

EASTERN AFRICA POWER POOL

**Executive Strategy Workshop to map out priorities
for IRENA's Africa Clean Energy Corridor initiative**

**The EAPP Master Plan and renewable power
options**

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Abu Dhabi, UAE



Outline



- Overview
- The EAPP Master plan
- Renewable power options in the Existing Master plan
- Renewable power options in the future Master plan_foreseen changes
- Issues to note



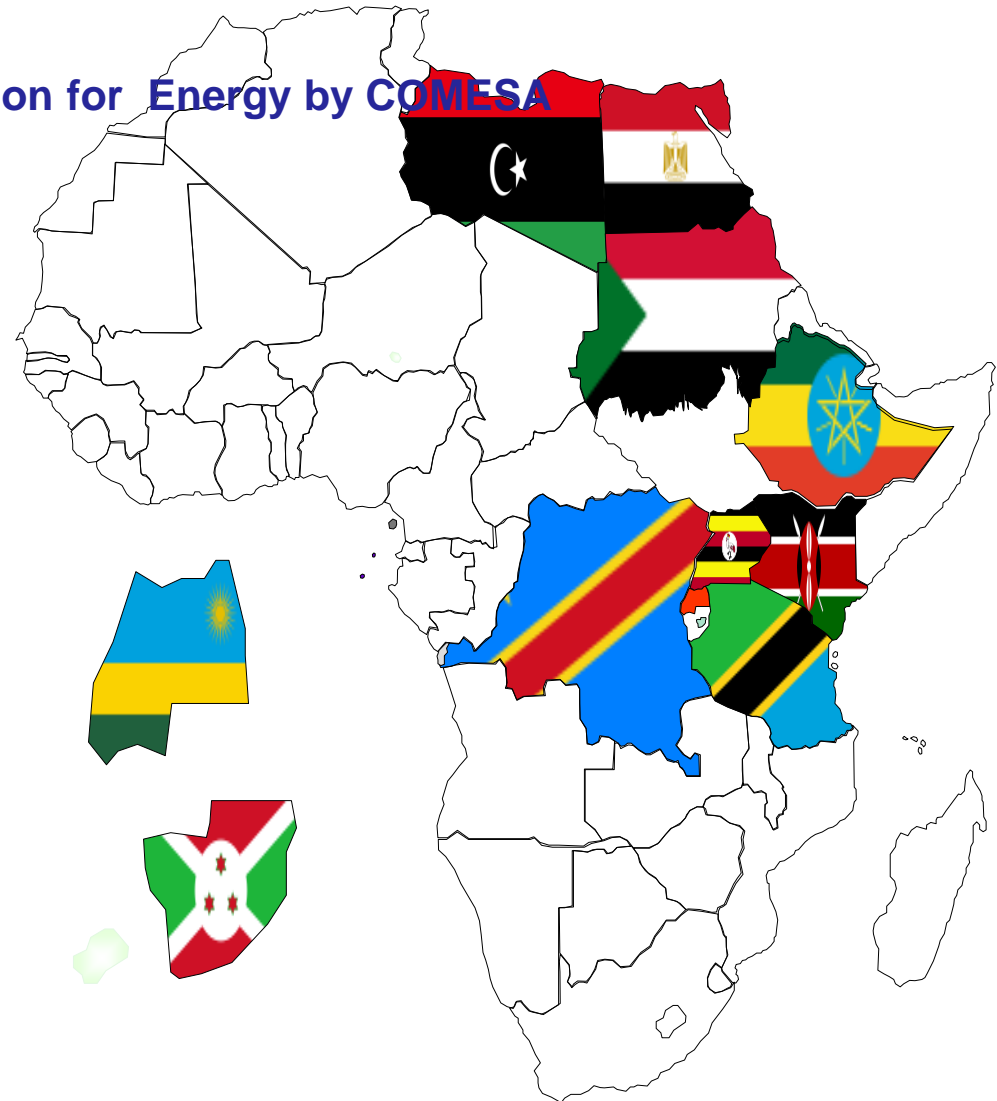
Overview-The EAPP



❑ Established in 2005

- ❑ Adopted as a Specialized Institution for Energy by COMESA
- ❑ Has 10 Countries as members

Country	Utility
Burundi	REGIDESO
DR Congo	SNEL/SINELAC
Egypt	EEHC
Ethiopia	EEPCo
Libya	GECOL
Kenya	KPLC/KENGEN/KETRACO
Rwanda	EWSA/SINELAC
Sudan	MED/SETCO
Tanzania	TANESCO
Uganda	UETCL



Overview-EAPP's Mission



- To facilitate and secure power supply to the countries of the Eastern Africa Region at the lowest possible cost.

