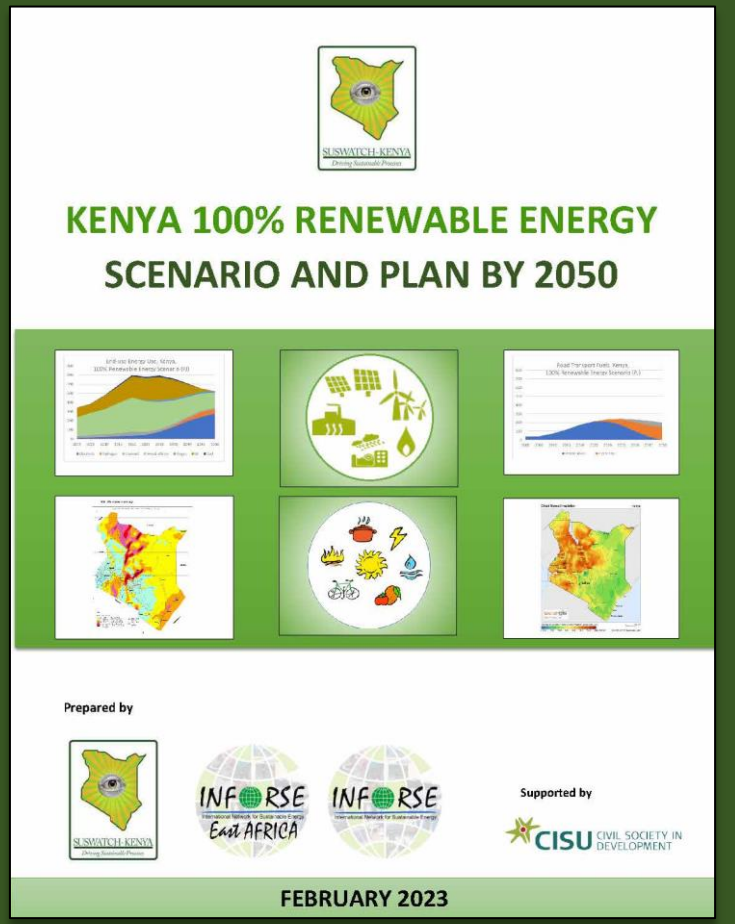
KENYA 100% RENEWABLE ENERGY SCENARIO & PLAN BY 2050



SusWatch Kenya
INFORSE / INFORSE - East Africa

EASCA Project partners:

Supported by

International Network for Sustainable Energy

- Network of 140 NGOs worldwide, formed 1992
- An international voice of NGOs promoting renewable & energy efficiency
- Sustainable Energy News
- Follow climate negotiations, now COP26
- Local solutions for climate & development
- Sustainable energy scenarios, 100% RE
- Active on EU Climate EU policies
- Eco-Village Solutions for climate & develop.

www.inforse.org

INFORSE
International Network for Sustainable Energy

Sustainable Environmental Development Watch (SusWatch) Kenya

Who we are:

- ❑ We are a registered NGO (March 2011).
- ❑ We are a network of CSOs engaged in various thematic areas, contributing to sustainable development.
- ❑ We are the national coordinator of International Network For Sustainable Energy (INFORSE) and a member of Climate Action Network, also a member and the current Chair of the East Africa Sustainability Watch (EA SusWatch).

Vision: "A nation where citizens are mobilized on Sustainable Development issues and livelihood interventions for an improved quality of life".

Mission To lobby and influence the national and county governments as well as other national, regional and global decision-making bodies to fulfill national, regional and international commitments on sustainable development".

- **SusWatch Kenya** has been engaging in the promotion of pro-poor low-emission development strategies in East Africa together with INFORSE and partners from Tanzania, Uganda, and Denmark. This has been primarily through promoting community level best practices in the energy sector while in tandem, pushing for policy implementation and ensuring the Civil Society Voice is considered in decision making processes.
- Currently, SusWatch Kenya, INFORSE and partners are implementing a project, alongside Tanzania, Uganda and Denmark on promotion of sustainable energy and climate solutions in East Africa: EASE & CA Project.

EASE-CA PROJECT PARTNERS

- The EASE & CA project partners are:
- SusWatch Kenya, UCSD and JEEP in Uganda, TaTEDO in Tanzania, INFORSE-East Africa c/o TaTEDO, INFORSE and Nordic Folkecenter for Renewable Energy (coordinator). The project period is 2019-22.
- The Project is supported by CISU, Denmark.

More information on the EASE & CA Project:
suswatchkenya.org/ease/ and inforse.org/africa/EASE.htm

