

# Power sector planning and grid enhancement

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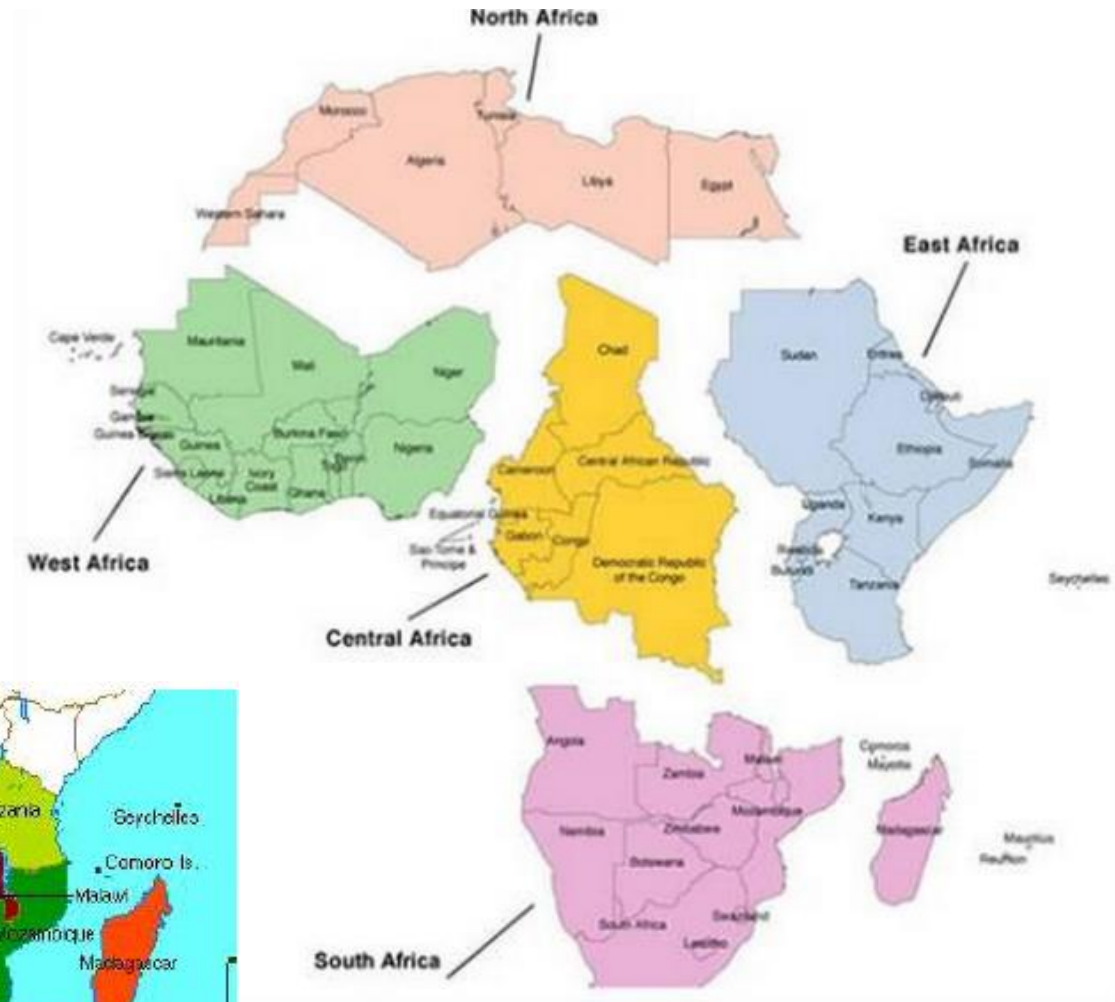
- Pan-Africa Power Sector Model (5 region model)
- System Planning Test model for SAPP countries
- Eastern African Power Sector Investment Planning model for Eastern African countries

[Maghreb region model, Central African region model to be completed soon]



# Regional Classifications in Pan-Africa analysis

- Angola: South (SAPP, CAPP)
- DRC: Central (CAPP, SAPP, EAPP)
- Tanzania: East (SAPP, EAPP)
- Egypt/Libya: North (EAPP, COMLEC)
- Burundi/Rwanda: East (EAPP, CAPP)