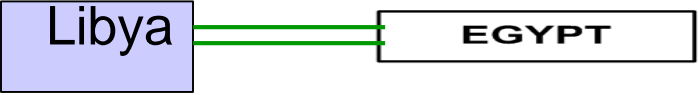
The EAPP aims to achieve that:

- Through “pooling” of resources for optimal exploitation of the available potential in the region to satisfy the increasing demands based on “regional” least cost options to benefit all member states.
- Through facilitation & coordination of power exchange among member utilities with the ultimate objective of establishing regional electricity market.

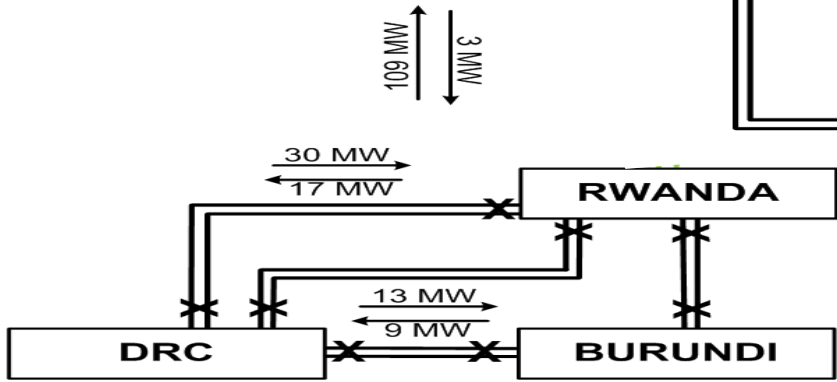
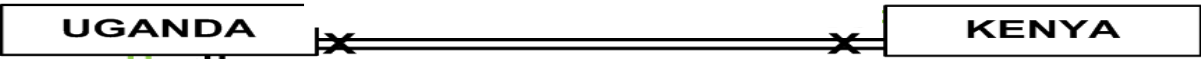


Overview-Existing Interconnection lines

- Double-circuit 70/110/132 kV
- Single-circuit 220 kV
- Double-circuit 220 kV
- Double-circuit 400 kV
- Double-circuit 500 kV
- Bipolar 500 kV HVDC
- Bipolar 600 kV HVDC
- 80 MW → Maximum power transfer for the year 2013
- ✕ Existing line in the year 2013



