

AFRICA CLEAN ENERGY CORRIDOR CONCEPT OVERVIEW

**GAURI SINGH, DIRECTOR
DIVISION OF COUNTRY SUPPORT AND PARTNERSHIPS
INTERNATIONAL RENEWABLE ENERGY AGENCY**

Clean Corridor Concept



- ❑ Transmission links between Eastern and Southern African Power Pools are expanding.
- ❑ Major opportunity for harnessing the renewable energy (RE) potential in the two sub-regions.
- ❑ Renewable power can provide a large share of electricity in an Africa Clean Energy Corridor from Egypt to South Africa.
- ❑ Affordable, clean and secure electric power supply for Africa.



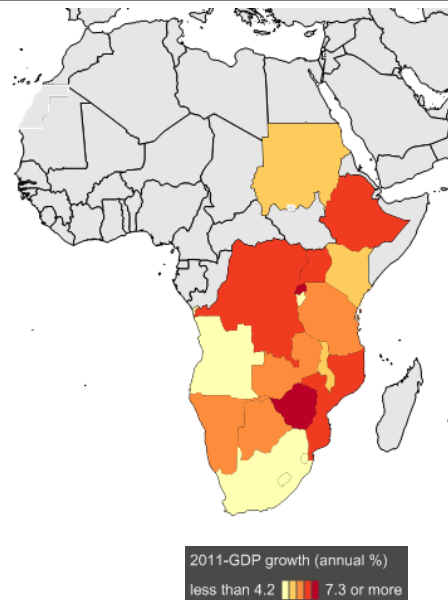
Transmission links :

- Ethiopia – Kenya: An 1100 km long 500 kV DC transmission line with a power transfer capacity of 2,000 MW is at an advanced stage of implementation. The line would enable these two countries to benefit from the respective advantages of their own power systems, which have strong complementarities: the bulk of Kenya's generation is expected to come from geothermal and fuel fired thermal plants, while Ethiopia possesses a large potential of hydro power.
- Mozambique : CESUL Transmission Project (North to South Backbone) this line will provide affordable and reliable electricity to Mozambique, South Africa and SAPP

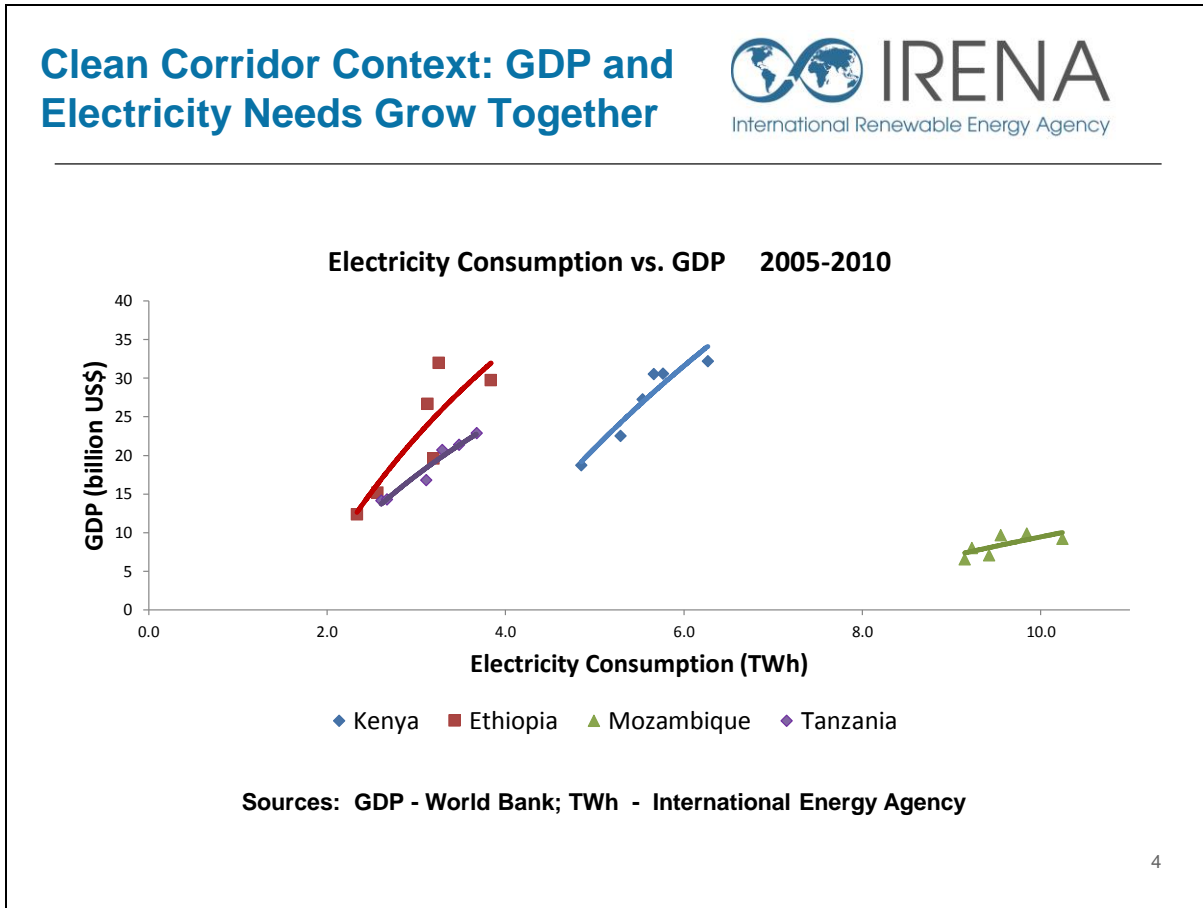
Clean Corridor Context: Fast-Growing Economies