CAPP

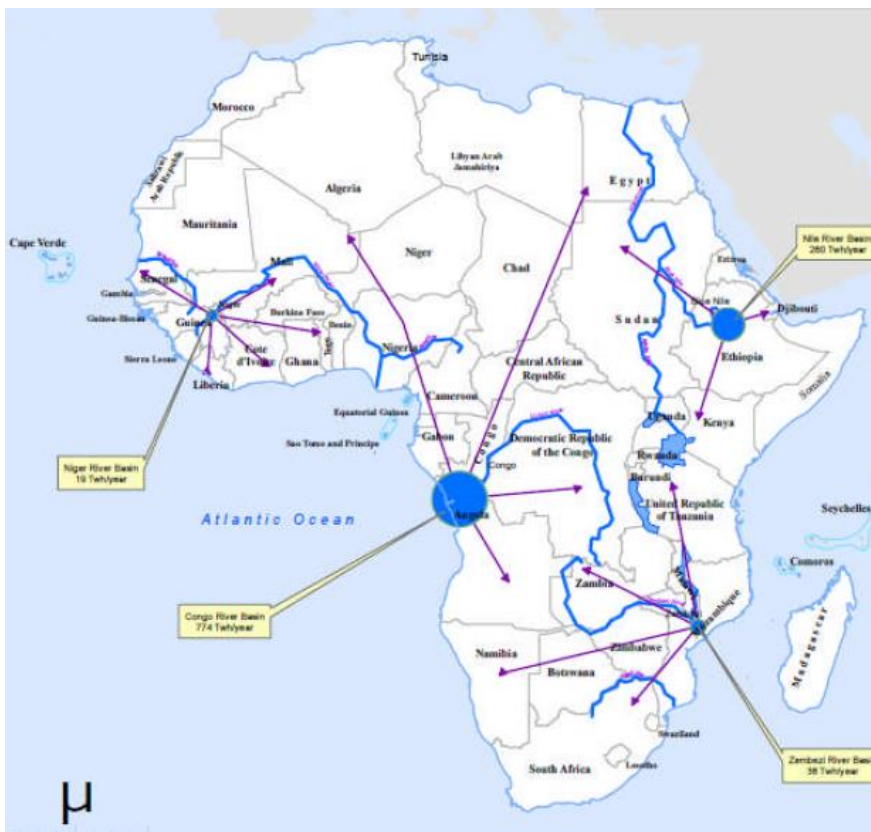


EAPP



SAPP

# Hydro potential and major inter regional trade



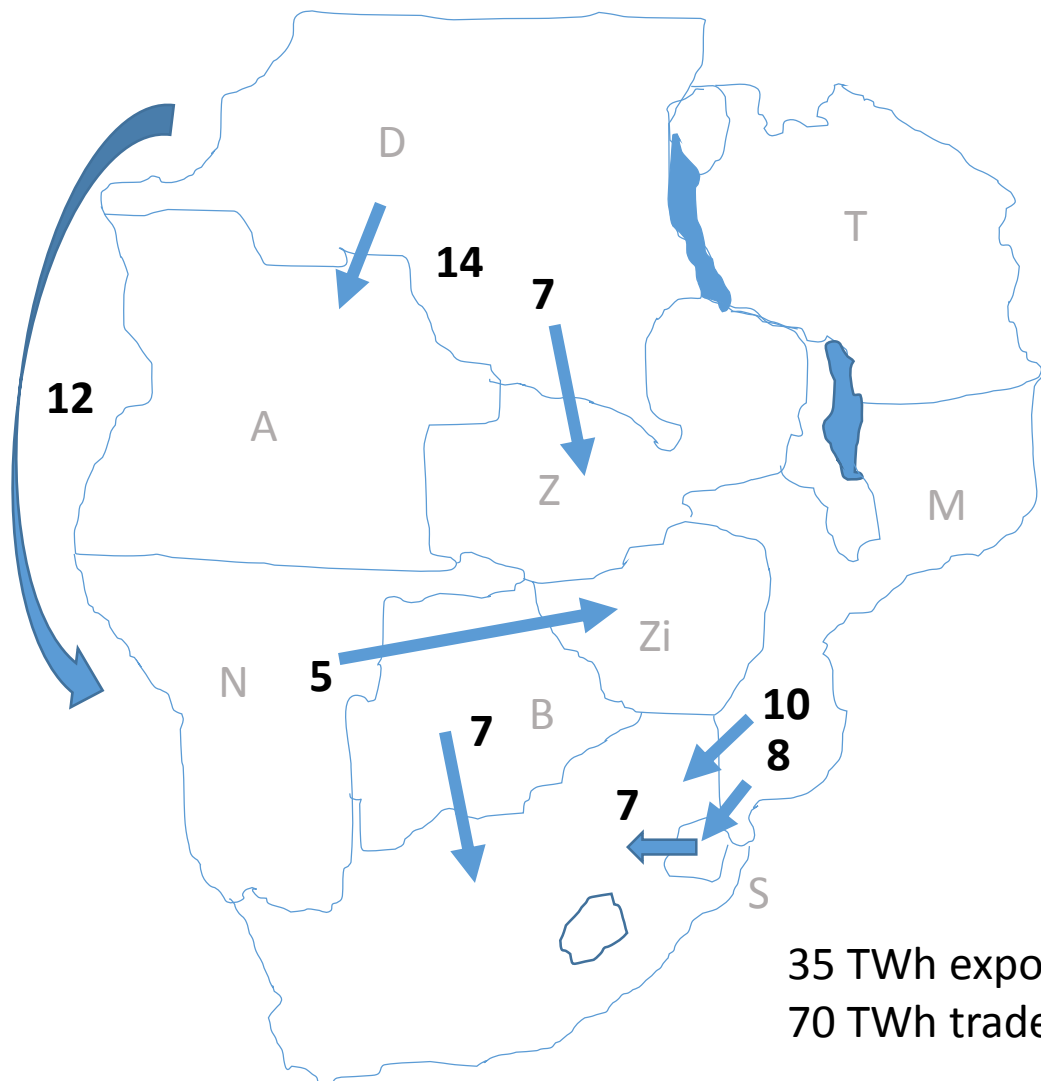
2030		Long term	Export share*	Import share**
Central → South	38 TWh	↓	23%	5%
Central → West	21 TWh	↑	13%	11%
Central → North	1.5 TWh	→	1%	Negligible
East → North	17 TWh	↓	9%	3%
East → South	8.6 TWh	→	4%	1%