INFORSE East AFRICA

SUSWATCH-KENYA

TaTEDO

UCSD

JEEP

Nordisk Folkecenter for Vedvarende Energi

INFORSE International Network for Sustainable Energy

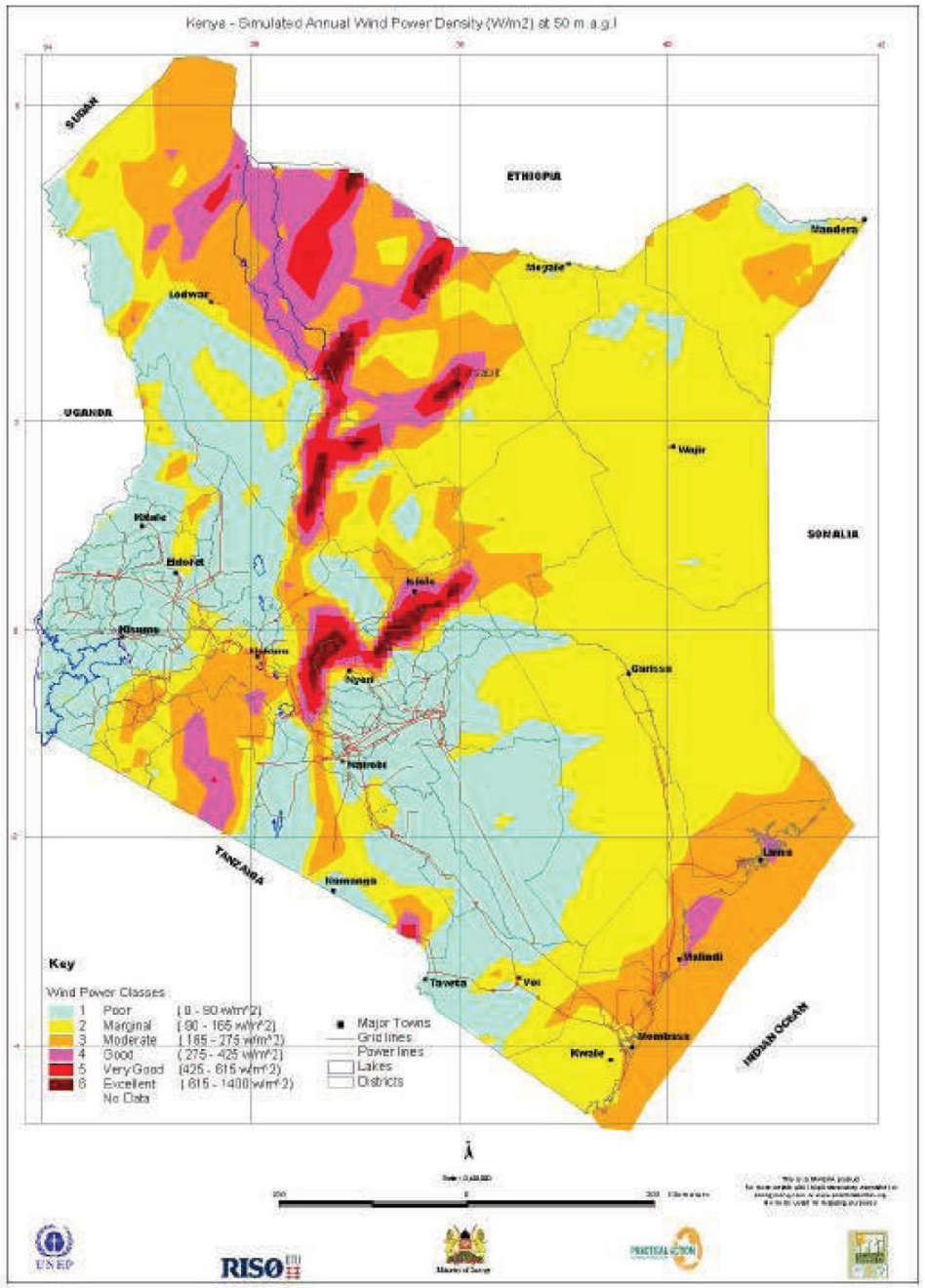
Supported by

CISU CIVIL SOCIETY IN DEVELOPMENT

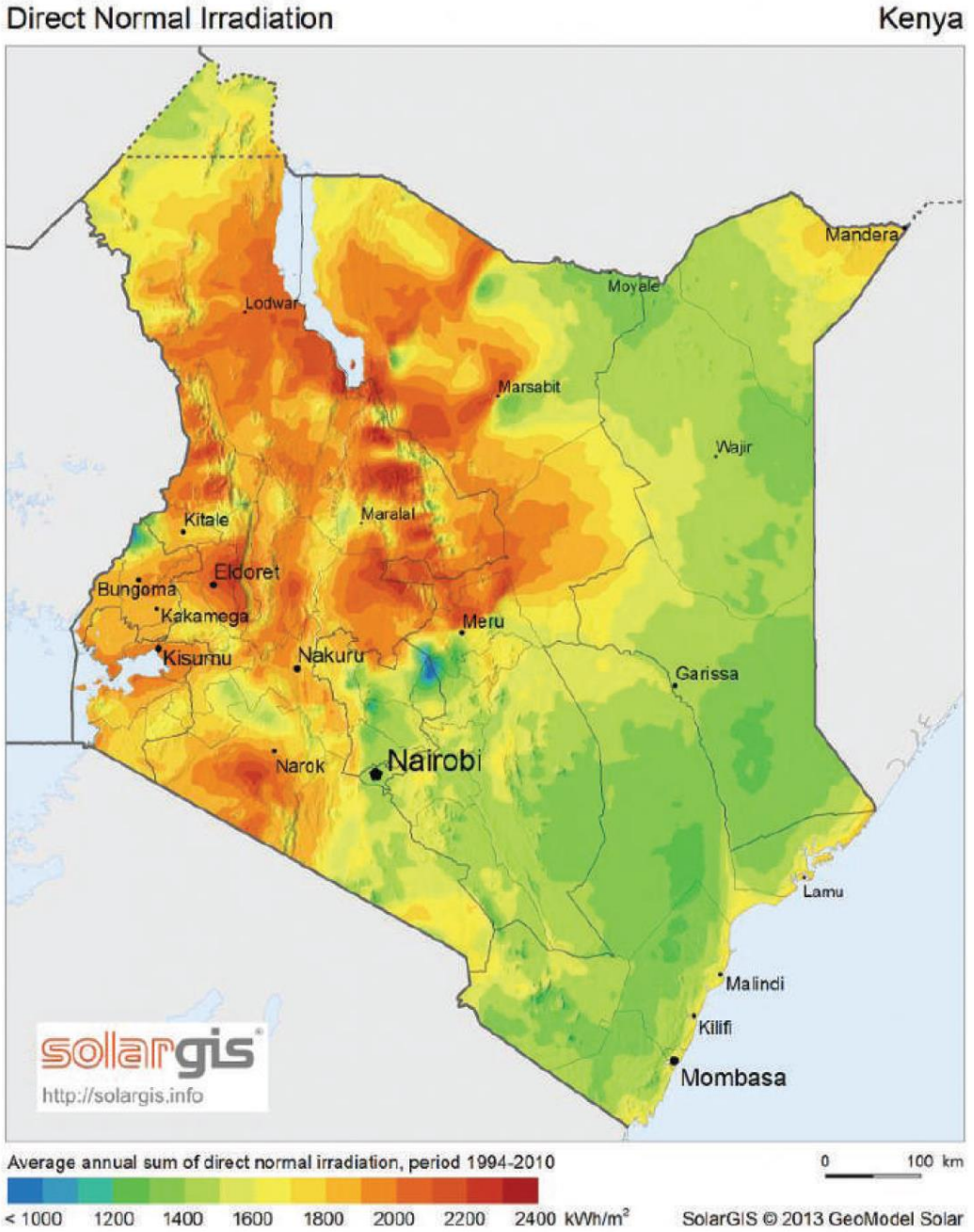
Opportunities for East Africa for 100% Renewables

- ❑ Energy Savings, where it makes economic sense
- ❑ Renewable energy (solar, geothermal, wind) for power demand increase
- ❑ Renewable energy for industry and commerce including SMEs
- ❑ Gradually more electricity in transport (e-bikes, e-buses, e-cars etc.)
- ❑ Energy Access with local solutions, analysis (100% RE Plan) focuses on cooking and electricity outside the grid.

Wind



Solar

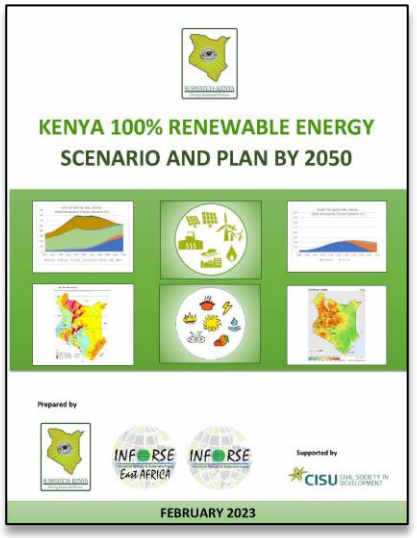


Source: GeoModel Solar

100% Renewable Energy Plan Pathway

- ❑Partners in Kenya and Uganda meet with selected stakeholders and CSO Coalitions for climate and sustainable energy (September 2019)
- ❑Cooperation between SusWatch-Kenya, government, INFORSE, interested CSOs and researchers, including students.
- ❑Develop draft strategies and scenarios for 100% renewable energy on national level, together with interested national stakeholders
- ❑Dialogues with stakeholders on drafts, find the largest consensus.
- ❑Launch of the strategies and scenarios in the year 2020.
- ❑Promotion of the strategy and scenario
- ❑Distributed 200 copies in print + online on Suswatch + INFORSE website
- ❑Policy brief in 2021 on how Kenya can become 100% renewable

Summary for 100% Renewable Energy Scenario & Plan for Kenya Report

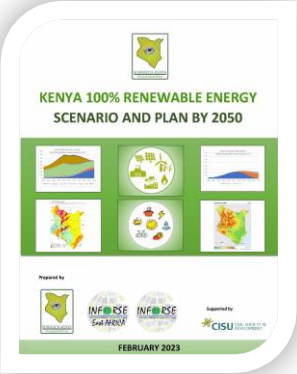


The study gives:

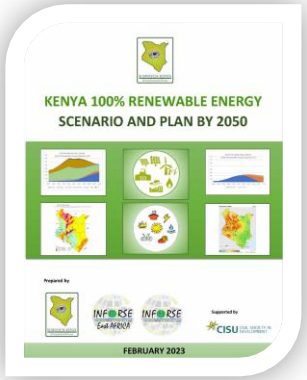
- An overview of the Kenyan situation regarding energy supply and demand in Kenya, and
- Presents a scenario on how Kenya can move into a 100% renewable energy economy until 2050 and at the same time move from a lower-middle income country into an upper-middle income country as well as reduce biomass use for energy to sustainable levels.

Kenya has **vast potentials for renewable energy** and has been ranked fifth globally in an annual Bloomberg index measuring investments and opportunities in clean energy, two facts that together give a good basis for realizing a development as described in the 100% renewable energy scenario in this report.

Conti……

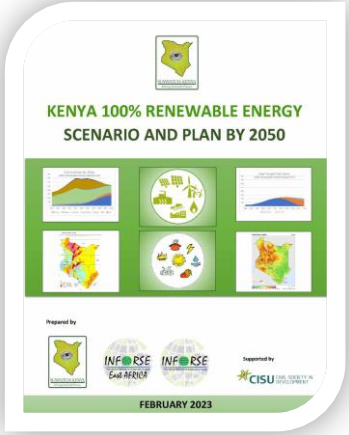


- The plan focuses on how to supply the energy for Kenya's development with renewable energy and how to limit energy use with modern, energy efficient technologies.
- In addition to the scenario for transition to 100% renewable energy, the report also includes a "business as usual" (BAU) scenario for how Kenya might develop without focus on renewable energy.
- A comparison of the cost of energy supply of the two scenarios shows an economic benefit of the renewable energy scenario.
- The report explains specific proposals that lead to 100% renewable energy development. The results include strongly increased electricity production from renewables, the change of the total primary energy demand to 100% renewables, biomass sustainability in Kenya with reduced biomass demand, reduced emissions of CO_2, and estimates of costs of energy supply in the scenarios in 2030 and 2050.



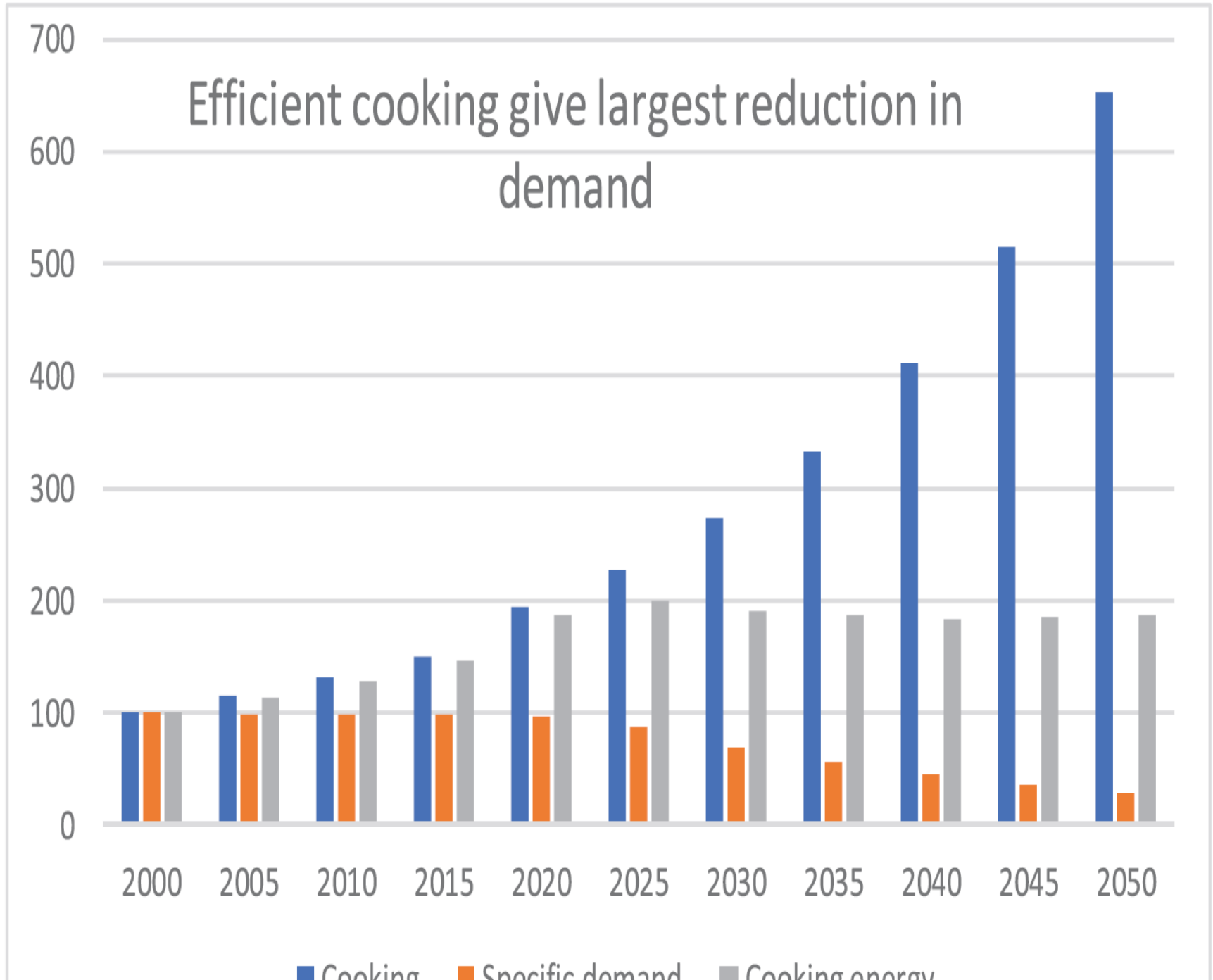
Kenya Development Assumptions
Populations (millions) and GDP (Billion USD)