- ❑ African economies continue to grow faster than the global average
- ❑ Over the past four years Ethiopia, Malawi, Mozambique, Rwanda, Tanzania, Zambia, Zimbabwe and Uganda grew at 7 percent or higher
- ❑ Growth is driven by mining, declining inflation, improved access to credit, lower interest rates, increase investment flows and incomes.
- ❑ Electricity demand quadruples in EAPP with growth 5.8 percent per year, (2013-38), doubles in SAPP with growth 4.3 percent per year (2005-25).



Source: World Bank - Africa Development Indicators



Africa is growing fast – and so are its power needs.

Over the 5-year period from 2005 to 2010, in Ethiopia, Kenya and Tanzania, GDP grew an astounding 13.4 percent per annum, and electricity demand grew a little more than half as fast. This is due to the fact that these countries but currently have an overall electrification rates lower than 25%.

Mozambique in the contrary has seen its electricity consumption grow faster than its GDP due to progress made in national electrification from 7% in 2005 to more than 25% in 2012.

If the 7 percent growth rate continues for another two decades, electricity needs will quadruple.

Renewable Power Potential: Much More To Develop



Country	RE Potential*	Planned RE in National Master Plan (by 2030)*
Ethiopia**	Wind: 1000+ GW	12 GW
	Hydro: 45 GW	
	Geothermal: 5 GW	
Kenya	Wind: 0.8 GW	1.5 GW
	Hydro: 6 GW	
	Geothermal: 10 GW	
Tanzania	Wind: 0.5 MW	3 GW
	Hydro: 4.7 GW	
	Geothermal: 0.65 GW	

*Sources: IRENA Studies on Renewable Energy Potential / 2011 EAPP Master Plan

**Ethiopia has conducted detailed Wind and Solar resource mapping

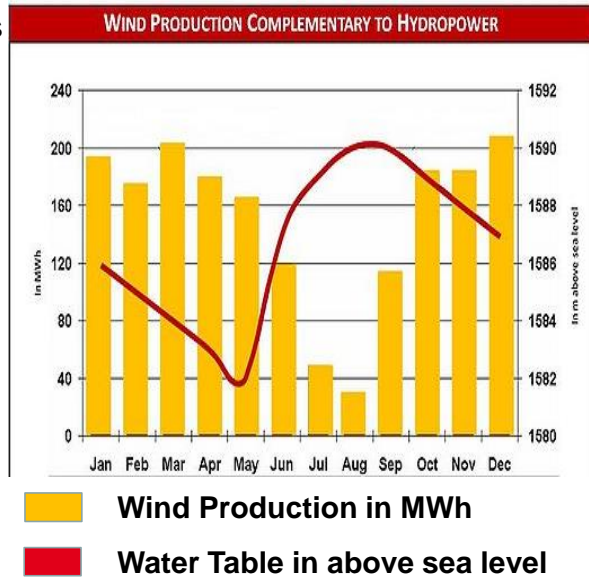
On the second point, renewable energy – clean, reliable, indigenous and affordable – is well-positioned to fill East Africa’s growing needs for generating capacity. Ethiopia, Kenya and Tanzania combined have identified about 15 gigawatts of cost-effective geothermal potential and 40 gigawatts of cost-effective hydro potential. There is also more than a thousand gigawatts of theoretical wind potential, of which 8 gigawatts or so have already been identified as cost-effective.