120 MW
200 MW
80 MW
0 MW



28 MW
17 MW

103 MW
59 MW
58 MW

109 MW
3 MW
601 MW

30 MW
17 MW

13 MW
9 MW



Regional Master Plan & Grid code study

Financed by: AfDB/NEPAD-IPPF

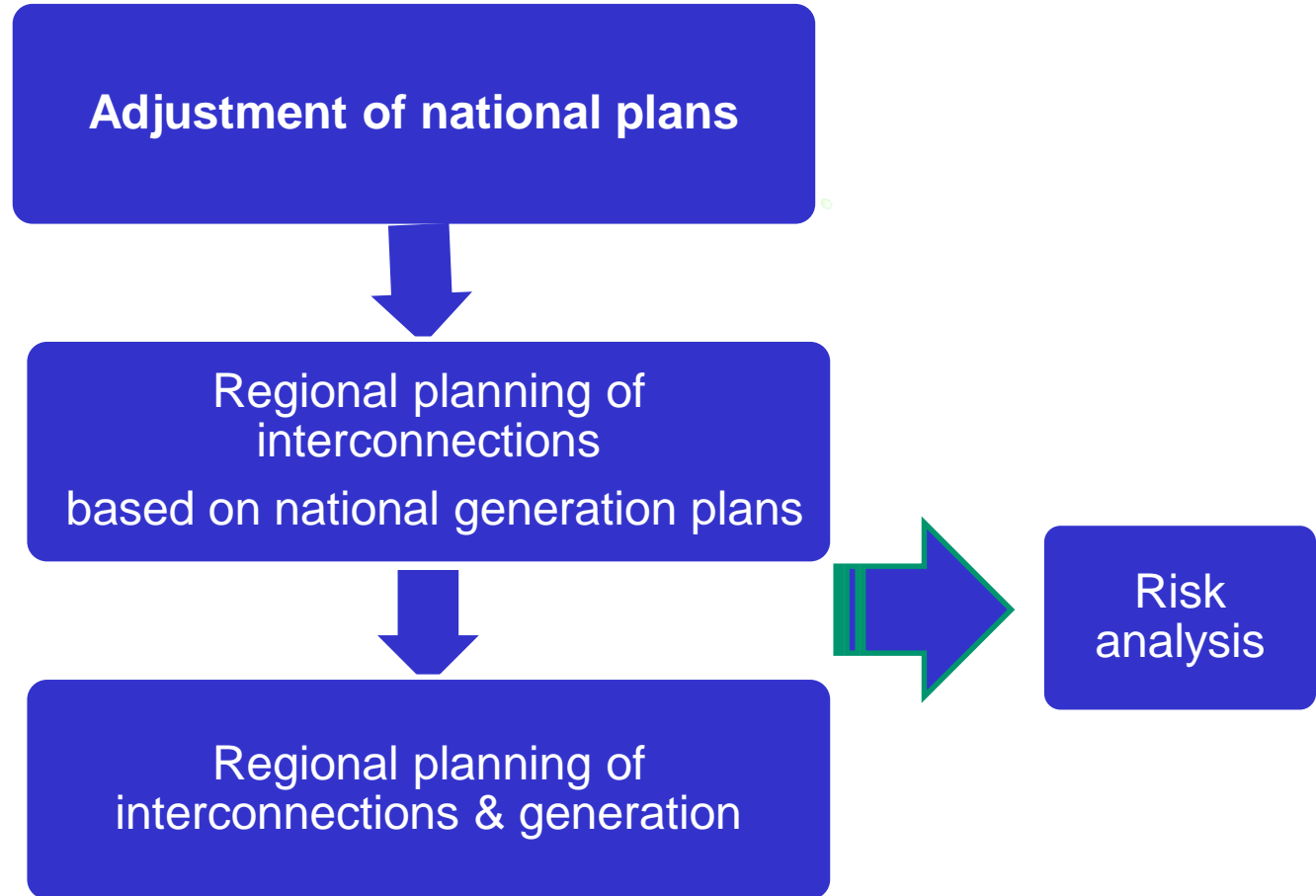
Grant amount: US\$....+GBP....= 1.7 M\$

OBJECTIVES:

To identify power generation and interconnection projects, at Master Plan level, to interconnect the power systems of EAPP countries in short-to-long term.

To develop common Grid Code in order to facilitate the integrated development and operations of the power systems of EAPP member countries.