\* share in production

\*\* share in consumption

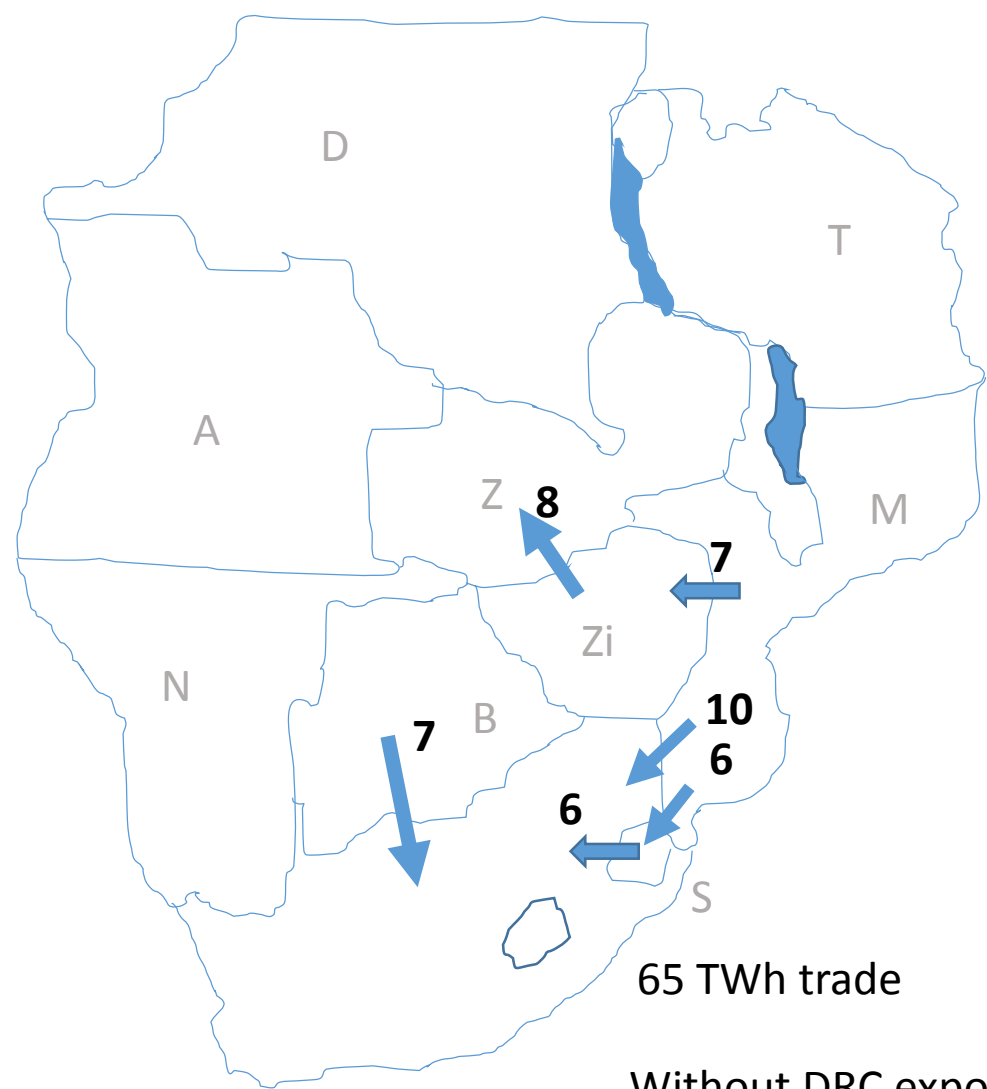
# Intra-regional trade: SAPP

2030: in TWh



35 TWh export from DRC  
70 TWh trade

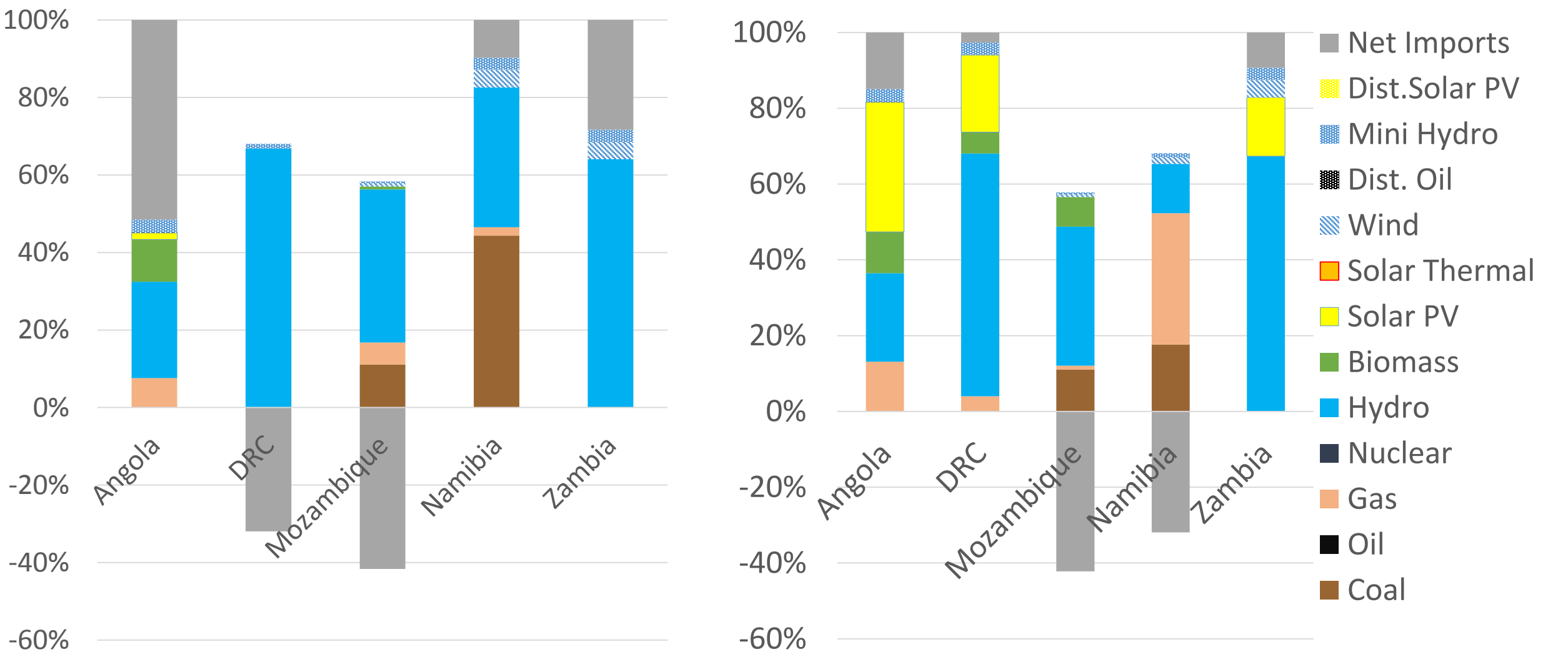
With DRC export



65 TWh trade

Without DRC export

# Intra-regional trade: SAPP (with and without DRC export)

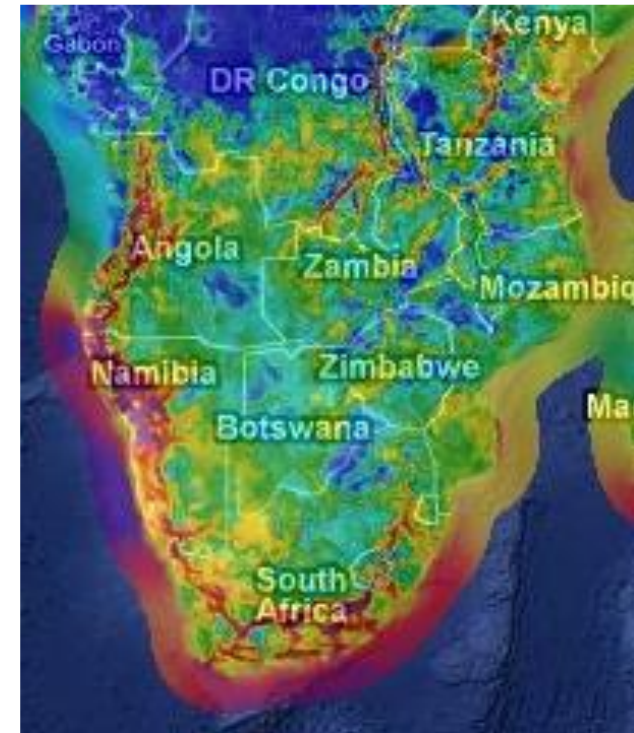


With DRC export (left)  
Without DRC export (right)