Renewable Power Potential: Complementary of Resources

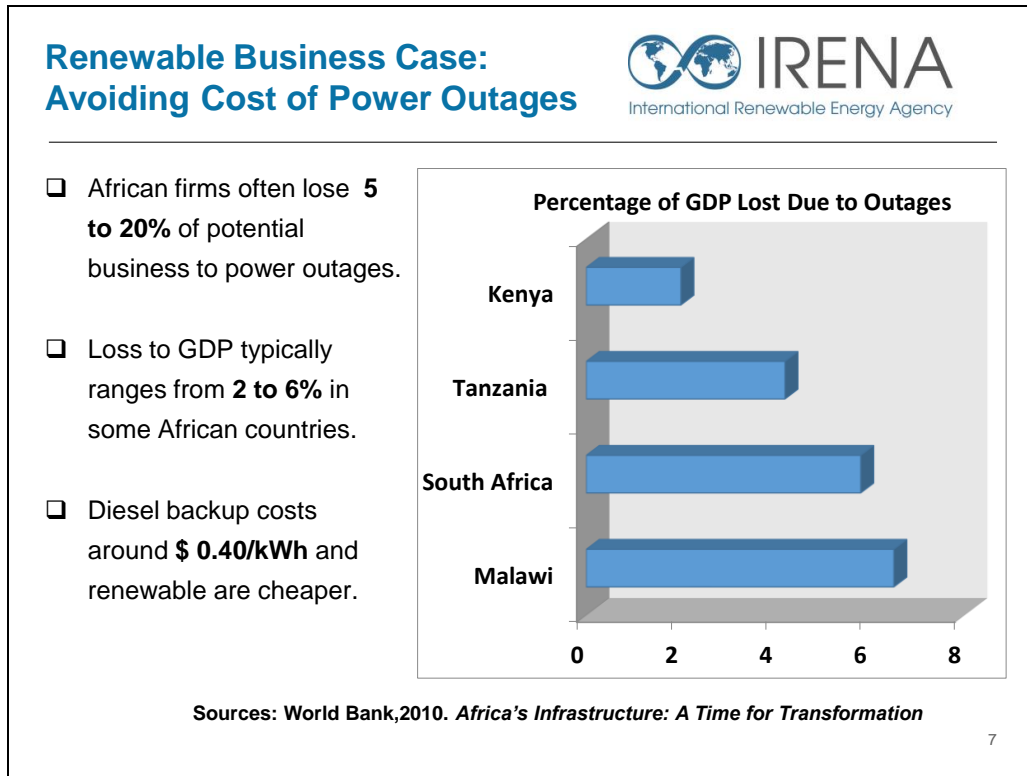


The large hydro potential in the region is subjected to seasonal variability and could be complemented with other renewables.

In Ethiopia, dry seasons are associated with low hydrological discharge while wind regime are high thus creating complementarity between the two resources.



Further study should be done on RE complementarity at national and regional level



A stronger transmission grid will also help African countries get more reliable electric service. More than 30 African countries experience power shortages and regular interruptions to service. The resulting loss to GDP typically ranges from 2 to 6 percent. This is a problem that needs fixing! That is not even to mention the losses in potential output from the fact that 5 out of 6 citizens in East Africa is not connected to the grid at all – their effective outage rate is 100 percent. Indigenous, affordable renewable energy can help to address this with the help of a reinforced grid.