Methodology



1st level of regional coordination

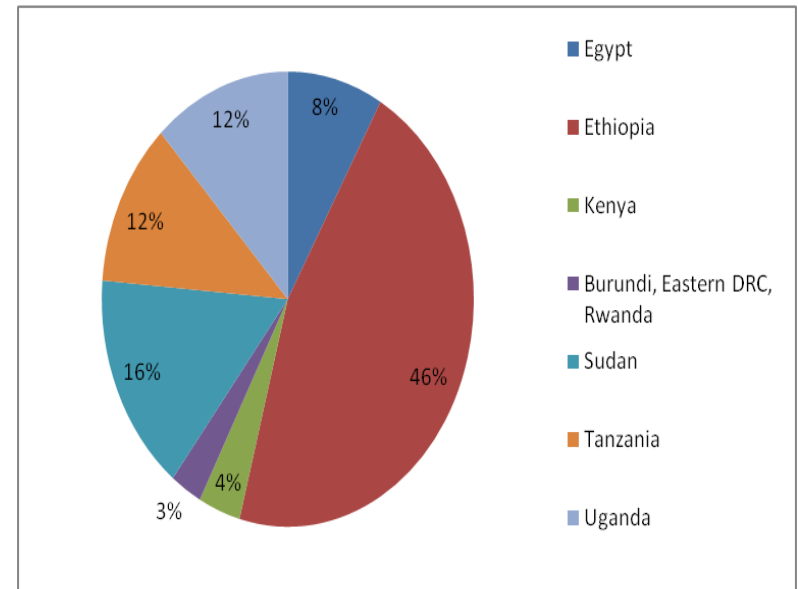
2nd level of regional coordination



Regional Master Plan-Hydro energy capabilities

Hydro generation

Country	MW	GWh	%
Egypt	2,902	13,897	8%
Ethiopia	16,204	76,986	46%
Kenya	1,300	6,135	4%
Burundi, Eastern DRC, Rwanda	961	4,620	3%
Sudan	4,678	26,393	16%
Tanzania	3,544	19,722	12%
Uganda	2,730	20,025	12%
EAPP	32,319	167,778	





Regional Master plan-Projects providing surplus available for exports

Country	Project and capacity (MW)
Ethiopia	G.Renaissance (6000), Mandaya (2000), Karadobi (1600), Baro I&II (500), Genji (200) plus under construction projects: Gibe III, Halele Worabesa
Uganda	Karuma (700), Murchinson Falls (750)Ayago (550)
EDRC	Ruzizi III(145),Ruzizi IV(287)
Rwanda,	Kivu I(100),Kivu II(200)
Tanzania	Stieglers Gorge (I, II & III – 1200), Ruhudji (358), Rumakali (222), Mnazi Bay (300)
Kenya	Large Geothermal projects



Regional Master Plan-Main findings(results)

- Some countries with significant surplus (due to size of some projects)
- Average surplus over study period (2013-2038):

Country	Load (GWh)	Surplus (GWh)	Surplus/Load
Ethiopia	28,386	12,557	44%
Uganda	7,768	2,636	34%
Tanzania	18,455	5,059	27%
Burundi, East DRC, Rwanda	3,369	840	25%
Sudan	46,707	7,824	17%
Kenya	39,975	6,003	15%