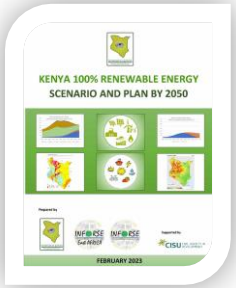
Kenya development assumptions	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Population (millions)	29.5	33.6	38.8	43.6	48.6	53.9	59.4	65.1	71.6	77.9	83.9
GDP (billion USD)	12.7	18.7	40	64.0	97.6	128	169	224	295	390	514



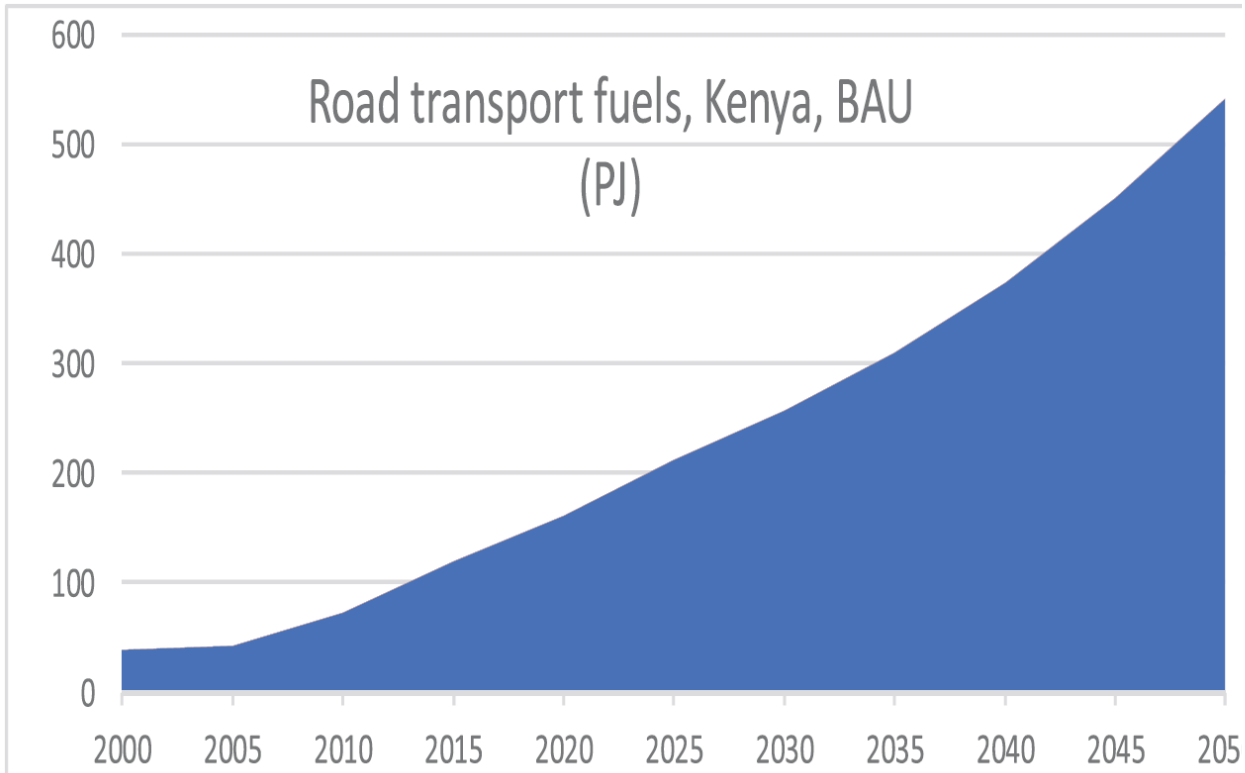
Proposal for a 100% Renewable Energy Development for Kenya

- Efficient cooking, follow Kenya's NDC to 2025 and cont.
- Change transport gradually to electricity, hydrogen and renewable fuels
- Make charcoal production much more efficient, from <15% today to 33%
- Expand windpower to 9,000 MW
- Expand solar power to 17,000 MW
- Expand geothermal power to 5,600 MW
- Expand electric interconnectors to 3,000 MW capacity
- Biomass power plants to balance demand and supply
- Our analysis shows that the 100% renewable alternative is cheaper than nuclear power and also the fossil fuel alternative with coal power.

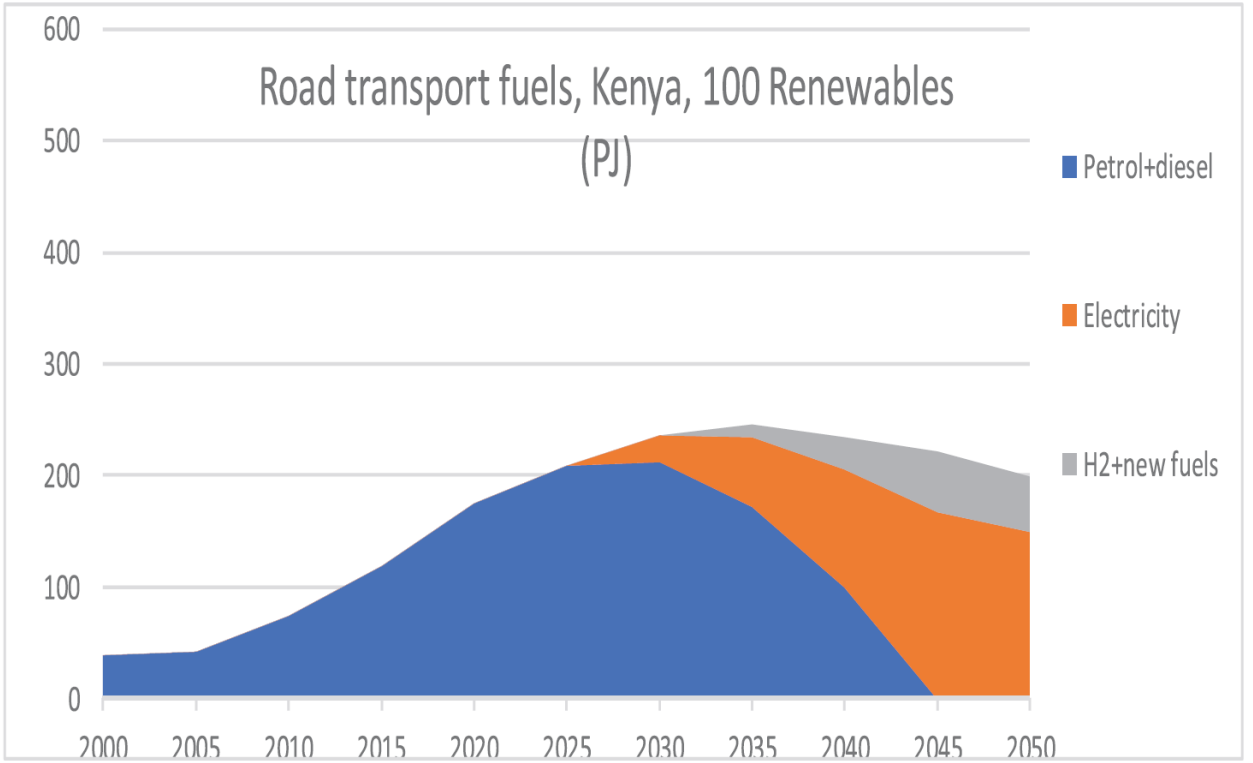

Efficient cooking give largest reduction in demand
700
600
500
400
300
200
100
0
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
Cooking
Specific demand
Cooking energy

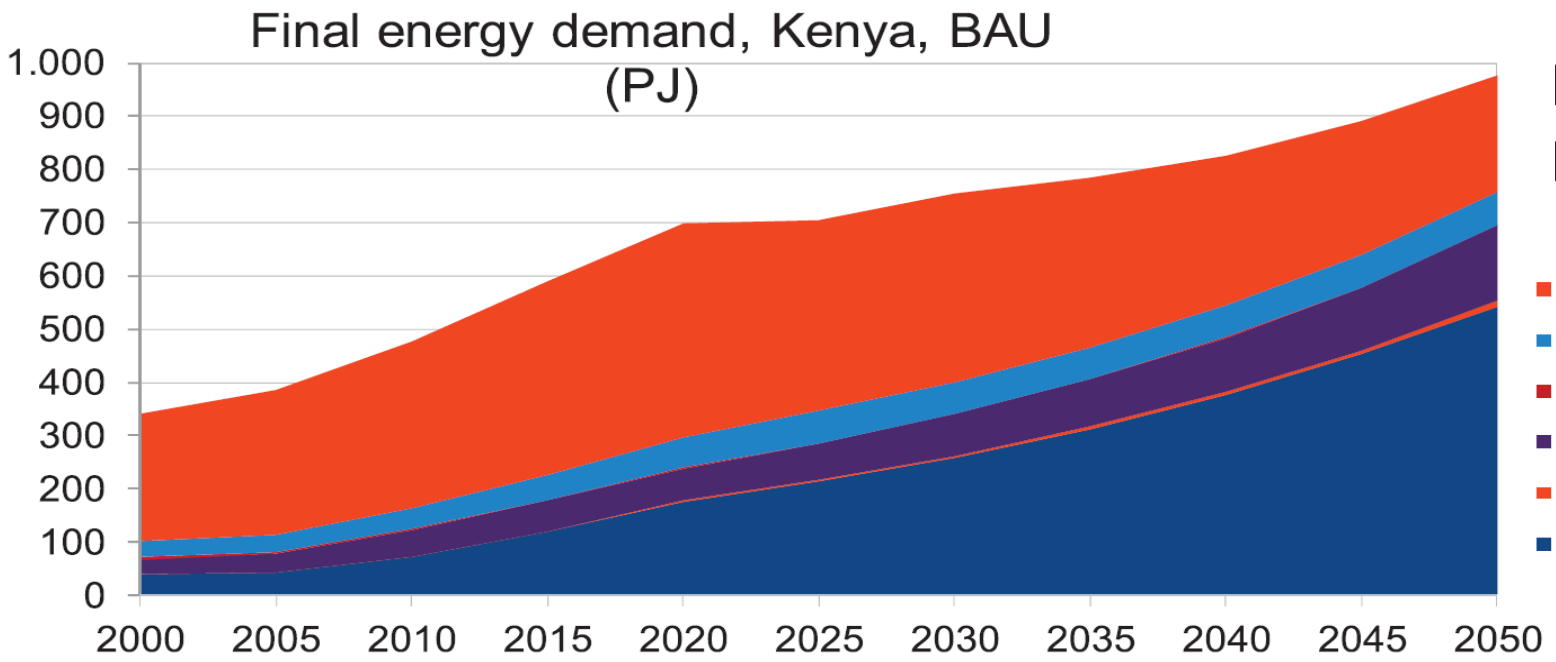


Road Transport Fuels, Business as Usual Scenario (BAU)

