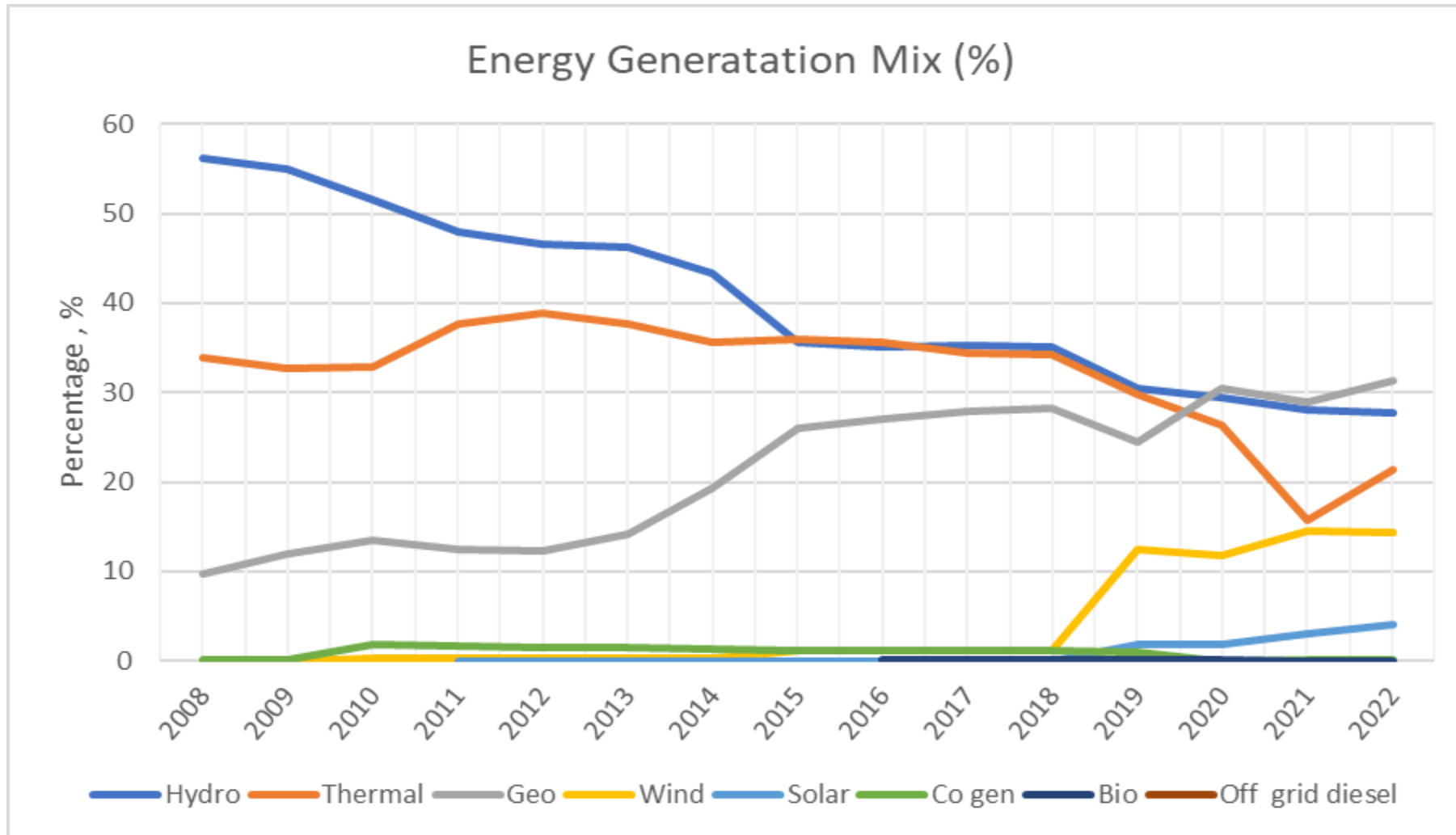
Which were the top two energy source used for electricity production in Kenya in 2010?



Which were the top two energy source used for electricity production in Kenya in 2022?



Annual energy generation mix



Energy sources

Over the past 5 years, Kenya has **imported** electricity from Uganda and Ethiopia and exported to Uganda and Tanzania. In year ending 30th June 2022, Kenya **exported** energy totalling to 16GWh and imported 338GWh.

The energy is also produced by **government and non-government actors (Independent Power Producers-IPPs)**. In 2022, the shares of energy produced were : 64 %- government, 36%- IPPs

Part of the energy produced is also **off grid (38MW in 2022)** under the Rural Electrification Programme (GoK) and consist of:

- Off grid diesel
- Off grid solar
- Off grid wind

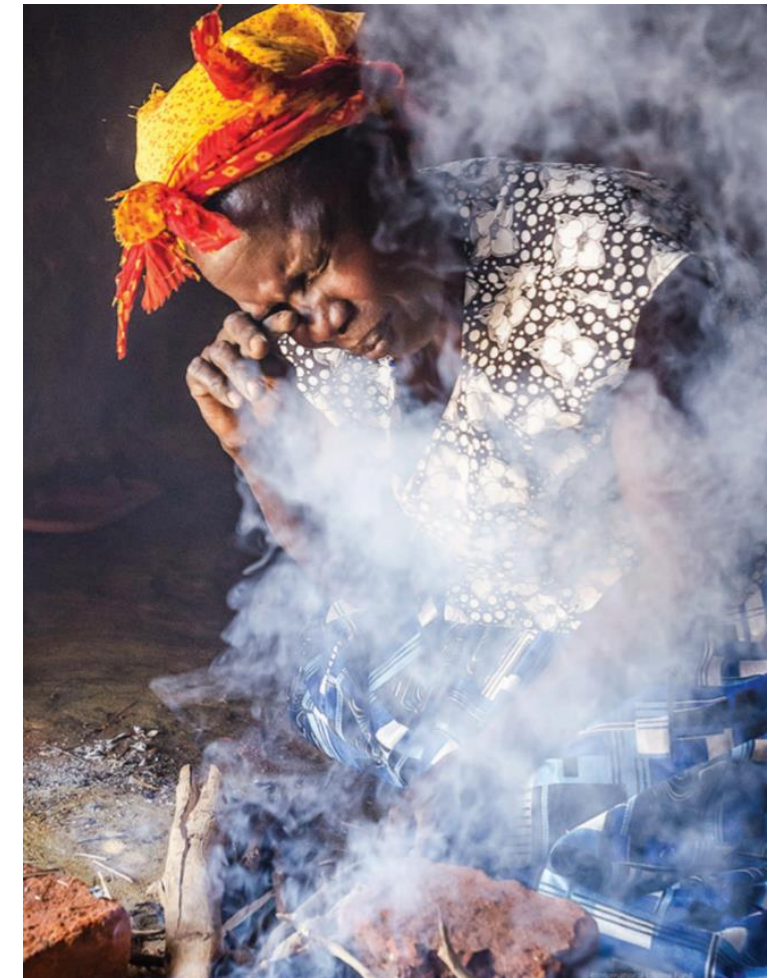
Energy consumption

Examples of **energy uses**: heating and cooling, lighting, cooking and transport.

Energy uses can also be linked to **consumer groups**:

- **Electricity**: domestic, commercial, Off-peak(interruptible) and street lighting (KPLC, 2022)
- **Petroleum**: agriculture, transport, tourism, Marine, aviation, power generation, Industrial and commercial and government (KNBS, 2022)

Climate change mitigation and **pollution and health concerns** have led to the drive for more adoption of clean energy, influencing uses to be cleaner like clean cooking and e-mobility



Take home message

- Kenya's energy sector has **numerous advantages** that propel its **continuous growth**.
- Growth evident from **sales numbers and supply and demand increase**
- **Challenges** hinder is the sector from reaching its full potential.
- **Majority** of our energy is sourced from **renewable energy**
- Important to improve on energy consumption and usage to better general health and reduce pollution, eg. More adoption of clean cooking
- Journalists and other media stakeholder: public awareness and advocacy

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Understanding the contemporary issues in energy markets

Kenya's energy planning structure

The energy governance in Kenya

National energy planning

The INEP coordination structure



Eng. Nickson Bukachi

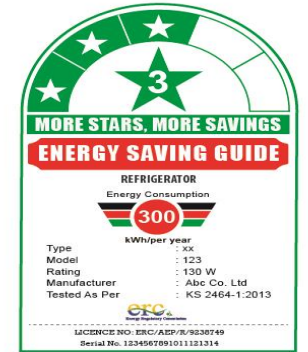
Energy and Petroleum Regulatory Authority

Contemporary Issues in Energy Markets



Possible Solutions

Increased power production



Embracing Energy Efficient operations



Global Perspective

Trilemma Index dimensions



MEASURES:

Ability to meet current
and future energy demand

Withstand and respond
to system shocks

COVERS:

Effectiveness of management
of domestic/external
energy sources

Reliability and resilience
of energy infrastructure



MEASURES:

Ability to provide universal
access to reliable,
affordable, and abundant
energy for domestic
and commercial use

COVERS:

Basic access to electricity
and clean cooking fuels
and technologies

Access to prosperity-enabling
levels of energy and affordability



MEASURES:

Ability to mitigate
and avoid
environmental
degradation and
climate change impacts

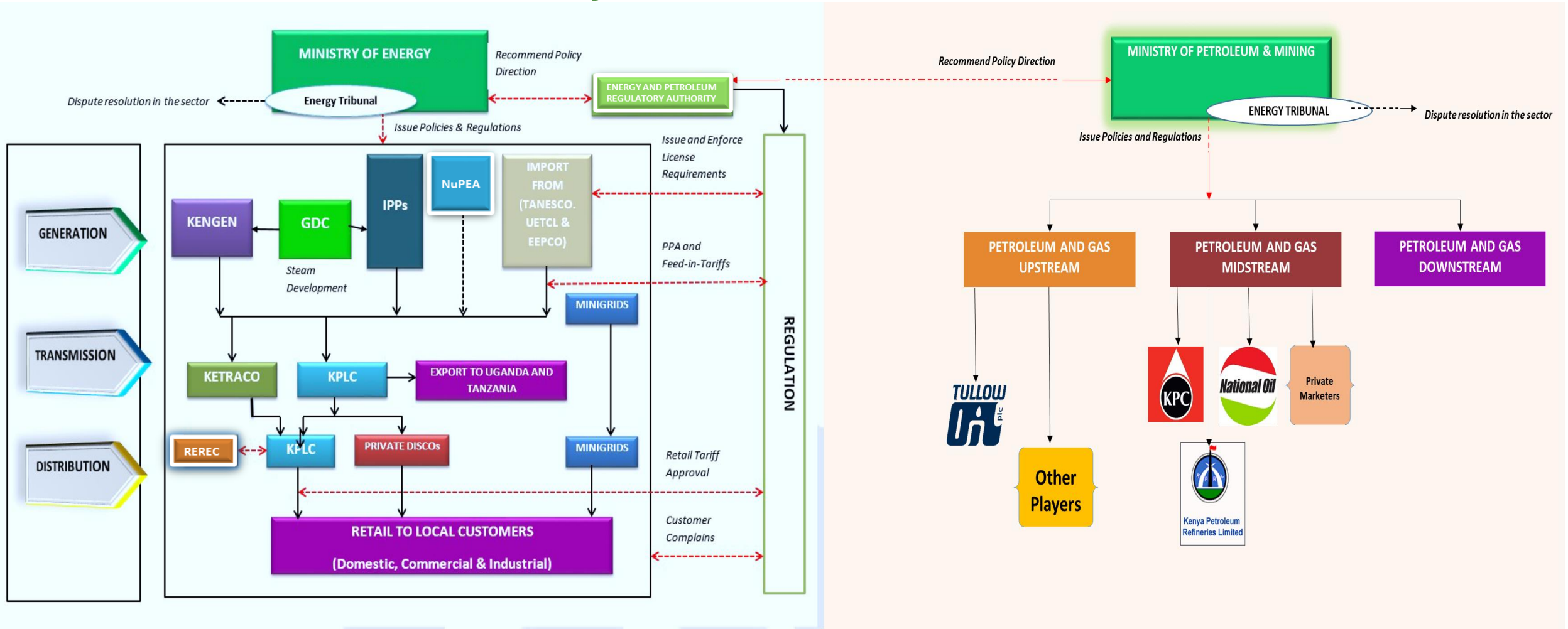
COVERS:

Productivity and efficiency of
generation,
transmission

Distribution, decarbonisation,
and air quality

Source: World Energy Council, World Energy Trilemma Index, 2021

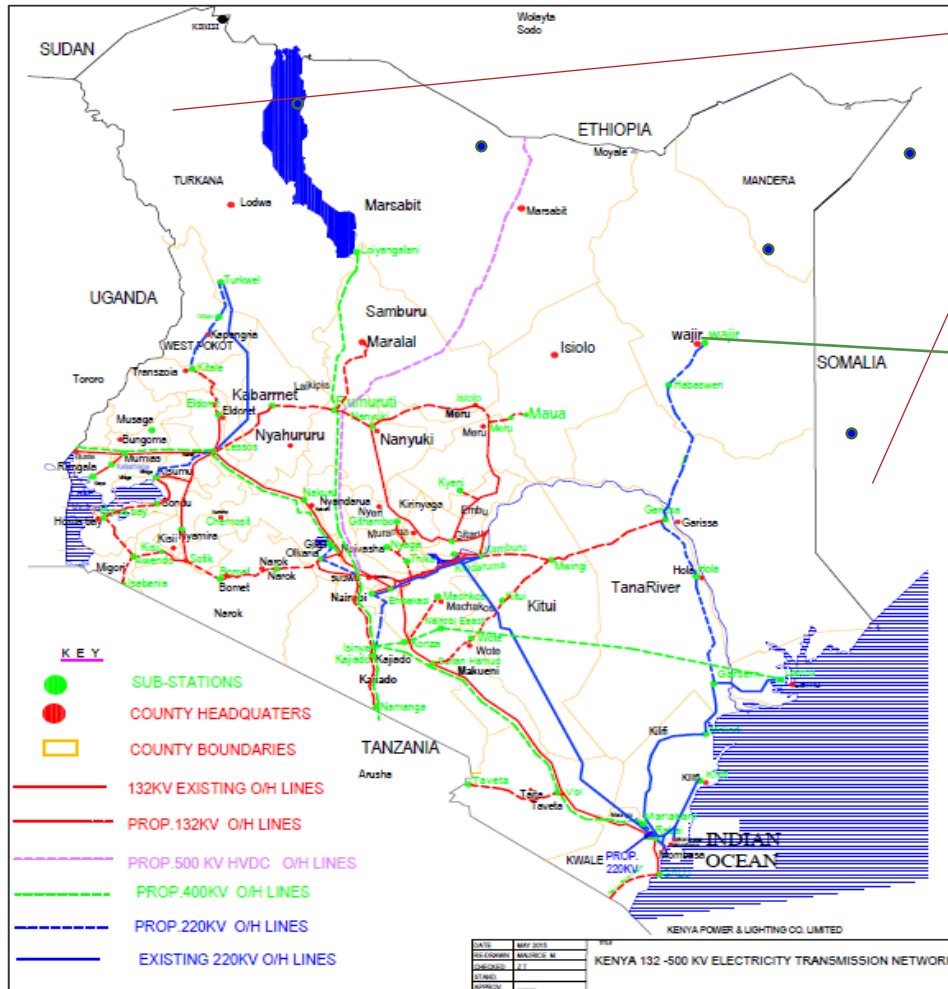
Electricity and Petroleum Structure



Power Sector Mandate



Kenya has a target of achieving universal electricity access by 2026.



Off-grid Zone Targeted for off-grid Mini-grid electrification program represented by

Examples of Off-grid Power Stations with mini grids

9.01 M Customers Connected.

Universal electricity access in line with development goals

Last Mile Project

- Funded by the Government with support from various development partners
- Targets customers living in rural and peri-urban areas
- Government secured funding from development partners totaling **KShs 65 billion**.

KOSAP Project

- Supports development of solar hybrid power supply complemented by water projects in **14 least electrified counties**.
- Target Population is about **430,000 households** within off grid regions
- The project is being financed by the World Bank to the tune of **KShs.16 billion**