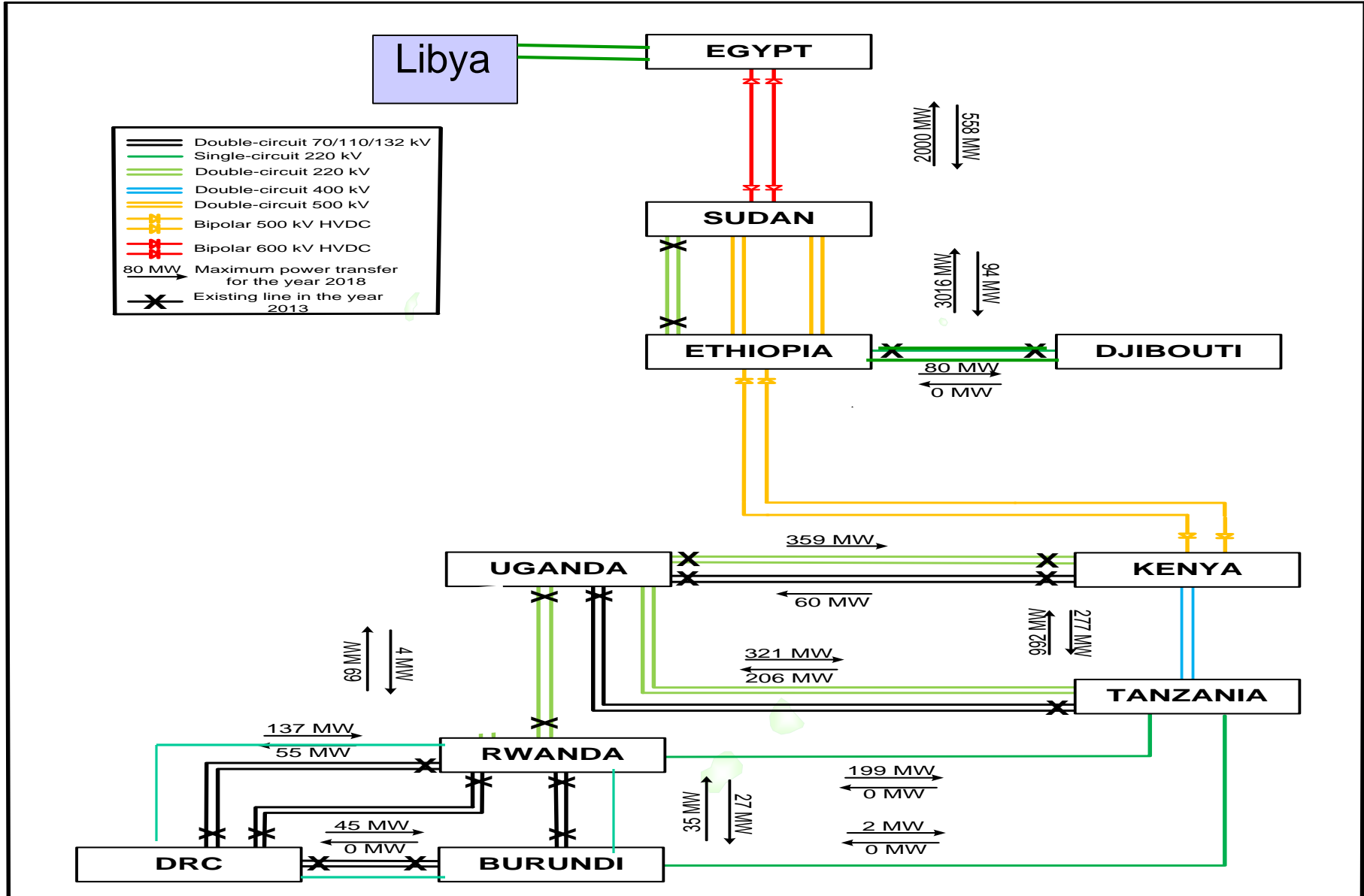
Regional Master Plan-Project identification