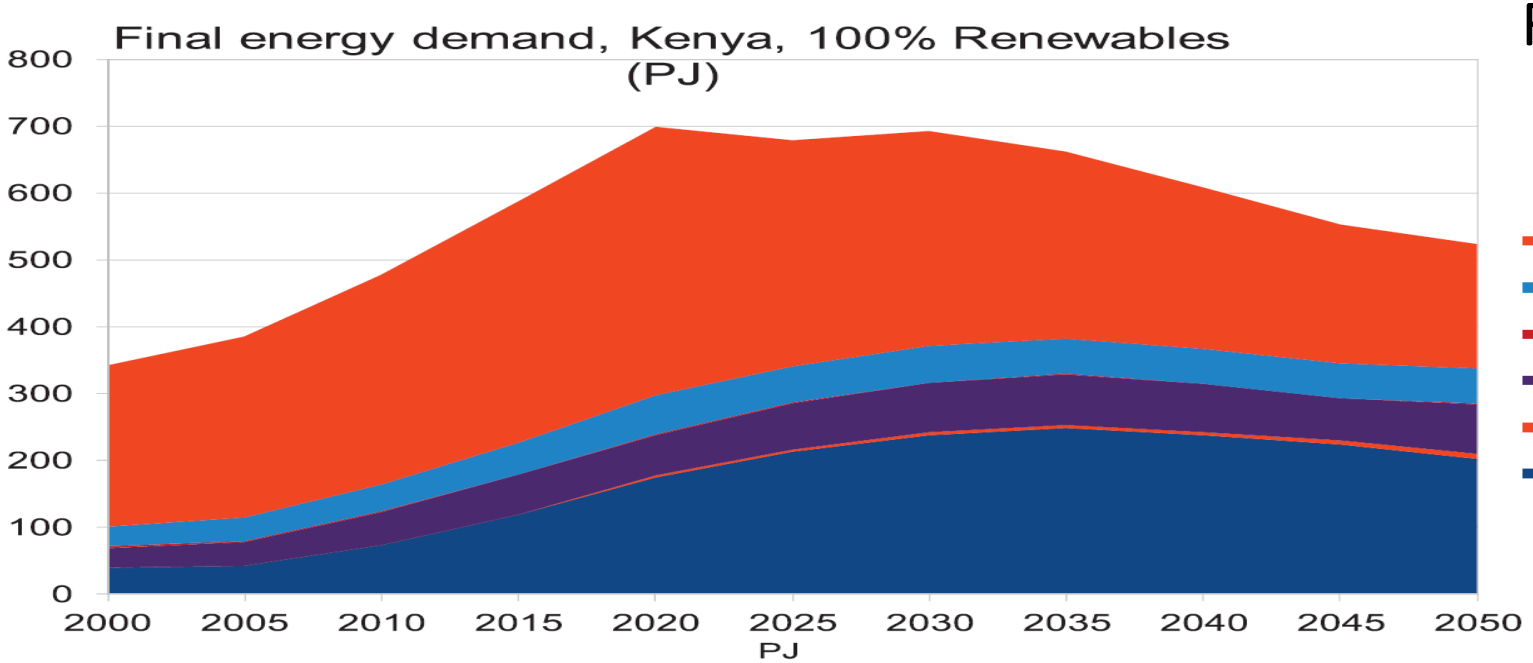


Road Transport Fuels, 100% Renewable Energy Scenario

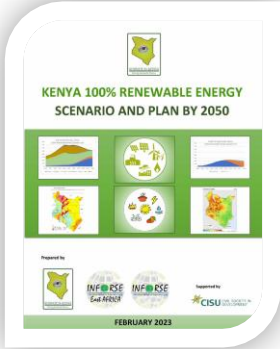


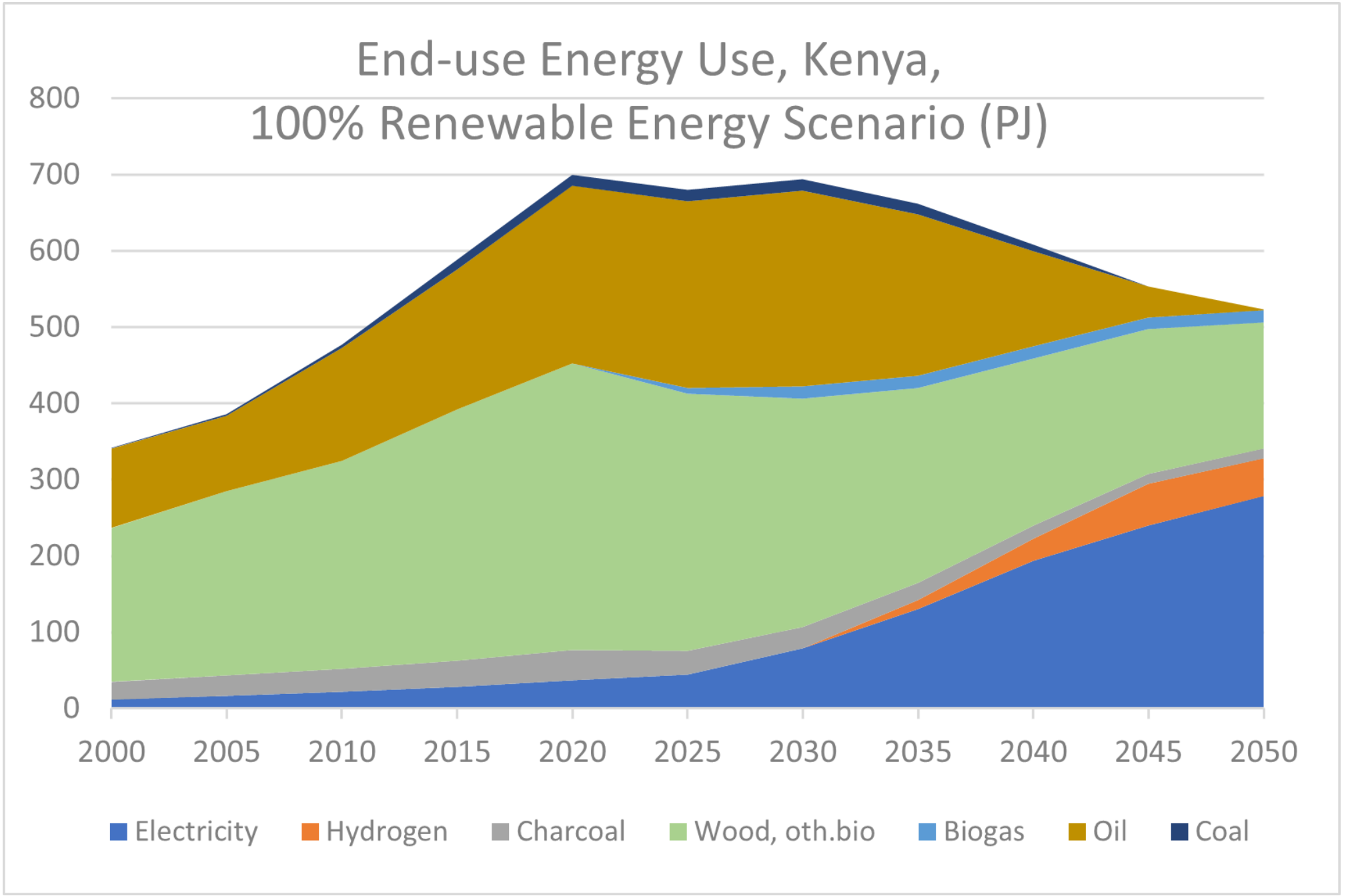


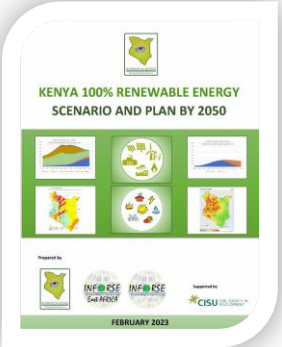
Final Energy Demand (PJ)
Business as Usual Scenario (BAU)