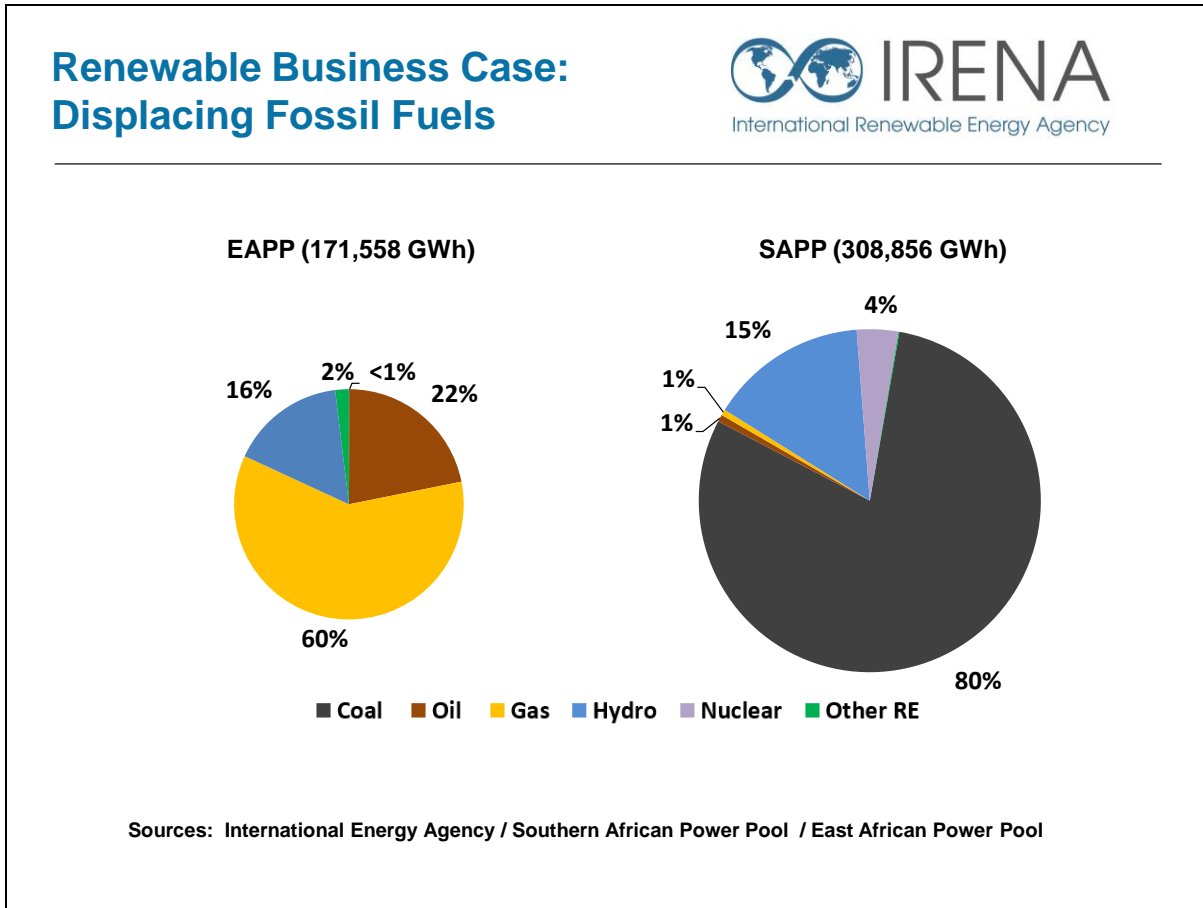
Additional Notes: The underlying causes vary:

- Failures to bring on new capacity to keep pace with the demands of economic growth,
- Droughts that reduced hydropower in East Africa,
- Oil price hikes that inhibited affordability of diesel imports for many West African countries,
- Conflicts that destroyed power infrastructure in fragile states.

Africa's firms report losing 5 percent of their sales because of frequent power outages—a figure that rises to 20 percent for informal firms unable to afford backup generation. Overall, the economic costs of power outages can easily rise to 1–2 percent of GDP.

Inadequate power supplies take a heavy toll on the private sector. Many African enterprises experience frequent outages: Tanzania 63 days, Burundi 144 days. Frequent power outages mean big losses in forgone sales and damaged equipment—6 percent of turnover on average for formal enterprises, and as much as 16 percent of turnover for informal enterprises unable to provide their own backstop generation. Therefore, many enterprises invest in backup generators. In many countries, backup generators represent a significant proportion of total installed power capacity: The cost of backup generation can easily run to \$0.40 per kilowatt-hour or several times higher than the utility's costs of generating power

Note : Economic cost is estimated as the value of lost load multiplied by the volume of load shedding.



Note: The following countries were not included due to lack of sufficient data: Burundi, Djibouti, Eritrea, Libya and Rwanda in EAPP, Lesotho, Malawi and Swaziland in SAPP

At present, substantial shares of electricity are generated from fossil fuel sources in both power pools.

In the southern African Power Pool, which is 80 percent South Africa, not so coincidentally 80 percent of the generation is fired by coal.

The East African Power Pool is two-thirds natural gas but also relies on fossil fuel and hydro for one-third of its generation (22% oil and 16% hydro).