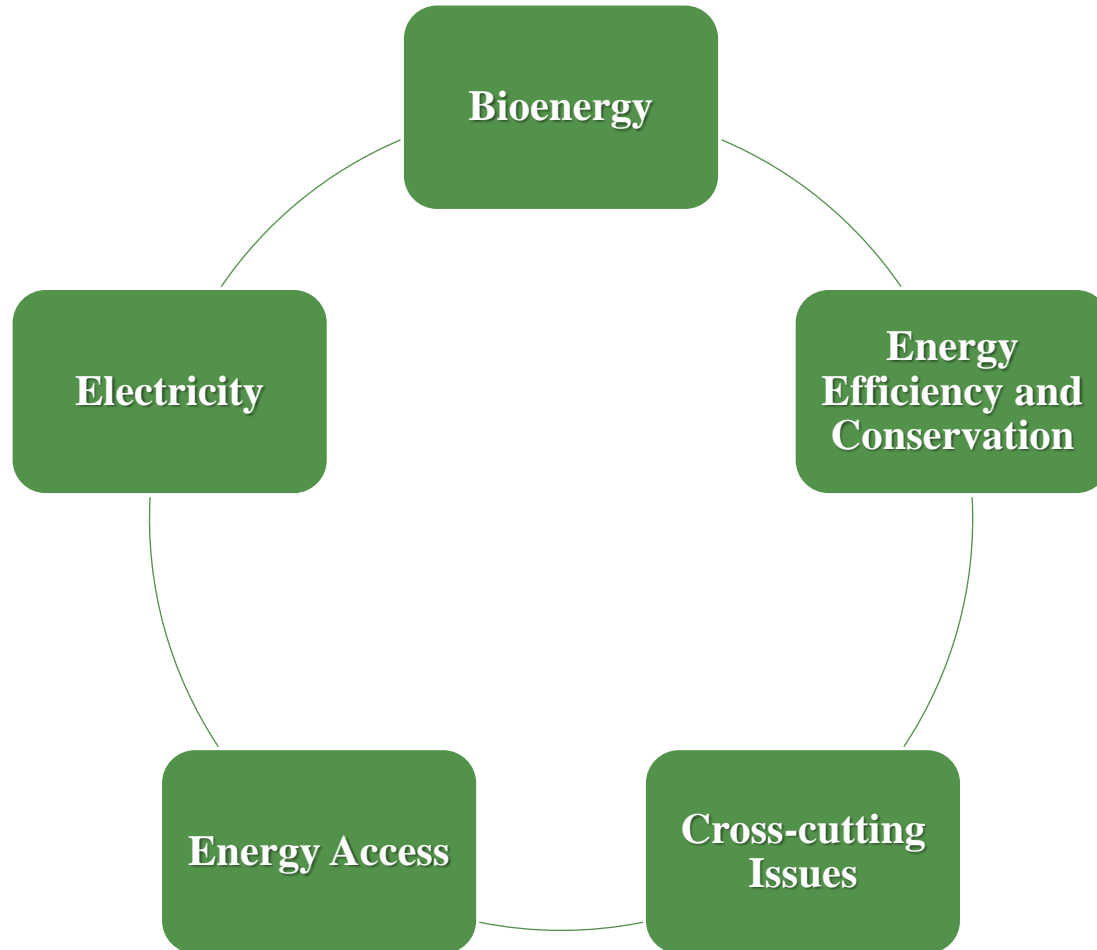
- Targeting connection of **1.2 million** customers over the next three years.
- Last Mile Connectivity Program aims to **provide 75-85%** of Kenyans with electricity

- Its estimated that about **1.5 million households** will be served by off-grid mini grids
- **120** potential mini and micro-grid sites (>100 structures per site) with roughly 28,000 customers targeted for **phase 1**.

National Energy Planning

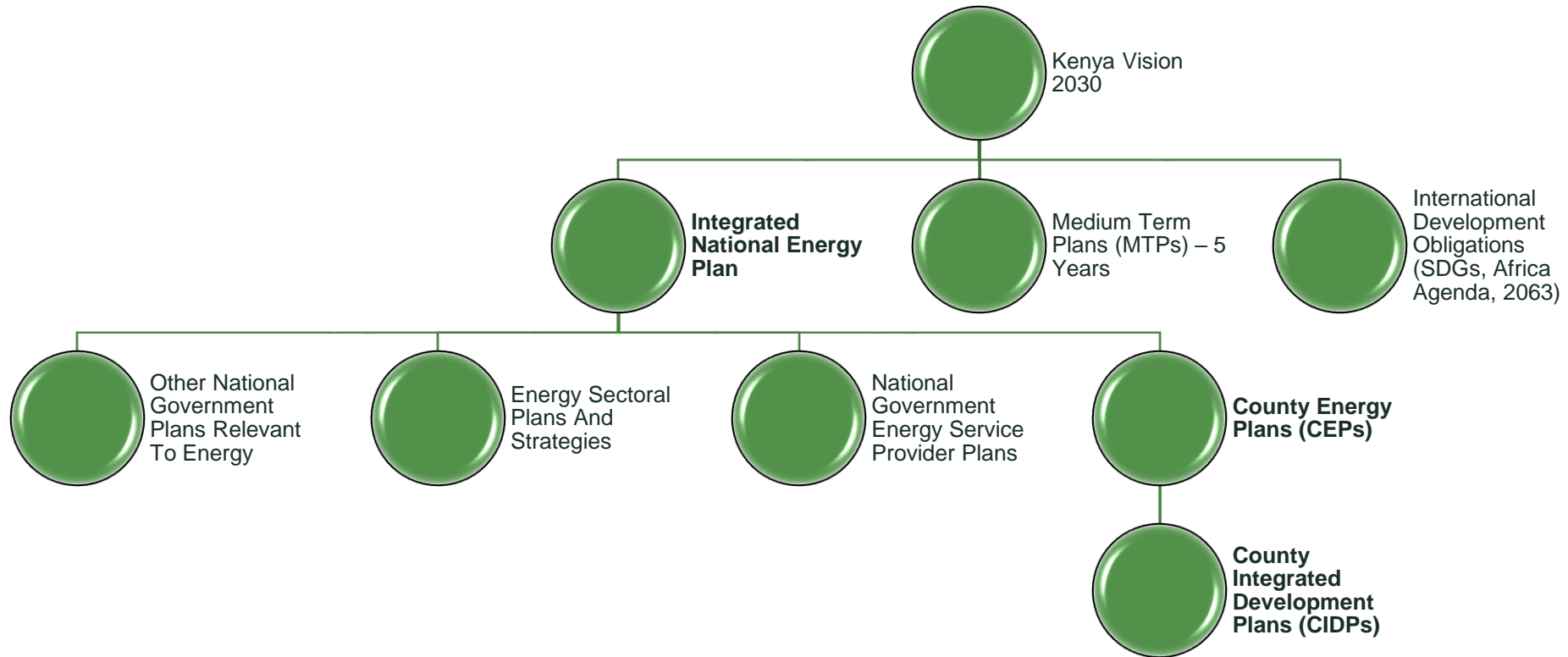
- Energy Planning is anchored under Section 4 of the Energy Act of 2019.
- The function is coordinated by the Cabinet Secretary
- The National Energy Service Providers and County Governments shall develop and submit to the Cabinet Secretary their plans for integration. The INEP shall;
 - take into account the national energy policy;
 - serve as a guide for energy infrastructure investments;
 - take into account all viable energy supply options; and,
 - guide the selection of the appropriate technology to meet energy demand.