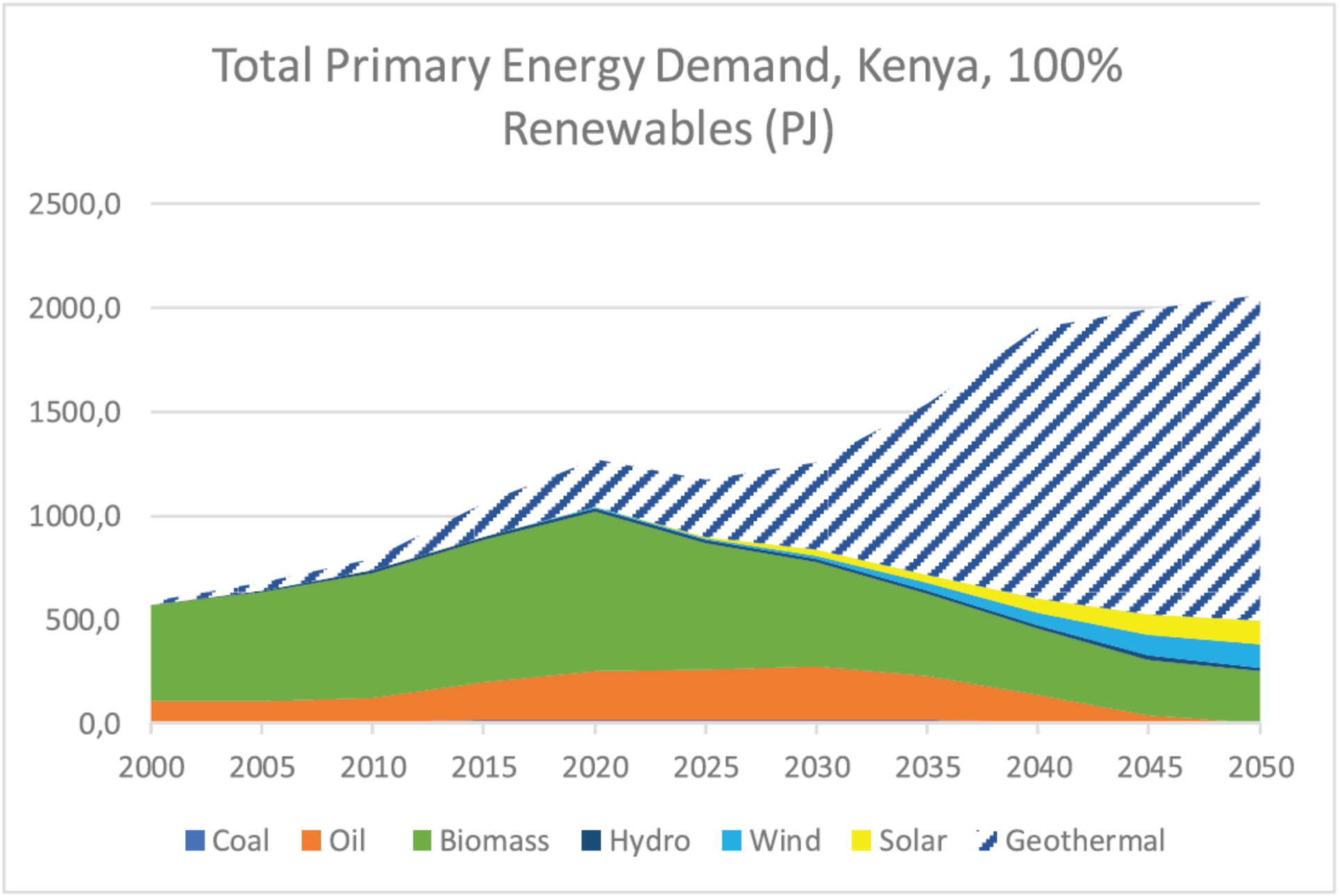


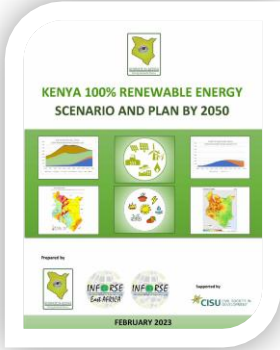
Final Energy Demand (PJ)
100% Renewable Energy Scenario

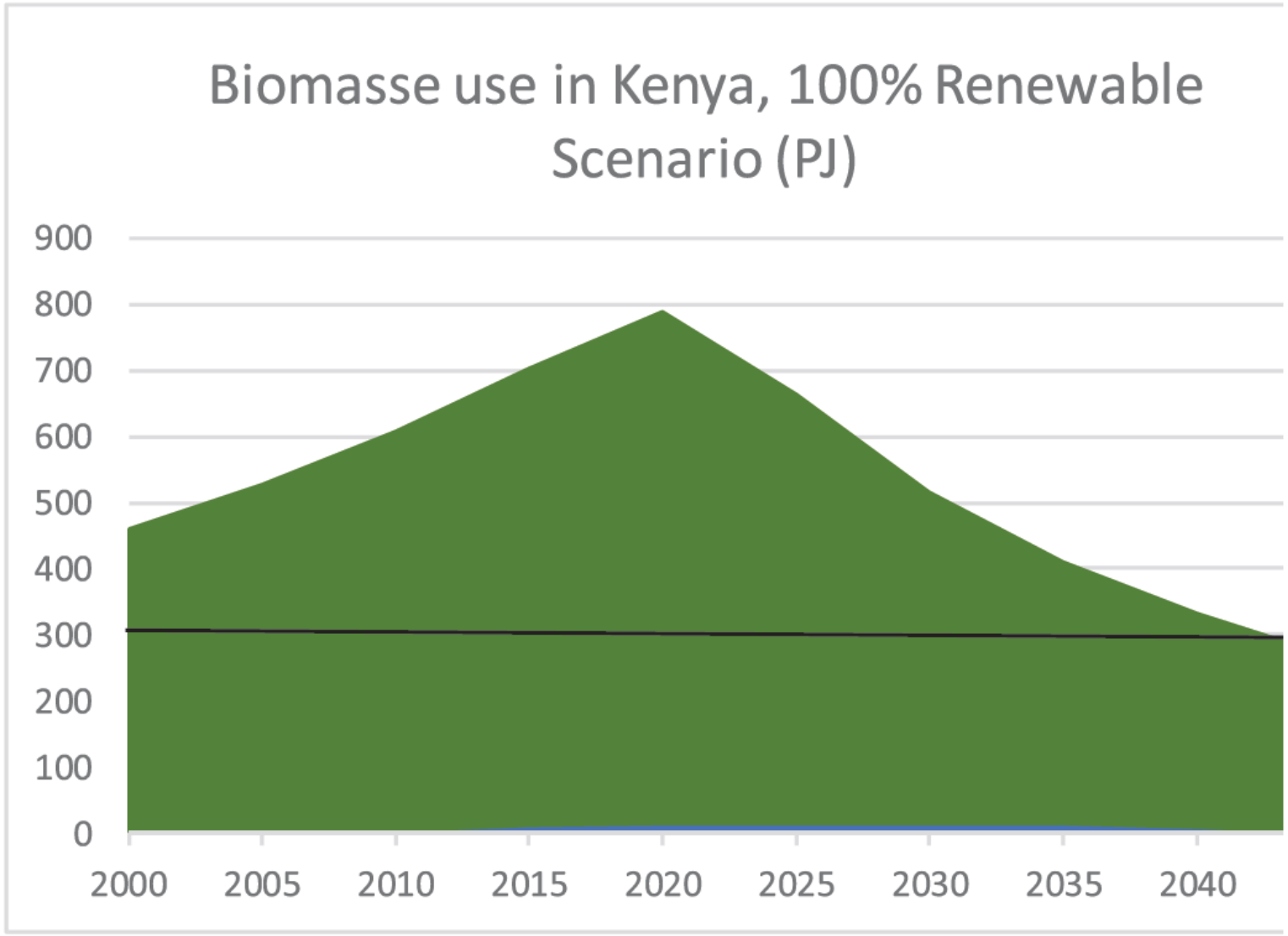



End-use Energy Use, Kenya,
100% Renewable Energy Scenario (PJ)
800
700
600
500
400
300
200
100
0
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
Electricity
Hydrogen
Charcoal
Wood, oth.bio
Biogas
Oil
Coal

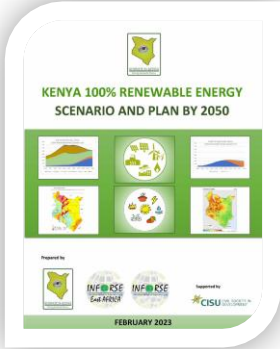

KENYA 100% RENEWABLE ENERGY
SCENARIO AND PLAN BY 2050
FEBRUARY 2023

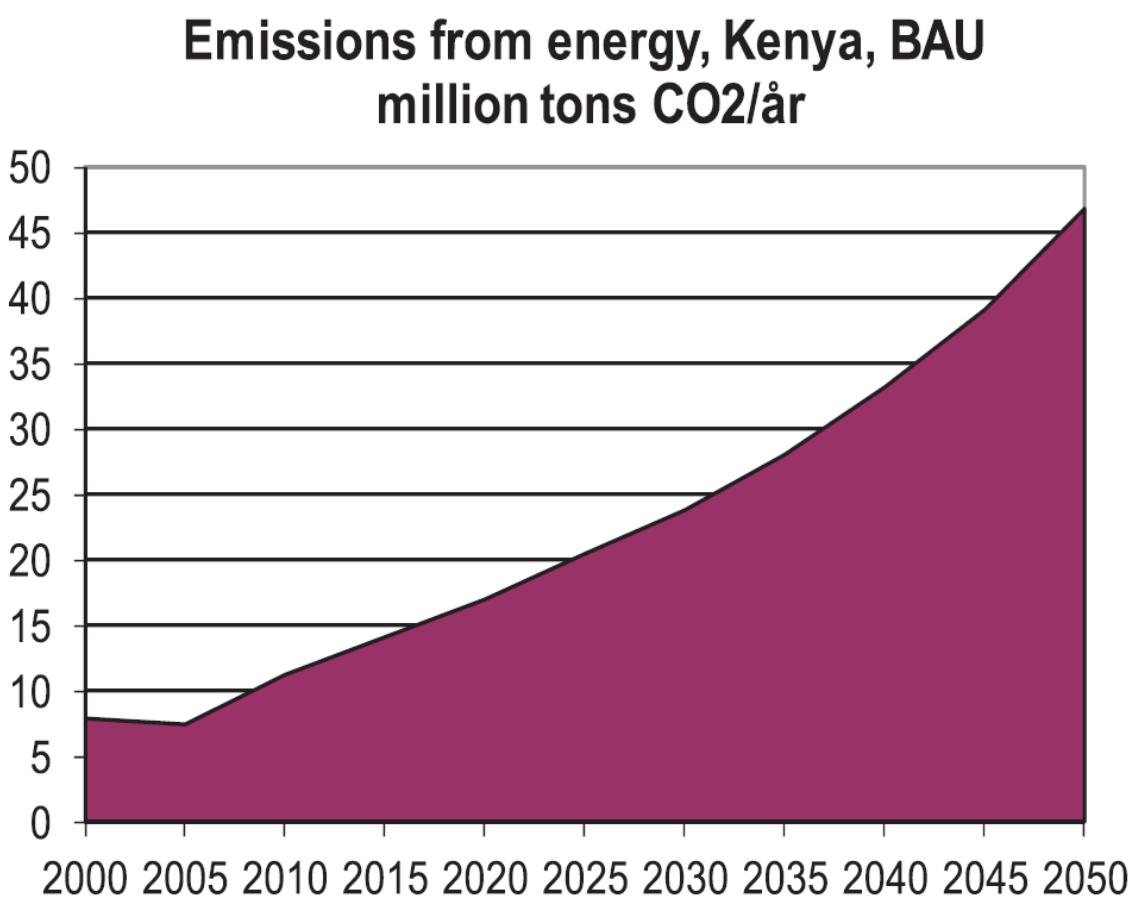

Total Primary Energy Demand, Kenya, 100% Renewables (PJ)
2500,0
2000,0
1500,0
1000,0
500,0
0,0
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
Coal
Oil
Biomass
Hydro
Wind
Solar
Geothermal