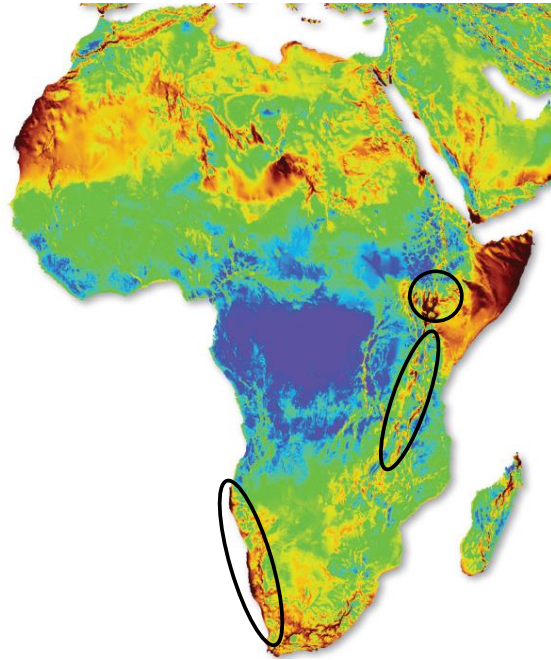
Without a determined effort, the fossil fuel shares may persist and even increase. Indeed, fossil plants account for 70 percent of planned capacity in the Southern African Power Pool through 2025.

But with a commitment to build an East Africa Clean Energy Corridor, the fossil fuel shares can be whittled down, with major benefits for African economies and environment.

Renewable Business Case: Jointly Optimised Generation & Transmission



- ❑ Coordinated pool planning rather than aggregation of national plans to avoids duplication, reduces costs
- ❑ SAPP 2009 draft Pool Plan found that coordinated planning could save US\$47.5 billion over 20 years.
- ❑ EAPP 2011 Master Plan found that regional optimisation of generation and transmission could save US\$7.3 billion over 25 years on top of \$25.2 billion from in-country optimisation.
- ❑ Spatial distribution of renewables is often trans-boundary, requiring a coordinated approach to harness.



Sources: 3 Tier 5 km - Wind Map 9

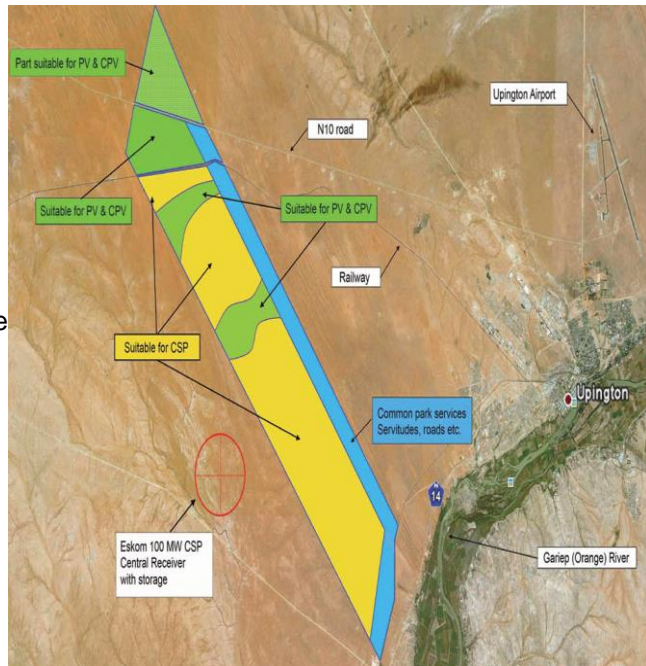
Transmission System Enhancement: Zoning for Economies of Scale



Renewable energy zones are special areas designated for renewable energy generation based on resource potential, land suitability and infrastructure.

With large amounts of renewable power clustered in the zones, high-voltage transmission lines can be built to evacuate the electricity generated to load centres.

IRENA Global Atlas can be a starting point in a renewable energy zoning initiative.