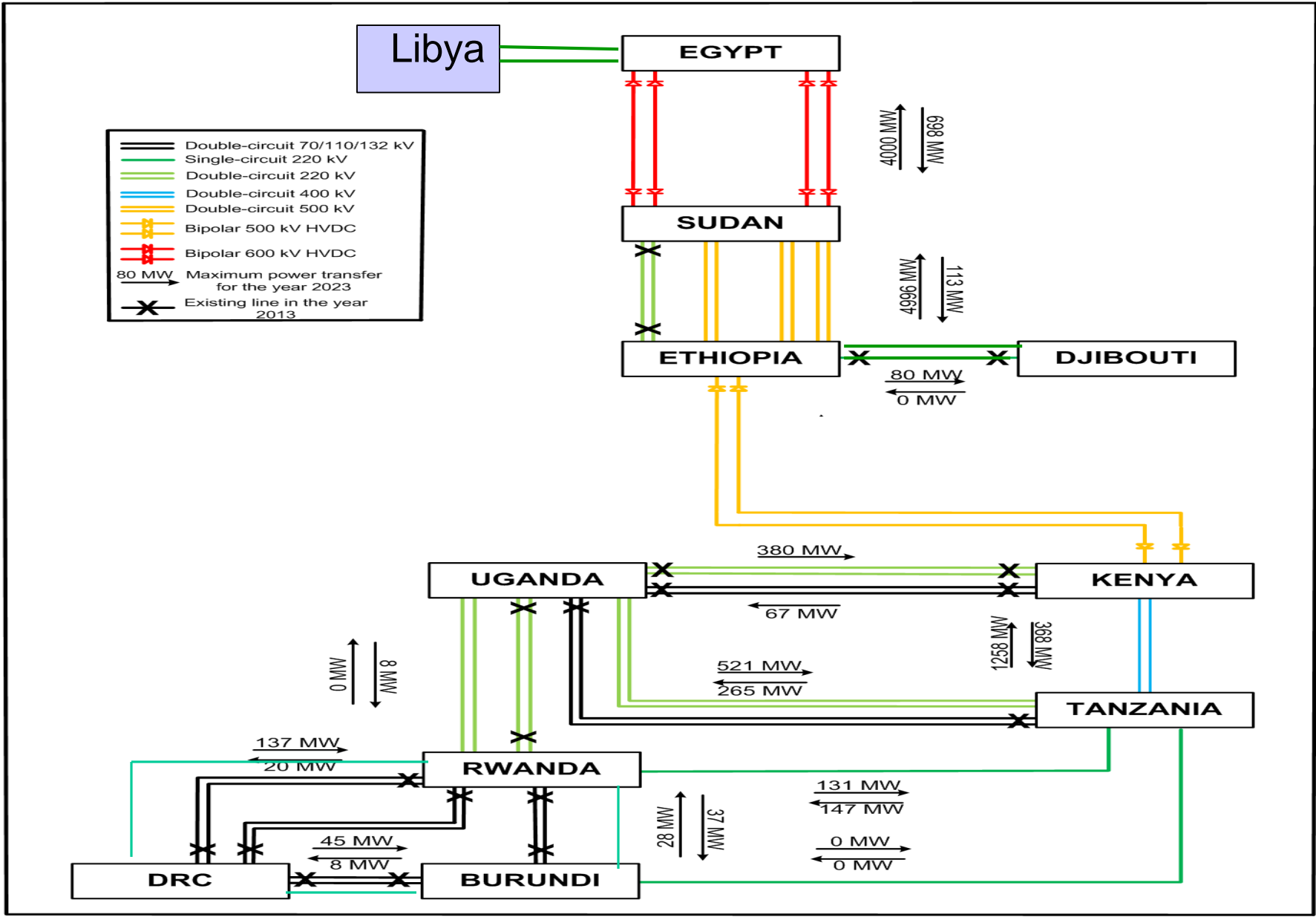
- A number of Transmission and Generation projects are identified as key to the integration of the power sectors in the EAPP Master plan
- The PIDA takes the Master Plan as an input to the electric power sub sector component of the program.
- Some of the Major transmission and Generation projects are approved at the AUC level as vital for Inter-regional integration