INEP Thematic Areas

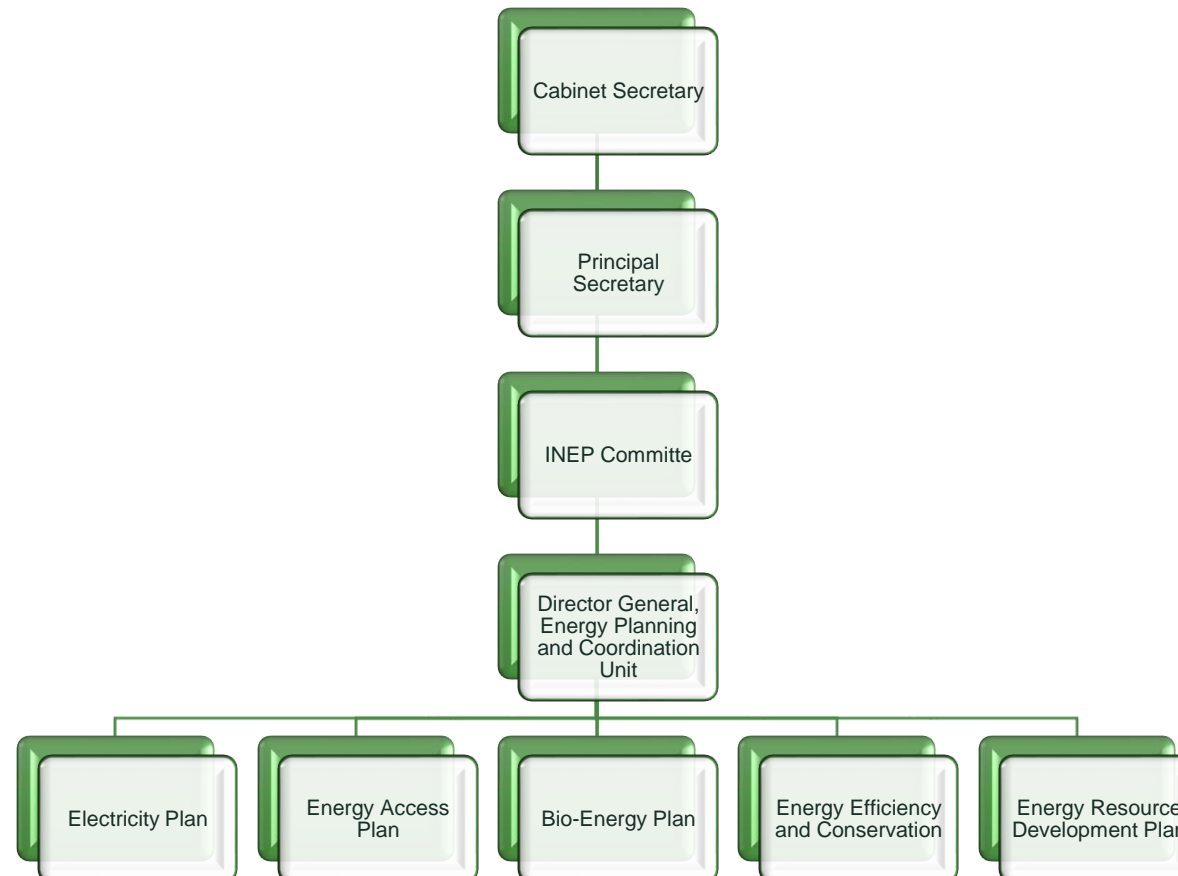


- Least Cost Power Development
- Energy Efficiency and Conservation Strategy and Action Plan
- Bioenergy Strategy and Action Plan
- Kenya National Electrification Strategy
- County Integrated Development Plans

Linkages of INEP with other National and International Plans (Section 5)



INEP Co-ordination Structure (Section 5)



Take home message

- Energy is a key ingredient for social economic development
- For effective growth there is need to ensure integrated plans that take into account the needs and optimize on the available resources
- It is our to participate and contribute in this space

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The energy transition explained

The energy transition in Kenya

The vision for 2030

The key examples that deserve particular attention



Priya Behrens-Shah
Team Leader and RE expert

Energy Transition: Definition and Objectives

Clean Energy Transition = Process of shifting away from fossil fuels to more low carbon energy sources

- **Sustainable energy - driven by the need to bring greenhouse-gas emissions down to zero**
- **Structural change in an energy system regarding supply and consumption**
- **70% of global greenhouse-gas emissions are for transport, heating, and industrial use. Energy efficiency key in energy transition**
- **Global efforts as driver: Sustainable Development Goals (SDGs), Sustainable Energy for All (SEforALL), Paris Agreement and NDCs**

Kenya already has a large share of geothermal energy. This is challenging for integrating VRE