**South Africa's Solar Park (Corridor) Initiative -
Upington, South Africa**

Transmission System Enhancement: Nexus to High-Value-Added Mining



IRENA

International Renewable Energy Agency

- Highly energy intensive (energy represents 15 to 40% of production cost)
- Challenges in securing reliable and affordable electricity
- Production in even more remote sites
- Increased environmental compliance

Opportunity:

- RE can provide reliable, economic energy in remote sites
- Potential for brownfields mines to be converted to green-energy sources
- Economic and community development
- Market based drivers reducing cost of RE

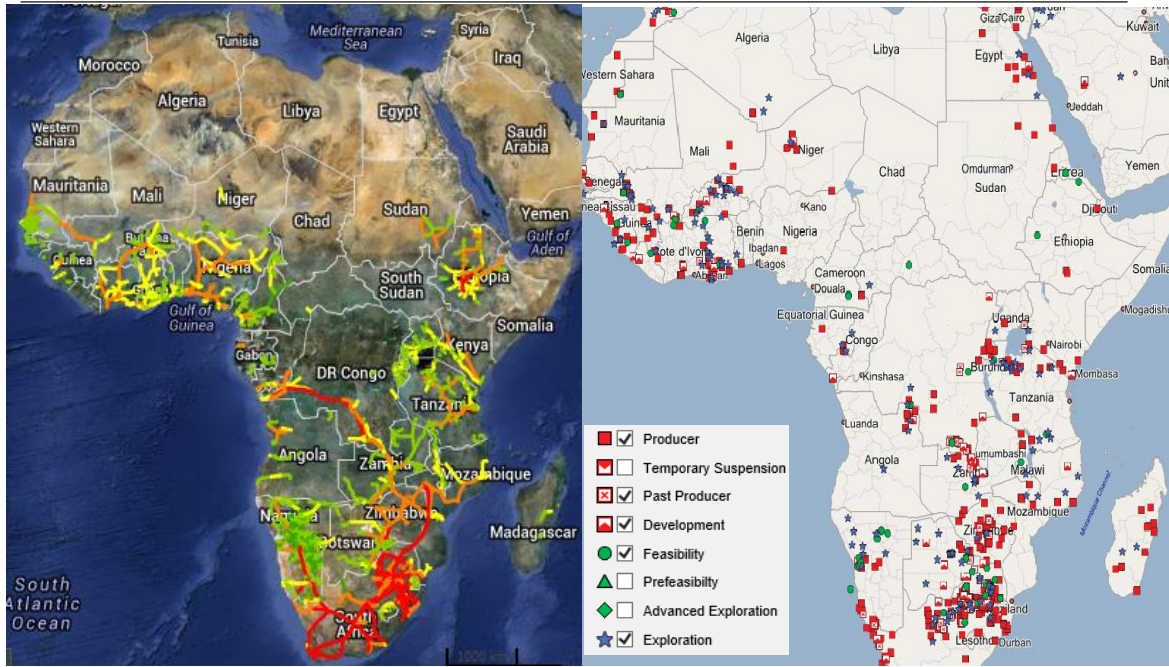
IRENA will work together with the mining sector and energy planners to identify how renewables can be part of the energy solution.

It is estimated that metal and mineral production of 15 important metals in Africa will expand by 78% in 2017 US Geological Survey (USGS).

Cobalt and copper production from known reserves will expand by more than 80% in the Democratic Republic of Congo (DRC) and Zambia respectively.

20% of Electricity Production in Namibia is absorbed by the Mining sector.

Transmission System Enhancement: Nexus to High-Value-Added Mining



Extracted from: IRENA Global Atlas

Source: Infomine - data mapper 12

RE Policy & Regulatory Landscape in Countries



Countries	RE Policy & Strategy	RE Targets	Vertically Integrated Utilities	IPPs in Power sector	RE in Rural Electrification	RE Policy Instruments (FIT, RPS)
ANGOLA			●			
BURUNDI	●					
EGYPT						
ETHIOPIA			●			
BOTSWANA		●			●	●
KENYA				●		
MALAWI						
MOZAMBIQUE			●			
NAMIBIA					●	
D R CONGO						
RWANDA	●			●		●
SUDAN						
TANZANIA					●	
ZAMBIA	●	●				
ZIMBABWE	●				●	
SOUTH AFRICA	●	●	●	●	●	●
UGANDA	●	●		●		●
DJIBOUTI						
SWAZILAND		●				

Overview of Preliminary information on the RE and Electricity policy and regulatory landscape of a selected number of countries in the EAPP and SAPP.

Making the Corridor a Reality IRENA

International Renewable Energy Agency

IRENA will work with countries' to strengthen existing institutional framework to implement policies and regulation to increase the share of RE into future generation plans

IRENA will also facilitate capacity building for resource assessments, demand forecasting, grid integration of renewables, and financing amongst others

IRENA will also partner with Multilateral and bilateral organisations to facilitate setting up guarantee mechanisms to lower risks and allow more private sector involvement (IPPs)

Thank You