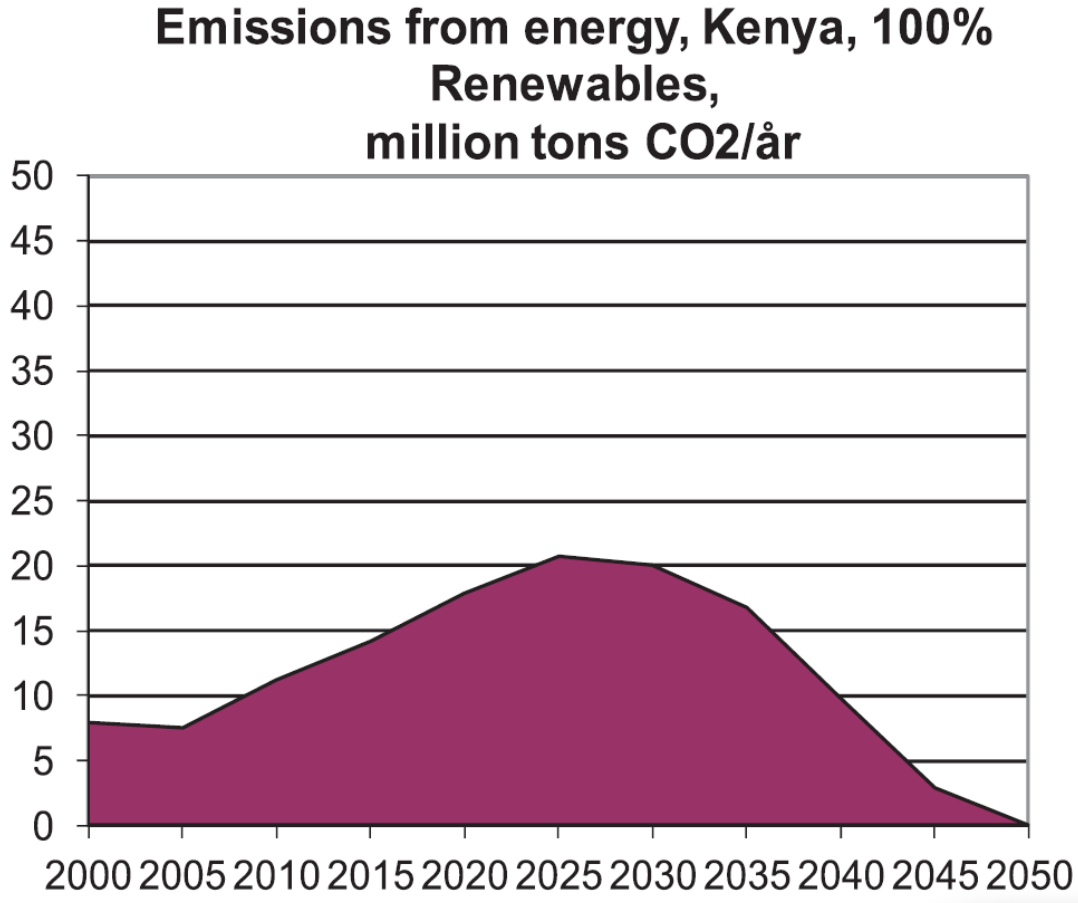

KENYA 100% RENEWABLE ENERGY SCENARIO AND PLAN BY 2050
FEBRUARY 2023

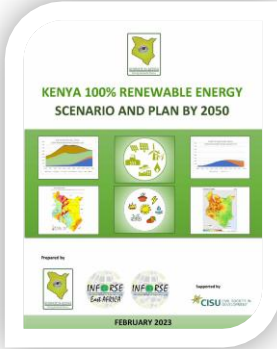


Sustainable level
300 PJ

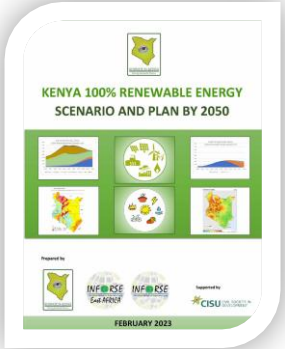


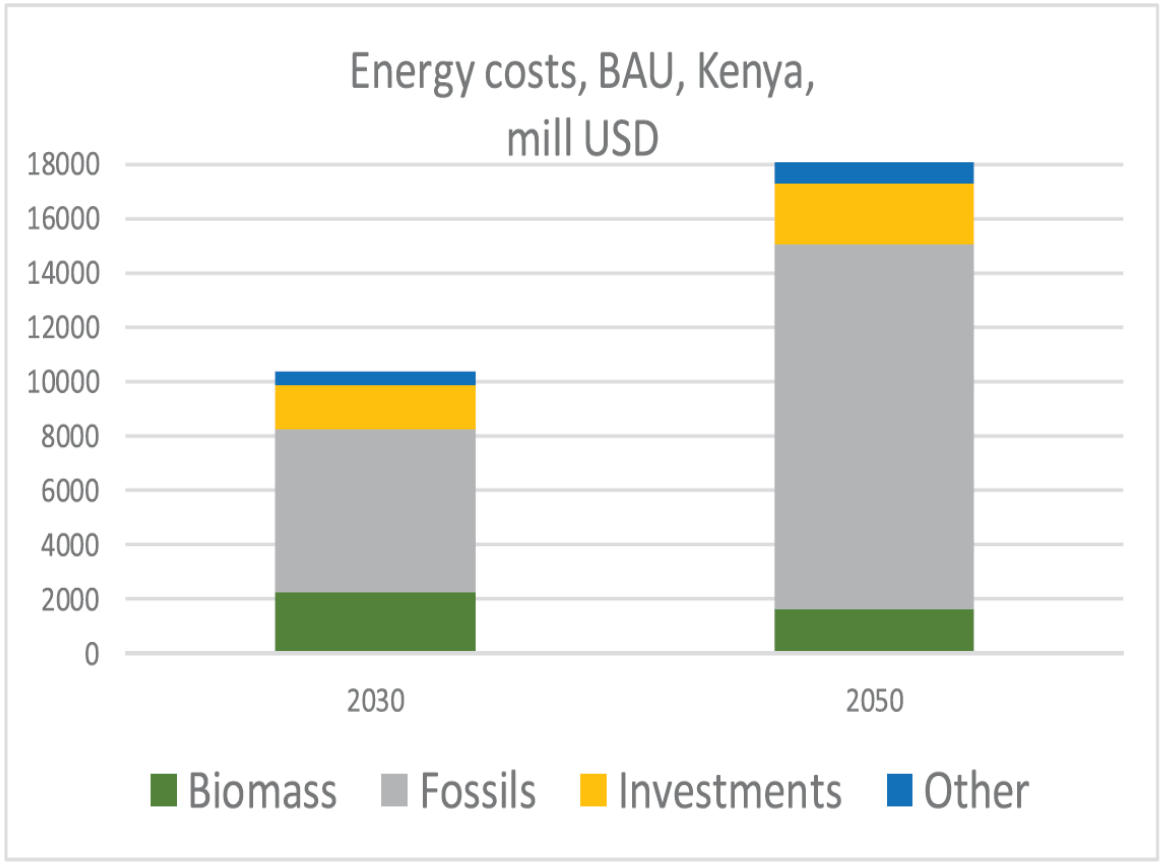

Emissions from energy, Kenya, BAU
million tons CO2/år
50
45
40
35
30
25
20
15
10
5
0
2000 2005 2010 2015 2020 2025 2030 2035 2040 2045 2050