## Special consideration for intermittent RE integration

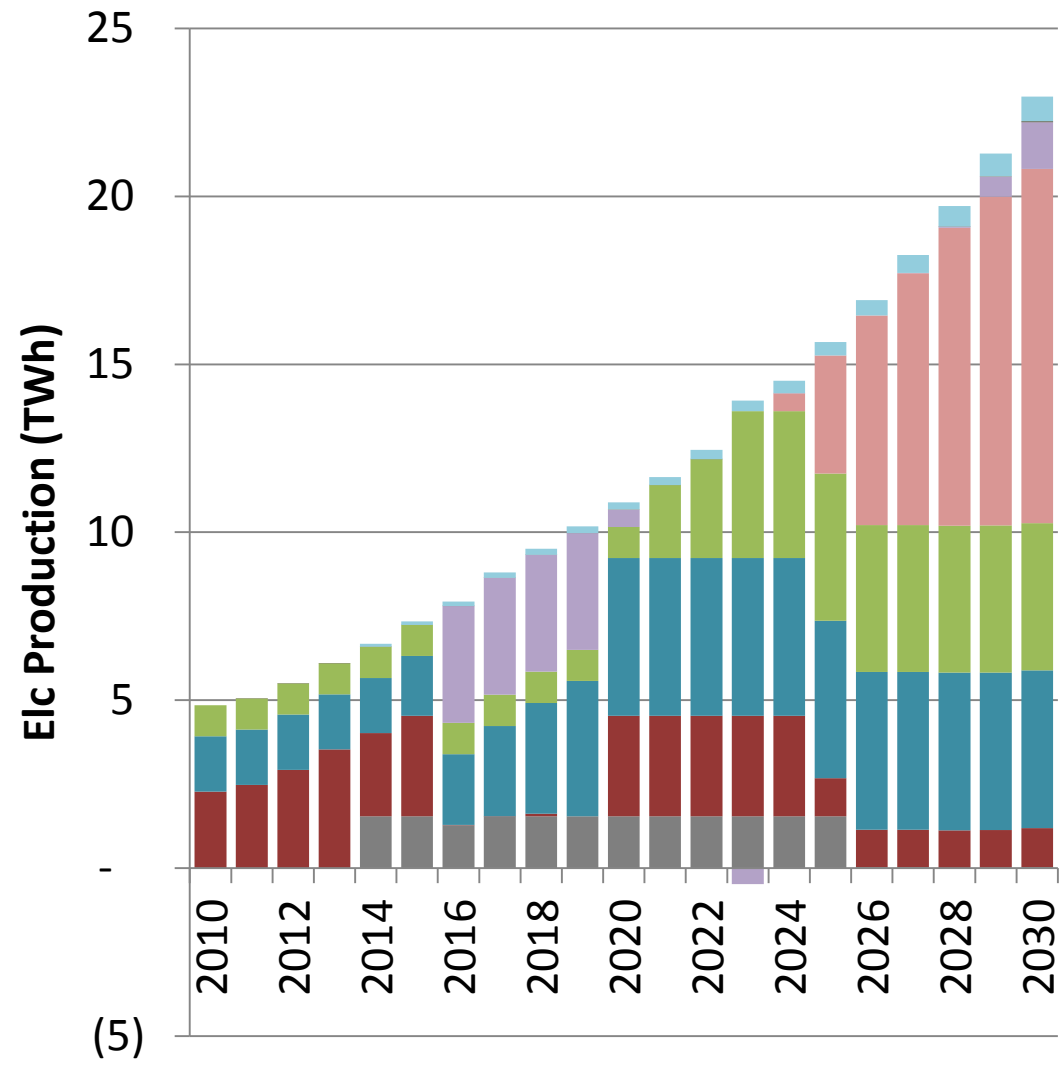
- Dispatch flexibility of the rest of the system
- Differentiated capacity credit of wind based for contribution to the reserve margin on geographical distribution of resources (0%-20%)
- Additional transmission investment associated with new wind investment

	Area	Wind capacity credit	Justification
	'000 km <sup>2</sup>	%	
Angola	1250	10%	resource is all along one coast
Botswana	600	5%	resource is concentrated and poor
DRC	2345	5%	resource is concentrated in one area
Lesotho	30	0%	country is small
Malawi	118.5	5%	country is small and resource is concentrated
Mozambique	800	10%	resource is all along one coast
Namibia	820	10%	resource is all along one coast
South Africa	1225	20%	resource is spread around country - along long coastline and inland - there is also a study
Swaziland	17	0%	country is small
Tanzania	950	10%	resource is concentrated in two areas that are relatively close
Zambia	750	5%	resource is poor
Zimbabwe	390	5%	resource is poor