Fig. 1: acatech

The Holistic View to Energy Transition

Energy intersects with critical social topics

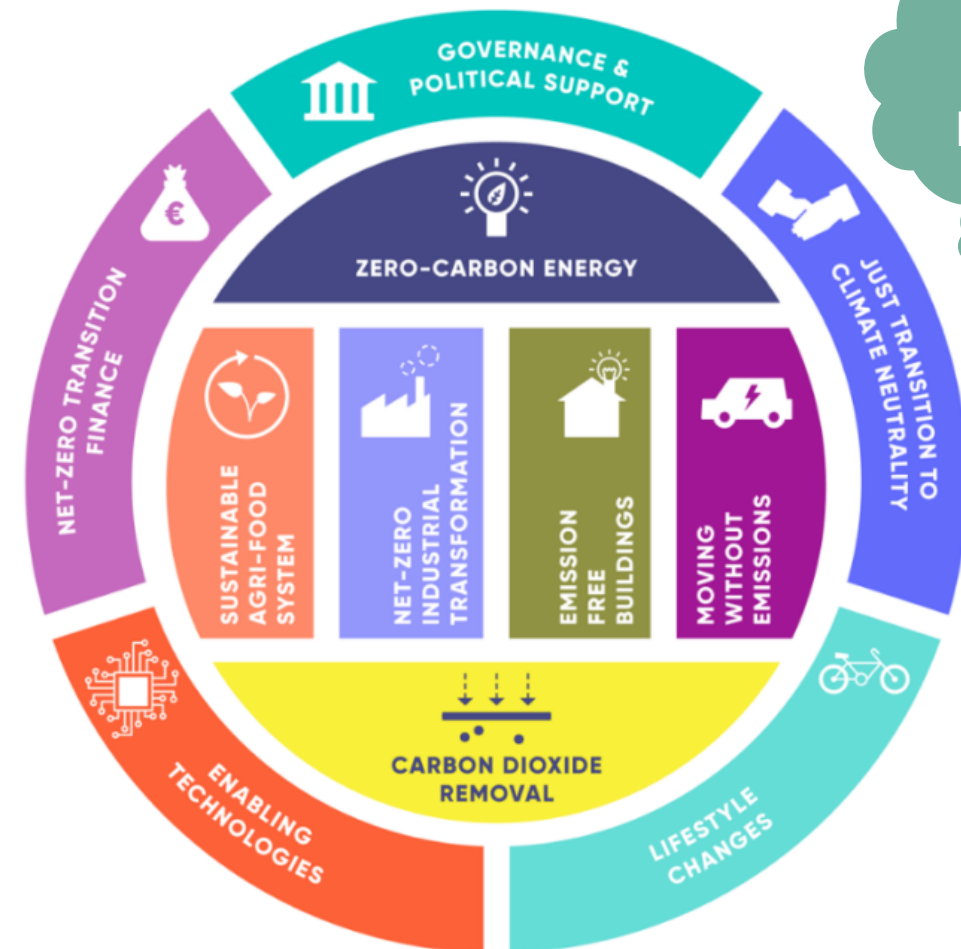
- Health, Security, Water, Food, Gender, Climate Change, Education

Energy Transition impacts whole systems and sectors

- Households, Buildings, Industry, Agriculture, Transport, Utilities

Energy Transition involves and connects a variety of actors and stakeholders

- Government institutions and agencies, Public and private Sector Enterprises, General Public



Role of the Media?

. 2: European Climate

Energy Transition in Kenya: A Balancing Act



Fig. 3: Singularity Hub

Driving Energy Transition

Increasing Energy Supply

Devastating effects of Climate Change

Ensuring Basic Needs

Keeping Pace with the rest of the World

Access to safe and sustainable energy

Kenya's Renewable Energy resources

Kenya Vision 2030



Fig. 4: Hivos

Kenya Vision 2030

Current situation: Energy crisis and lagging socio-economic development

- **Huge number of rural settlements with differing socio-economic realities**
- **Vast majority of HHs dependent on biomass for cooking**
- **Growing population = growing needs over time**
- **Expansion requires more investment beyond the grid**
- **Reliance on hydroelectric power (dependent on precipitation)**
- **Heavy industries still use a lot of imported coal and fuel oil for industrial process heating**

Vision 2030: Kenya as a newly developed middle-income country that offers a good quality of life for all its citizens

- **Big Four Agenda: Food security, affordable housing, manufacturing, and affordable healthcare**
- **Kenya's Energy Efficiency and Conservation Strategy: Improve energy efficiency and conservation in commercial, domestic, industrial and institutional sectors of energy consumption**

Two-thirds of Kenya's energy currently comes from bioenergy (Africa Energy Outlook, 2019)



KENYA
VISION 2030

*Towards a globally competitive
and prosperous nation.*

Fig. 5: Kenya Vision

Kenya Vision 2030

Sustainability, Adequacy, Affordability, Competitiveness, Reliability and Supply of Energy

Kenya's Strategy

- **Policies for advancement of Renewable Energy** (draft National Energy Policy 2018)
- **Enabling investments in energy expansion i.e. energy access**

Renewable Energy in Kenya

- **Resources: Geothermal, solar, biomass, wind and hydro**
- **90 % energy generation from renewable energy sources**
- **Mostly in urban context**

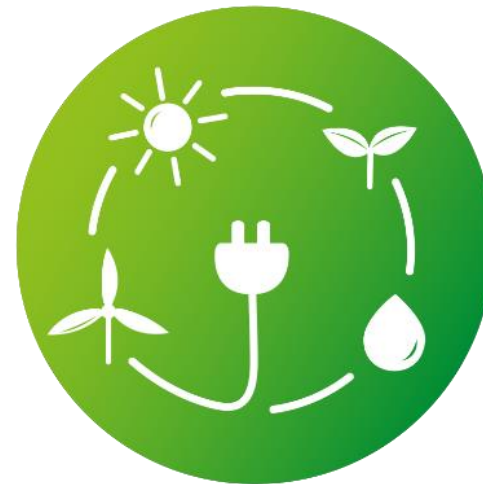


Fig. 6: Renewable Energy

Opportunities

- **Adoption of advanced technology, improving generation and distribution**
- **Investment in Renewable Energy (job creation)**
- **Decreasing deforestation**
- **Improving quality of life and health**
- **Spurring economic development**

Modern Cooking Energy

Pika na Power!

Kenya's Goal

- Achieve Universal Access to Modern Energy Cooking Services by 2028

Actions

- Transition to clean energy cooking in public institutions, hospitality sector and MSMEs
- Accelerate access to clean cooking technologies and fuels for rural and urban households
- New policies and regulations: adoption & use of modern energy cooking services
- MoEP: Kenya Off-grid Solar Access Project

Impacts

- Restoration of forest
- Health and safety benefits
- Time and energy savings in households
- Opportunities in economic activities and in education
- Reduction of GHG emissions

Options

- Scale-up via electric cooking (Grid expansion, mini-grids)
- Electric cooking with EPCs = most cost effective
- Even shifting to higher efficiency stoves!