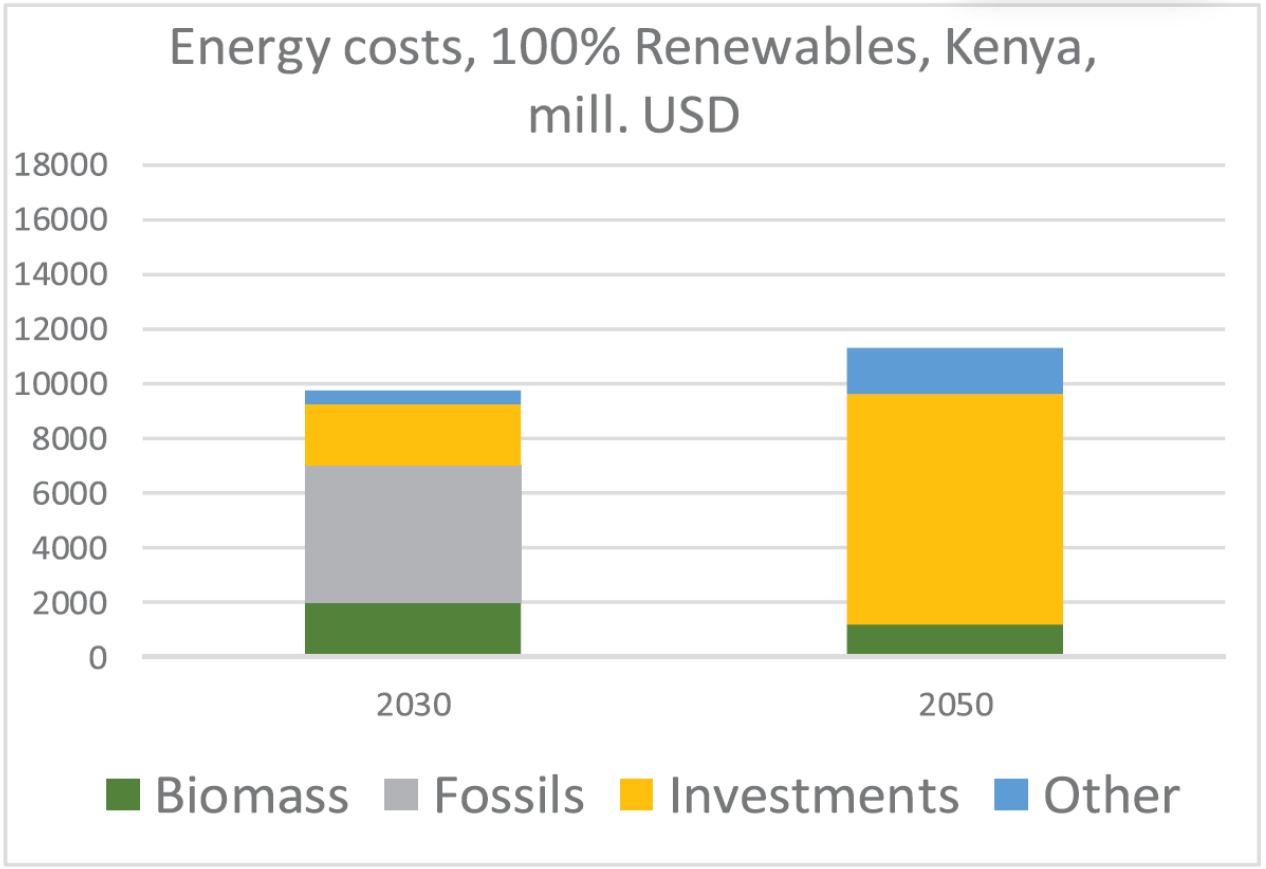

Emissions from energy, Kenya, 100% Renewables,
million tons CO2/år
50
45
40
35
30
25
20
15
10
5
0
2000 2005 2010 2015 2020 2025 2030 2035 2040 2045 2050


KENYA 100% RENEWABLE ENERGY
SCENARIO AND PLAN BY 2050
FEBRUARY 2023

Cost Comparison with
Oil Price 54 USD/barrel in 2050, interest rate 10%



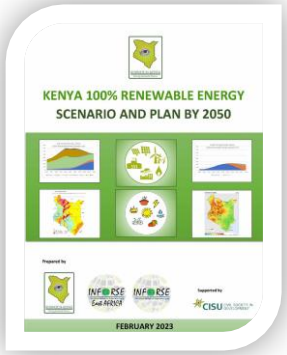




-and with nuclear power the energy will be more expensive

Key recommandations

1) Energy expansion is crucial if the country is to provide all with energy access and provide energy for developments that can improve the country's economic performance.
2) Investing in modern energy solutions with energy efficiency and cleaner, renewable energy should be priorities. There should be high priority on efficient cooking, but all sectors must be in the scope for increased energy efficiency.
3) Diversifying the energy mix into different renewables to reduce over-reliance on finite resources like hydro-generation and petroleum sources of energy without creating new dependencies on energy imports.
4) Fully exploiting clean and renewable energy sources that are locally available like geothermal, wind and solar.
5) Fully exploit energy efficiency potentials in all sectors with capacity building on energy efficiency, regulation, and energy audits in domestic, service, and industrial sectors.



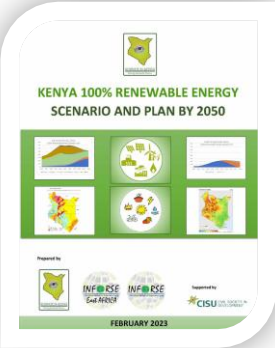
Key recommandations, continued

6) Managing the cost of energy through optimal combination of energy efficiency and affordable renewable energy should be a priority. Expensive energy solutions as nuclear power should be avoided.

7) Make biomass use for energy sustainable with a combination of efficient biomass use, efficient charcoal production, increased supply with plantations etc. and change to affordable alternatives based on renewable energy as they become available. This shall include better enforcement of the legal and regulatory framework for sustainable production, distribution and marketing of biomass as well as stronger promotion of sustainable afforestation programmes.

8) Make transport energy sustainable with use of electric transport, based on renewable electricity.

9) Raising public awareness of more efficient energy use, including energy efficiency measures, local use of renewable energy, and new technology developments. There is a need to raise awareness of the potentials and benefits of renewable energy, including biogas and solar energy for electricity and heat.

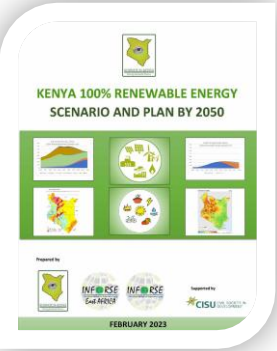


Key recommandations, continued

10) Reducing the geo-political tensions with regional neighbors and carefully/transparently negotiating bilateral and multi-lateral agreements with them to ensure mutual benefit and successful regional integration and cooperation, also on sustainable energy, allowing a larger market for renewable energy and energy efficiency.

11) Involving local communities and county governments along the entire energy chain as well as transparent and accountable management of resources for the mutual benefit of all to reduce tensions and enhance ownership of projects. Local communities must be included in decisions on siting of renewable energy installations (solar, wind, geothermal, hydro), and have benefits that at least compensate for the change in land-use that affects them. The benefits should be long-lasting and can include job opportunities, affordable power supply, and infrastructure as better water supply. Renewable energy installations shall create local development.

12) Gender mainstreaming in the implementation of energy projects and programs.



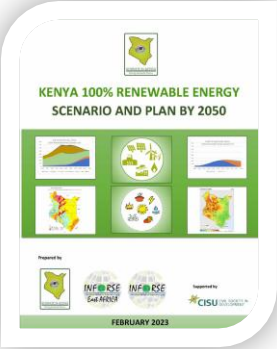
Key recommandations, continued

13) Deliberately creating local capacity on all levels in the new energy areas to create employment and reduce foreign domination of labor in the sector. This shall include increasing the expertise in Kenya in geothermal energy, windpower, and biogas.

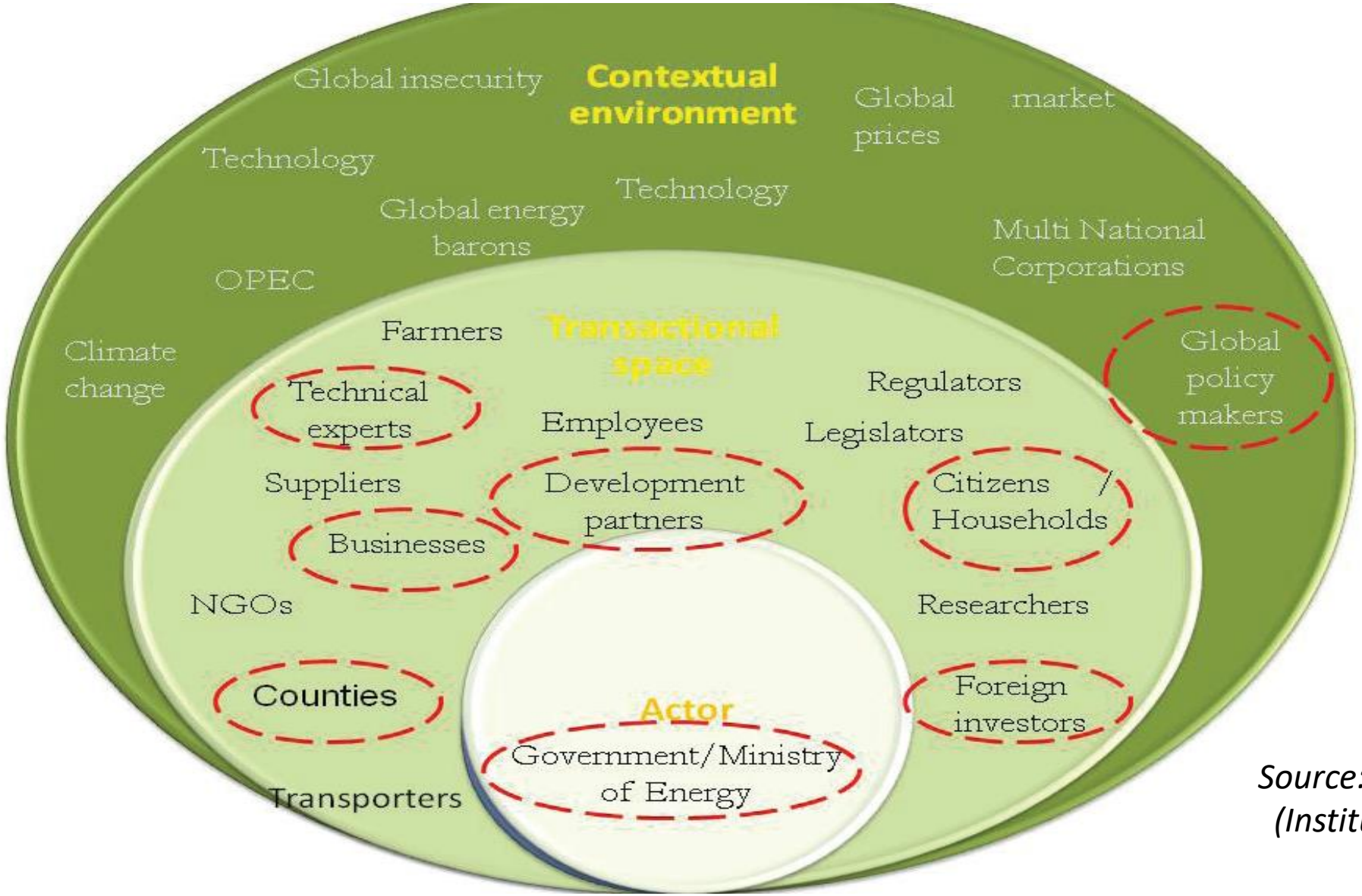
14) Develop Investment cost Frameworks to guide private sector investment in DREs; especially for high capital intensive like mini-grids and grid extension for rural electrification. There is also need to review the existing policies and provisions to protect the private sectors in energy sector from exploitation in energy research, innovations, production and benefits by the government as a way to facilitate sustainable partnerships.