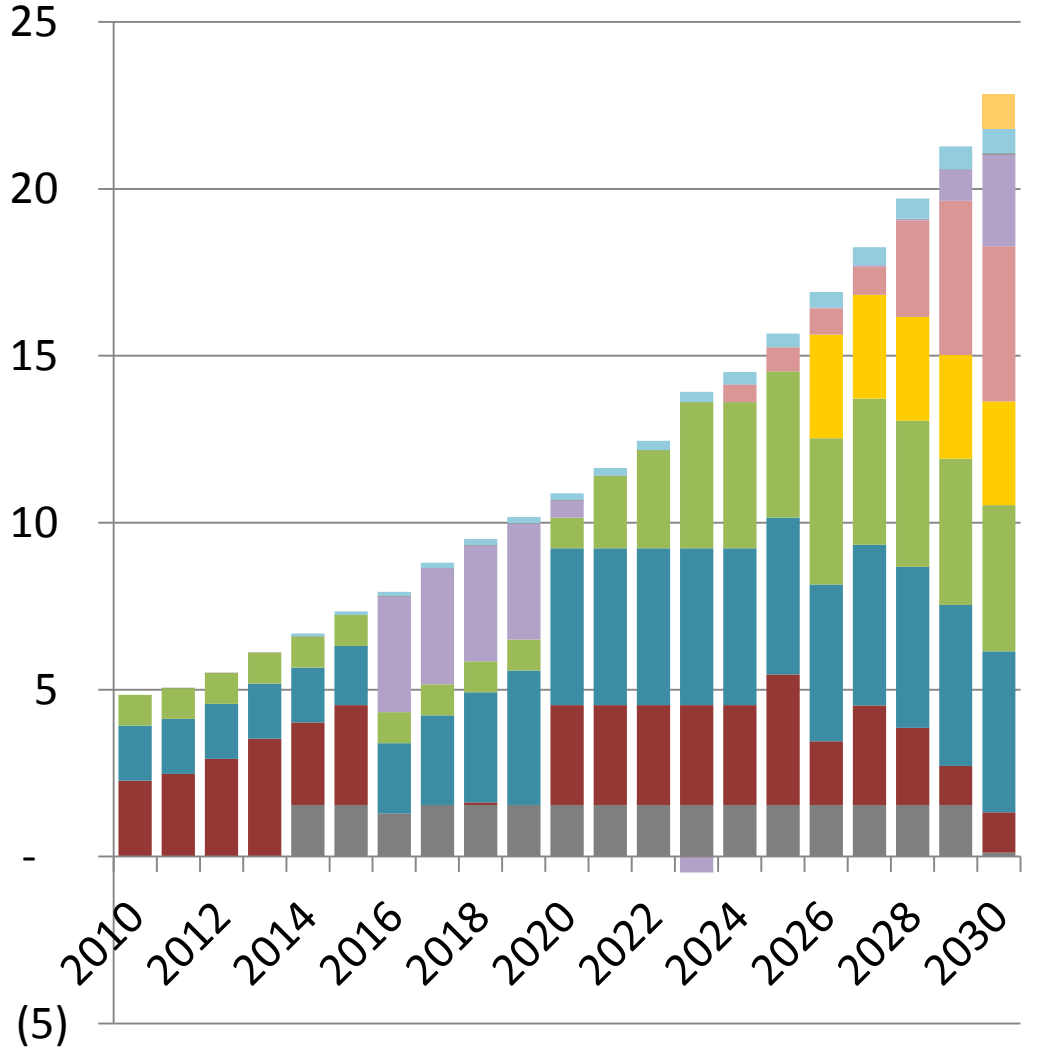


# Special consideration for intermittent RE integration

## Tanzania



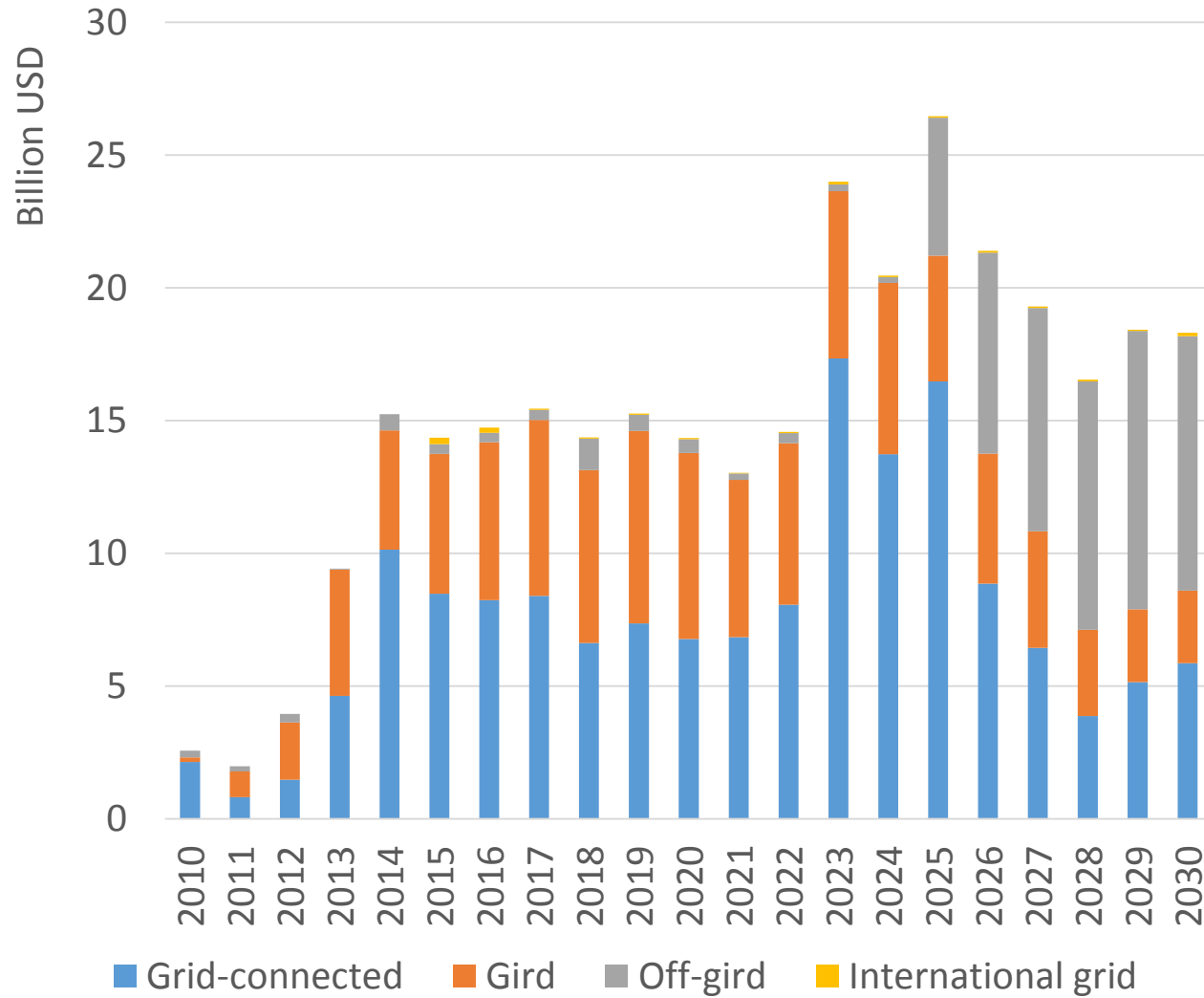