Cooking with biomass is the dominant practice in Kenya: firewood, commercial charcoal and kerosene

29-73% increase in electrification in 5 years!? (Kenya Cooking Sector Study, 2019)



Fig.7: ORF

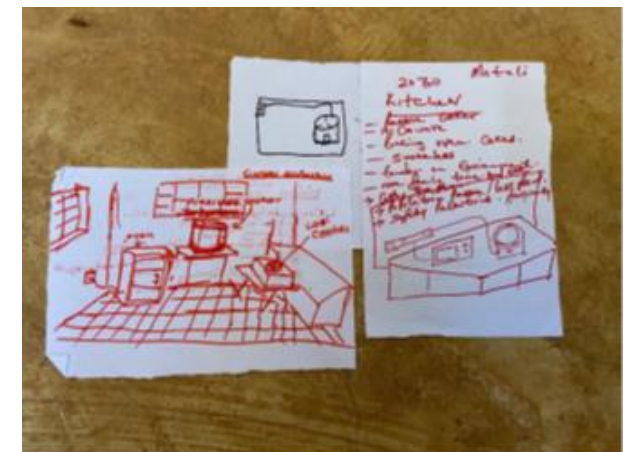


Fig.8: Hivos

Electric Vehicles (E-mobility)

Initiatives driving E-mobility

- Development of electric vehicle (EV) standards
- Reduction of tax on EVs from 20% to 10%
- Partnerships: e. g. United Nations Environment Program (UNEP) on pilot project to evaluate uptake and challenges in e-mobility adoption



Fig.9: E-bus

E-mobility in Kenya

- E-mobility startup scene (around 50 startups, investments of \$26m in new funding in 2021!)
- Electric busses and e-bikes
- EV delivery / transport services
- Enterprises involved in converting cars into electric vehicles with infrastructure developers and local associations

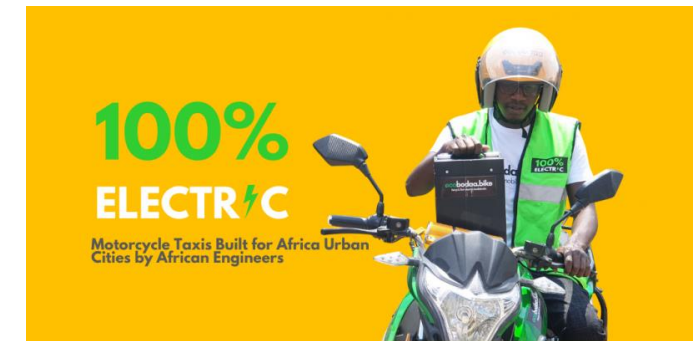


Fig.10: E-motorcycle

Development of the industry

- Establishing an E-Mobility Network Infrastructure System (ENIS)
- Kenya Power: EV charging infrastructure, incentives for EVs investments and adoption

Green Hydrogen

Hydrogen

- **Most plentiful resource in the world, found in many different chemical compounds**
- **Used in many industrial processes (metal processing) where it emits carbon dioxide**
- **In gas form, can be used as an energy carrier or fuel, with low carbon footprint**
- **Energy intensive to produce. 95% of global hydrogen production generated by fossil fuels**

Decarbonisation potential

- **In thermal uses (e.g. heating) and for transportation in combination with fuel cells**
- **For electric power generation**
- **In many industries: steel, cement and chemical industries**

Opportunities

- **High potential for energy transition (especially in industrial heat processes)**
- **Off-grid production in combination with renewables, thus the term “green” hydrogen**
- **Can be used to produce Ammonia, a major agricultural input as fertiliser**
- **Ammonia has potential for energy storage**
- **Emerging field of research with high innovation potential**

Constraints

- **Scaling-up hydrogen production is expensive, storage risky**
- **Depends on choosing the appropriate technology pathways and viable business model**
- **Many hydrogen-production technologies / methods currently being tested**
- **Requires vast quantities of demineralized water, possibly through desalination (water permit needs)**

Power-to-X

Power-to-X = Conversion of surplus electric power into an energy carrier for other sectors

- power-to-gas (green hydrogen)
- power-to-liquid (synthetic fuels, methanol)
- power-to-heat (hot water)
- power-to-mobility
- power-to-chemicals
- power-to-power
- power-to-food (ammonia, feedstock)

Suitable...

- As a storage medium, to manage VRE in the grid
- For charging EVs (battery storage)