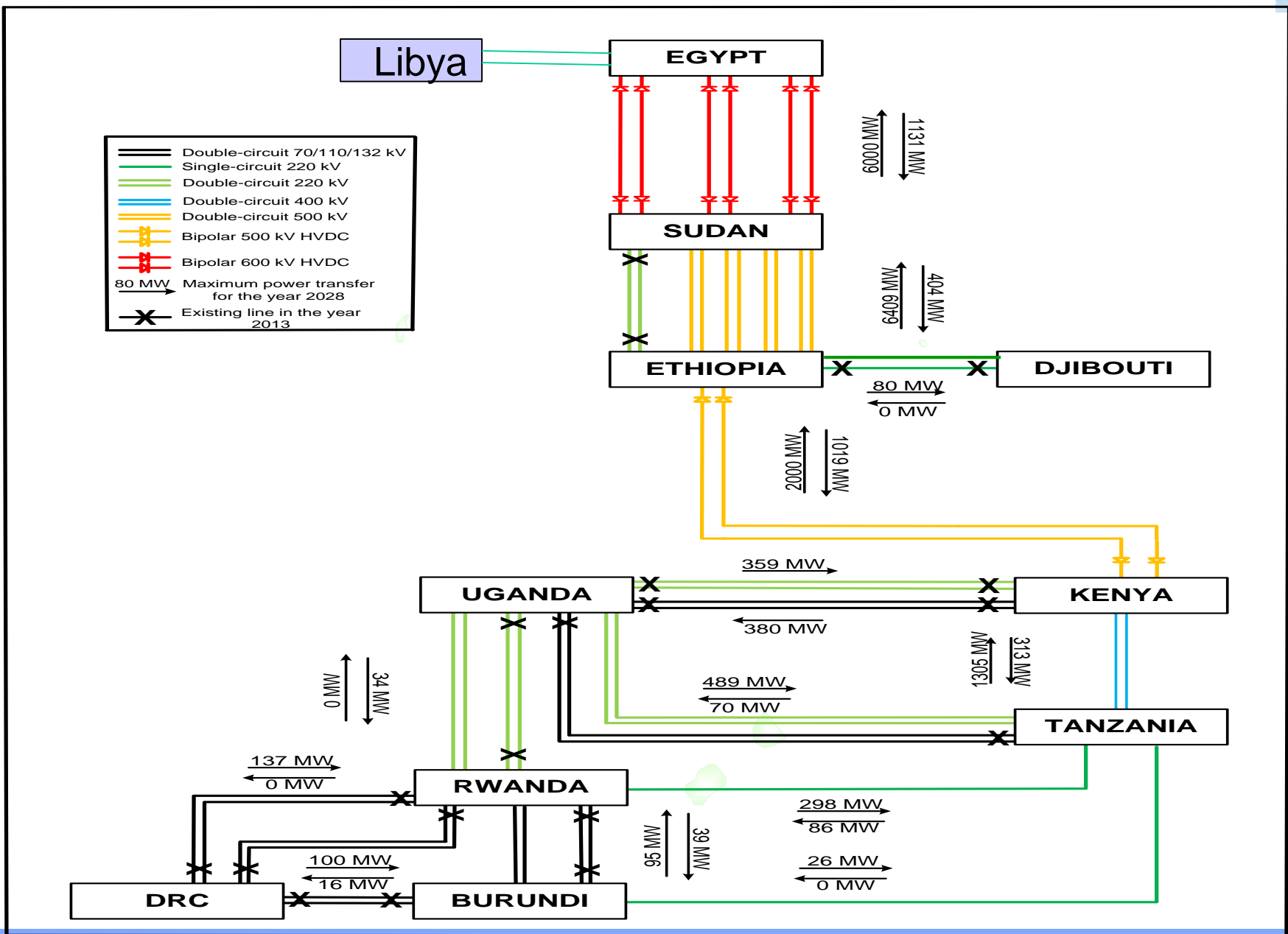
Regional Master plan-EAPP Transmission - 2018



Regional Master plan -EAPP Transmission - 2023



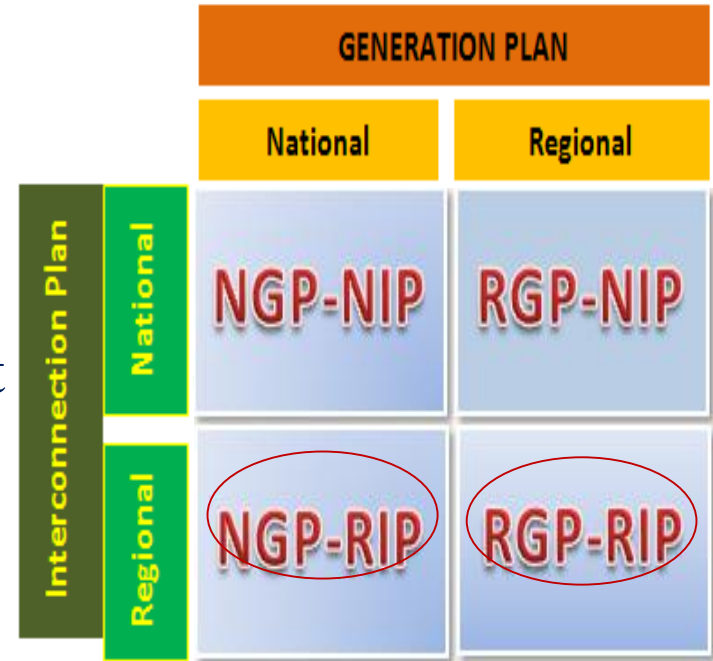
EAPP Transmission - 2028





Regional Master Plan study-Results/Prospects

- 1st level of Regional coordination-Net benefits over study period of 25,194MUSD
-Reduced operational cost
- 2nd level of Regional coordination-Net benefits over study period of 32,451MUSD
-Reduced operational and capital cost



- NGP-RIP most realistic Scenario. Region saves 969 million USD annually.
- Scenarios feasible even if cost doubles.