## Tanzania



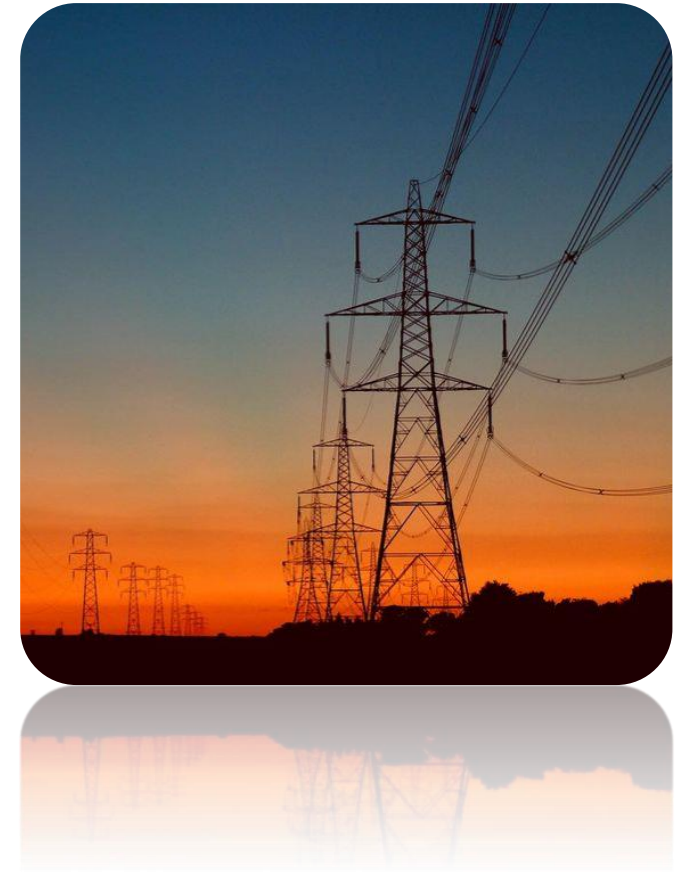
- Dist. Solar PV
- Mini Hydro
- Dist. Oil
- Net Imports
- Wind
- Solar Thermal
- Solar PV
- Biomass
- Hydro
- Nuclear
- Gas
- Oil
- Coal