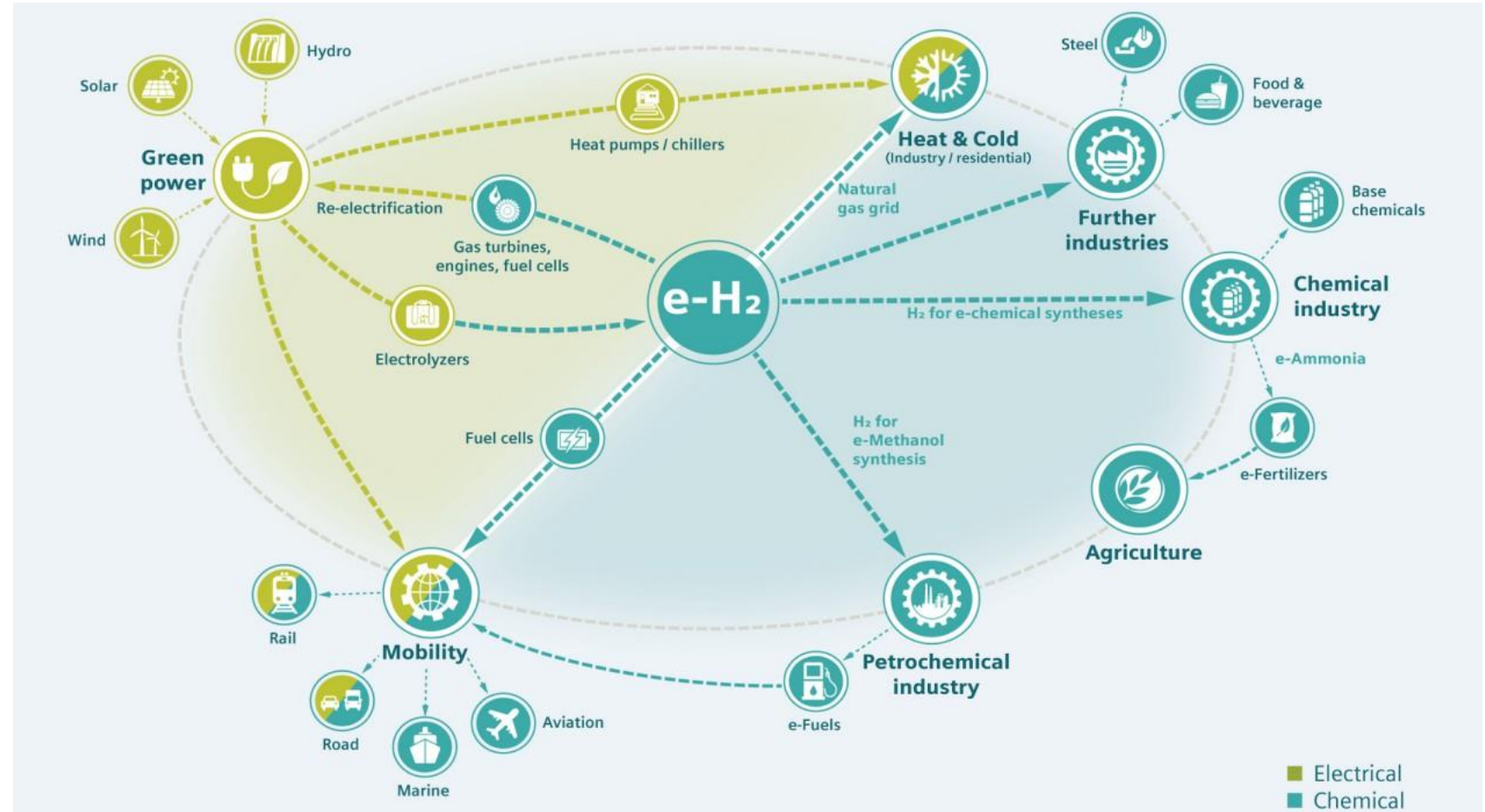


Fig. 11: P2X

Take home messages

- Reporting on the impacts of clean energy transition should be much bigger than merely focusing on achievements in electricity expansion and electricity coverage
- More emphasis needs to be placed on the need for investments to support integrate of RE into the grid, especially due to the large geothermal baseload in the power sector in Kenya.
- In the short-medium term, more money is needed, but long-term benefits are priceless (energy security, stabilized prices, economic development etc.)
- Energy efficiency opportunities are often not talked about a lot (e.g. with regards to industry, transport, cooking etc.)
- New opportunities arising from energy transition need to be followed – technological development pace is quick, with lots of innovation happening. How to keep the public abreast of these?
- Frequent exploration of human interest stories, business success cases – how are the developments benefitting people, re-shaping lives, creating new economic opportunities?
- Backing up stories with statistics is important

Thank you!

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Team Leader and RE expert
Project consultant at
INTEGRATION environment &
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priya@be-development.org

Share your thoughts and feedback after this webinar

very insightful. keep it up

great

It was good. Just extend the time.

Let's have physical training in future

Awesome really learnt alot..robert ruben fm

Loved it. Extremely informative and useful. Thanks to our presenters

It was educative.. Good work.. Keep encouraging journalists and media personnel to spread the word on clean energy transition.

This has been a very insightful discussion on clean energy transition and I hope to attend more such meetings

Very insightful presentations, plenty of stories to report on.

Share your thoughts and feedback after this webinar

Very informative I think when I get out there to report on energy it's very diverse. Looking forward to brighter country if this is not just paperwork.

Clean energy transition is what will form a lasting solution to the climate change in Kenya

I will appreciate getting a link to the presentations. At some point, I was unable to access the chat. This is a very good forum and an eye opener to story ideas

Thanks for such an insightful and apt session. Thanks for the organizing and would be glad to attend more and be a part if possible (am a renewable energy enthusiast)

The presentation was very clear and educational. I have gained a lot which I will ensure to apply where necessary

very informative

very informative-thank you

Physical trainings

Well presented, well organized, thank you!

Share your thoughts and feedback after this webinar

Make it more interactive

So productive. Looking forward for partnership for better energy

The Webner session was informative Thank you so much for the lesson

im so much grateul. personally i lerned alot about the energy sector in kenya

Thanks so much.very informative 🙌🙌 session

The session was very informative and educative, cant wait to attend more of such.

Super insightful. Great thanks

Bravo. It has been a successful session since I got some added knowledge concerning energy matters.

This was so educative and informative discussion on this forum Am so much Rich in matters of Energy Reporting and the impacts This is so great!

Share your thoughts and feedback after this webinar

It was a very insightful and informative presentation on clear energy

A very good presentation by the speakers. The energy sector requires more focus, attention and resources.

Insightful

Very insightful webinar. I've learned so much about Kenya's energy situation and there is clearly a need for journalists to create more awareness by covering human interest stories just as Priya mentioned. I'm happy I joined 🍌

great

Very insightful session

I have learnt alot on energy issues and believe that now could bring change on reporting to issues related to energy

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FIGURES

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Fig. 3: Singularity Hub: <https://singularityhub.com/2018/11/02/why-our-current-energy-transition-is-both-unprecedented-and-urgent/>

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