Renewable energy portion in the current Master plan



Country	Installed Capacity in MW							Total RE 2013-2038	%age of RE
	2013- 2023	2024-2038	Total 2013-2038	Hydro 2013-2038	Geothermal 2013-2038	Wind 2013-2038	Other RE 2013- 2038		
Burundi	369	489	858	191	-	-	-	191	22
East DRC	200	209	409	409	-	-	-	409	100
Egypt	33,493	65,771	99,264	25	-	6,170	-	6,195	6
Ethiopia	6,320	9,202	15,522	10,711	2,950	-	-	13,661	88
Kenya	3,070	11,418	14,488	556	3,640	410	126	4,732	33
Rwanda	249	741	990	173	-	-	50	223	23
Sudan	3,709	12,632	16,341	2,900	-	-	-	2,900	18
Tanzania	2,388	3,822	6,210	2,798	-	150	40	2,988	48
Uganda	872	1,519	2,391	1,600	90	-	-	1,690	71
Total	50,670	105,803	156,473	19,363	6,680	6,730	216	32,989	21

Renewable energy portion in the future Master plan



- The current Master Plan to be revised to account for recent developments (new Gen projects, proposed Interconnectors(UG-SS,ET-SS etc)
- Recommendations for the initial years(up to 2018) are under implementation ,except Et-Sud-Egy 500KV AC/600KV HVDC line
- Enhanced interconnectivity with the mechanism for trade coordination to facilitates development of RE generation
- More renewable candidates to be considered in the Master plan revision
 - Kenya ~ 8764 MW of RE candidates, 85% higher
 - Ethiopia ~21324 MW of RE candidates,83% higher
 - Tanzania~3550 MW of RE candidates , 18% higher

Possible reasons for changes in renewable portion



- Changes in projected demand for power
- More assessments done on renewable generation resources
- Renewable generation options being the best alternative for some countries.
- Ongoing developments in the area of interconnectivity
- Enhanced awareness on the merits of RE technologies
- EAPP region's endowment with vast RE generation potential



Issues to note



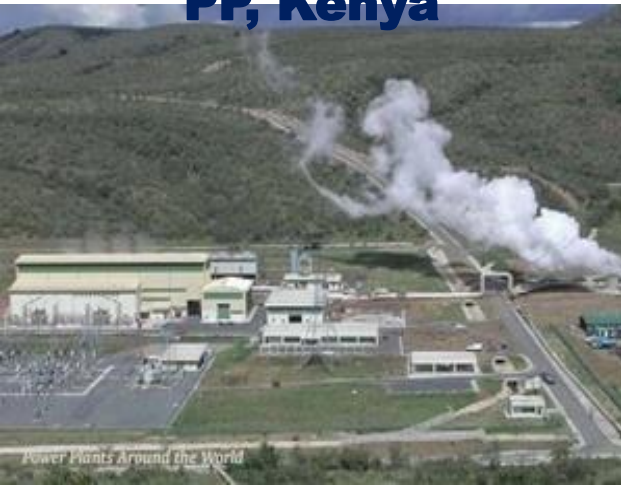
- In terms of potential, the EAPP region has significant hydro, geothermal, wind and solar potential
- From the power pool's point of view, grid connected large scale wind/solar generation systems to be considered priority areas next to hydro and geothermal systems.
- The size of most of the national systems in EAPP region is a constraint to development of large scale grid connected wind/solar generation technologies
- Good news! The power pool provides the needed system size for development of large scale RE generation systems
- Integration of large scale wind and solar gen technologies should be preceded by the expansion of the existing generation capacity with major hydro and geothermal plants.

THANK YOU

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<http://www.eappool.org>

**Olkaria Geothermal
PP, Kenya**



**Ubungu Gas PP,
Tanzania**



Zafarana Wind Farm, Egypt

**Merowe Hydro PP,
Sudan**