15) Improving regulatory compliance of existing provisions as well as formulation of legal and regulatory framework of energy technologies and resources. This include regulatory compliance of natural gas and oil resources to be able to effectively manage extraction and exploitation, have clear revenue distribution, eradicate corruption, and set sunset dates in line with the Paris Agreement and the renewable energy scenario. It also includes enforcement of standards and regulations for renewable energy, in particular solar technologies, to avoid sub-standard equipment.

16) Fiscal investment in greening of the economy to reduce the impact of climate change and environmental degradation.



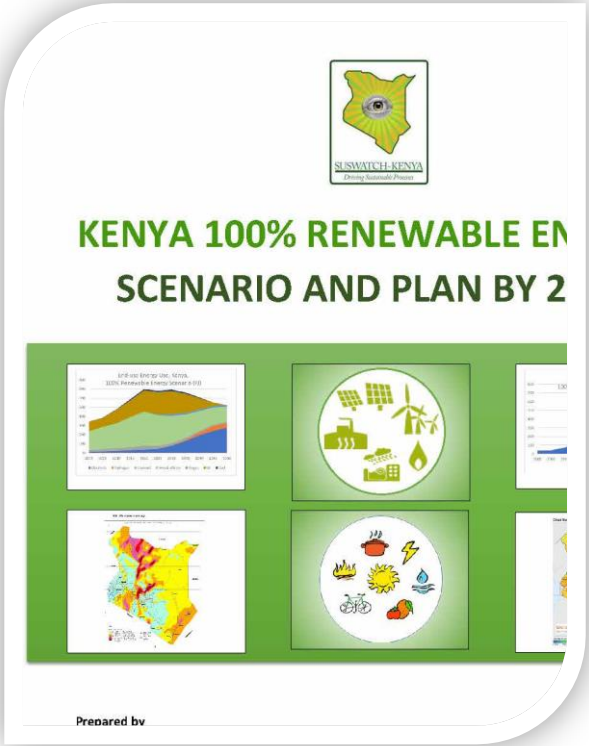
Actors: The working terrain

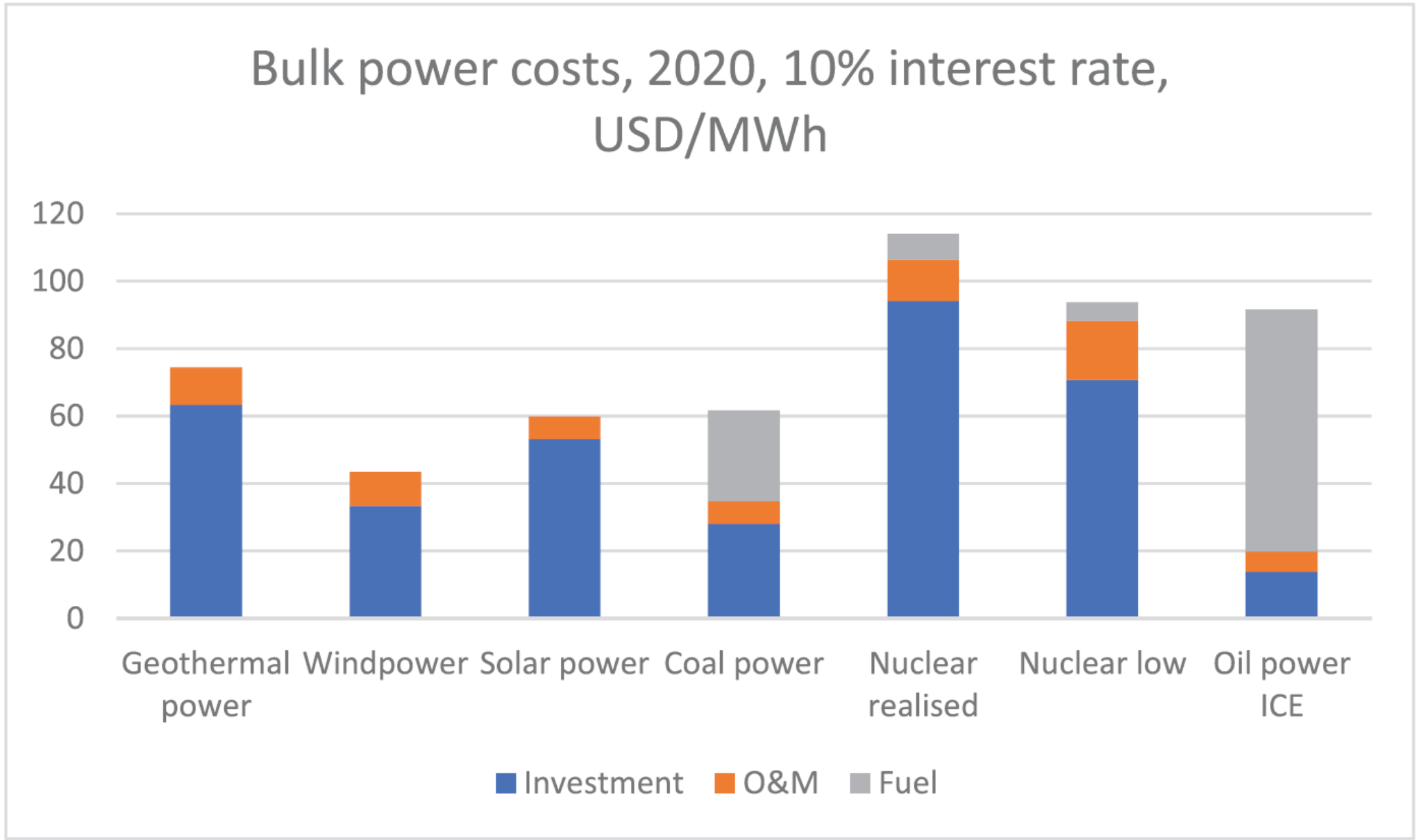


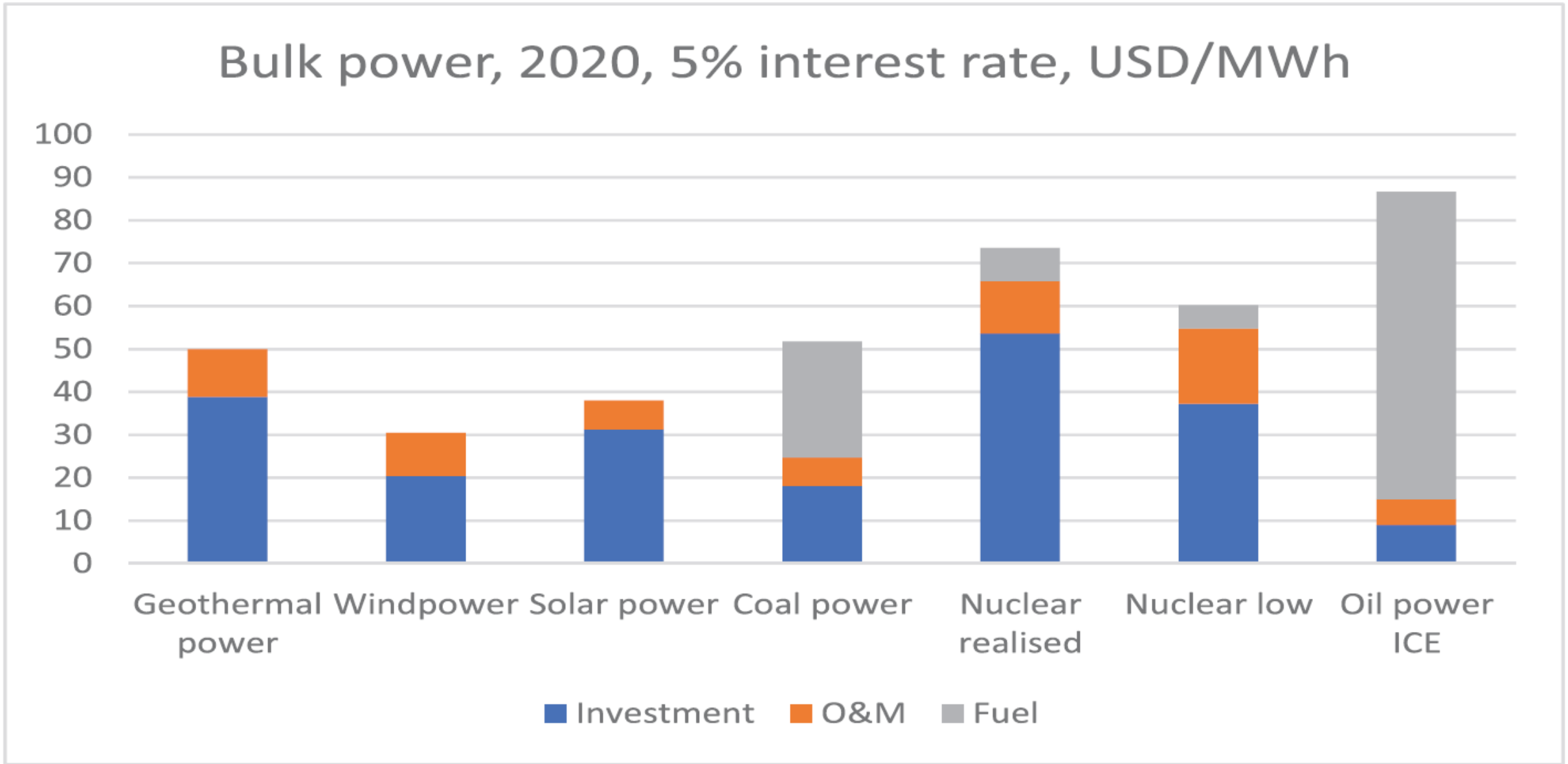
Source: Scenarios participants (Institute of Economic Affairs (IEA), 2015)

Thank you for your attention

www.suswatchkenya.org/100-renewable-energy-plan-for-kenya-by-2050/




Bulk power costs, 2020, 10% interest rate, USD/MWh
120
100
80
60
40
20
0
Geothermal power
Windpower
Solar power
Coal power
Nuclear realised
Nuclear low
Oil power ICE
Investment
O&M
Fuel


Bulk power, 2020, 5% interest rate, USD/MWh
100
90
80
70
60
50
40
30
20
10
0
Geothermal power
Windpower
Solar power
Coal power
Nuclear realised
Nuclear low
Oil power ICE
Investment
O&M
Fuel