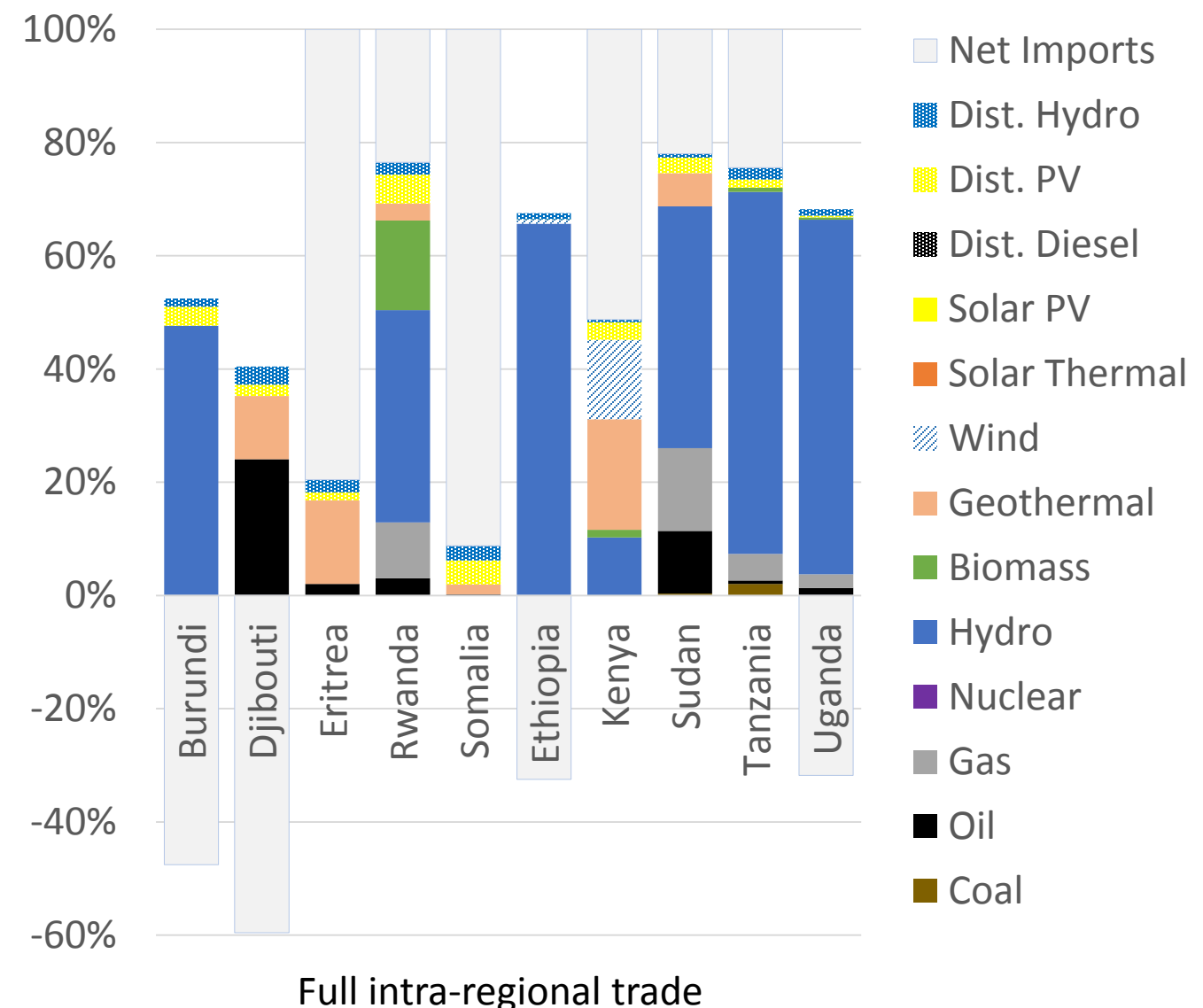
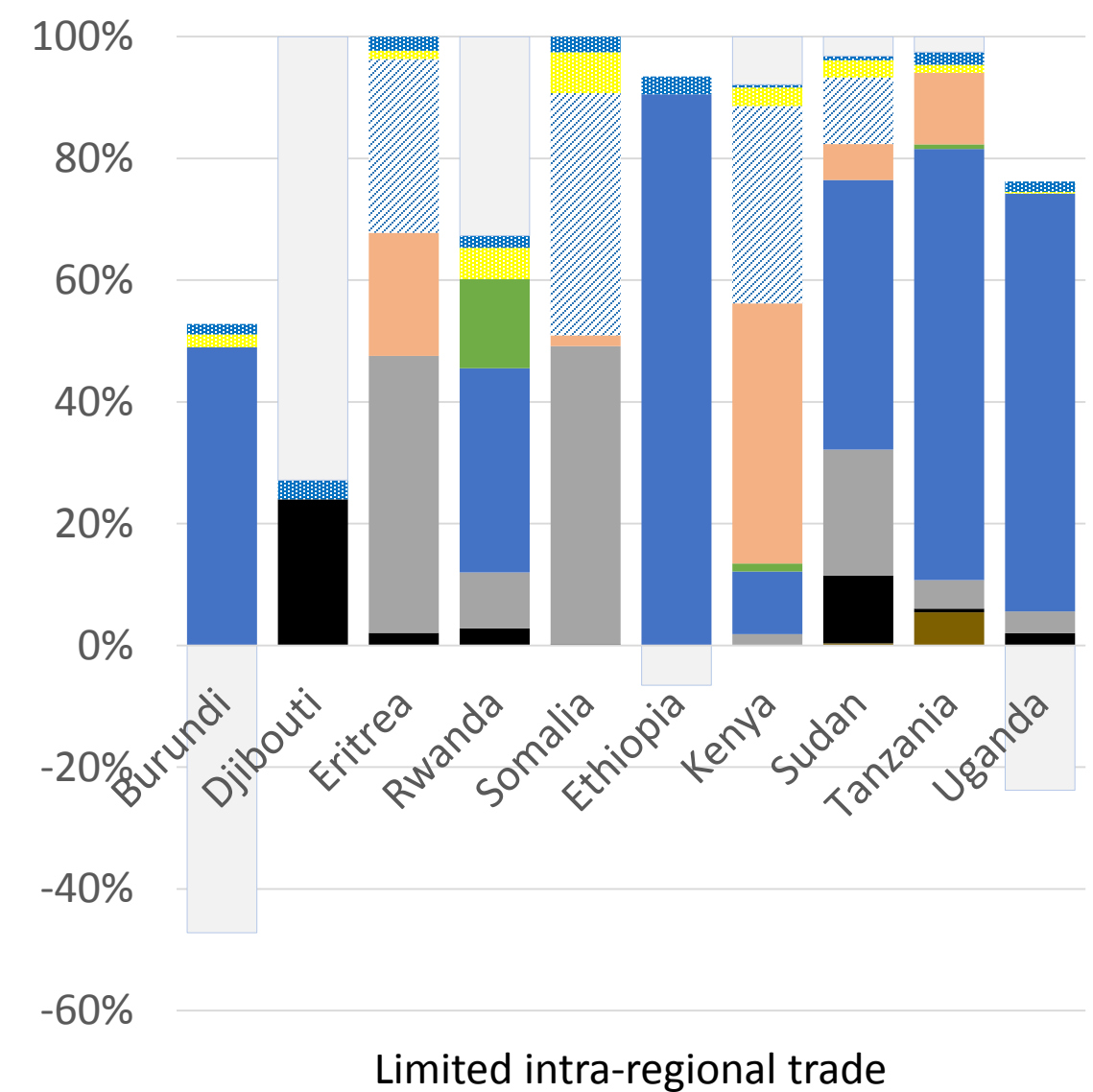
# SAPP: investment requirements



Financial requirement for international grid investment is only marginal



# East: Supply mix (no trade with North)



- Net Imports
- Dist. Hydro
- Dist. PV
- Dist. Diesel
- Solar PV
- Solar Thermal
- Wind
- Geothermal
- Biomass
- Hydro
- Nuclear
- Gas
- Oil
- Coal

- System perspective
- DRC to the rest of South and East to North as main links
- Energy security consideration for promotion of non-hydro RE
- Resource quality assessment for generation/transmission planning
- Good planning exercise with updated information (RE resource, costs, performance etc)
- Energy planning support
  
- Advanced modeling potential: demand side management, grid and storage

[www.irena.org/SAPP](http://www.irena.org/SAPP)  
[www.irena.org/WAPP](http://www.irena.org/WAPP)

- Investment cost: USD 365 /kW
- Losses
  - Intra-regional transmission loss: 7%
  - Central – North 25%
  - Central – West 5%
  - Central – South 15%
  - East – South 15%
  - East – North 15%
  - West – North: 20%



# Special consideration for intermittent RE integration

