EASTERN AFRICA POWER POOL

EAPP PROFILE

Presentation to East Africa Regional Partnership Exchange Program

October 2014

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OUTLINE:

1. EAPP Profile
2. EAPP Regional Master Plan
3. On-going Activities
4. Way forward


ARCTIC OCEAN
Greenland
Svalbard (Nor.)
ARCTIC OCEAN
United States of America
Greece
Turkey
Tunisia
Syria
Lebanon
Iraq
Iran
Morocco
Israel
Kuwait
Algeria
Libya
Jordan
Egypt
Saudi Arabia
U.A.E.
Oman
Mauritania
Mali
Niger
Chad
Eritrea
Yemen
Sénegal
Sudan
Djibouti
Guinea-Bissau
Sierra Leone
Liberia
Cote d' Ivoire
Ghana
Togo
Nigeria
Cam.
C.A.R.
Ethiopia
Somalia
Gabon
Dem. Rep. of Congo
Uganda
Kenya
Rep. of the Congo
Tanzania
Angola
Zambia
Malawi
Madagascar
Namibia
Zimbabwe
Botswana
Mozambique
Swaziland
Lesotho
South Africa
ATLANTIC OCEAN
PACIFIC OCEAN
Solomon Islands
Fiji
New Zealand

EAPP Establishment

- Established in 2005
  - Adopted as a Specialized Institution for Energy by COMESA
  - Has 10 Countries as members
  - South Soudan, Eritrea Djibouti and Somalia are potential members which are expected to join EAPP very soon

Current Members

- Rwanda (2005)
- Burundi (2005)
- DRC(2005)
- Kenya(2005)
- Ethiopia(2005)
- Sudan(2005)
- Egypt(2005)
- Tanzania(2010)
- Libya(2011)

EAPP's Vision & Mission

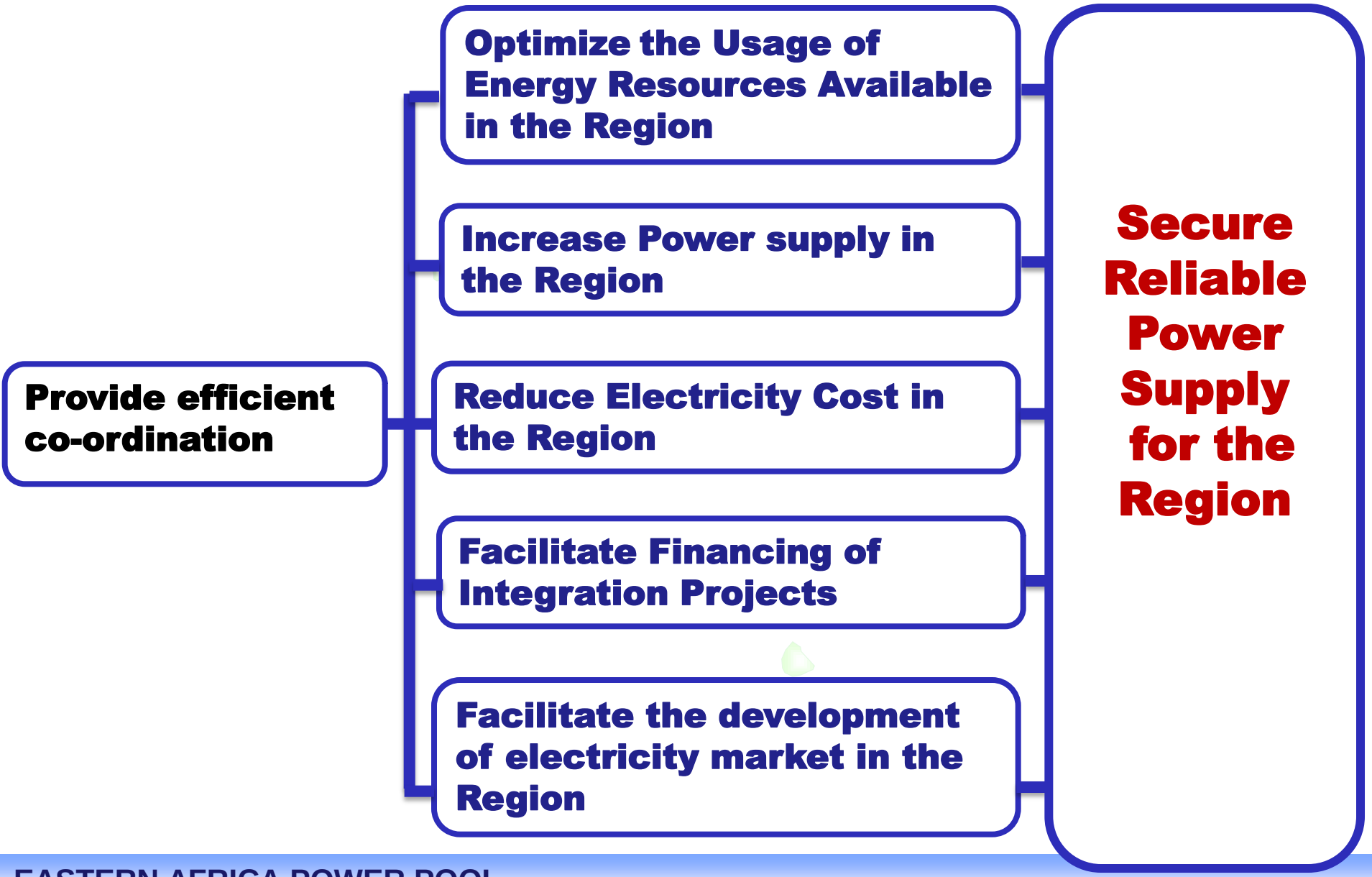
Vision

- To be the most vibrant power market that provides a least cost, efficient and reliable electricity supply through fully integrated and interconnected regional system.

Mission

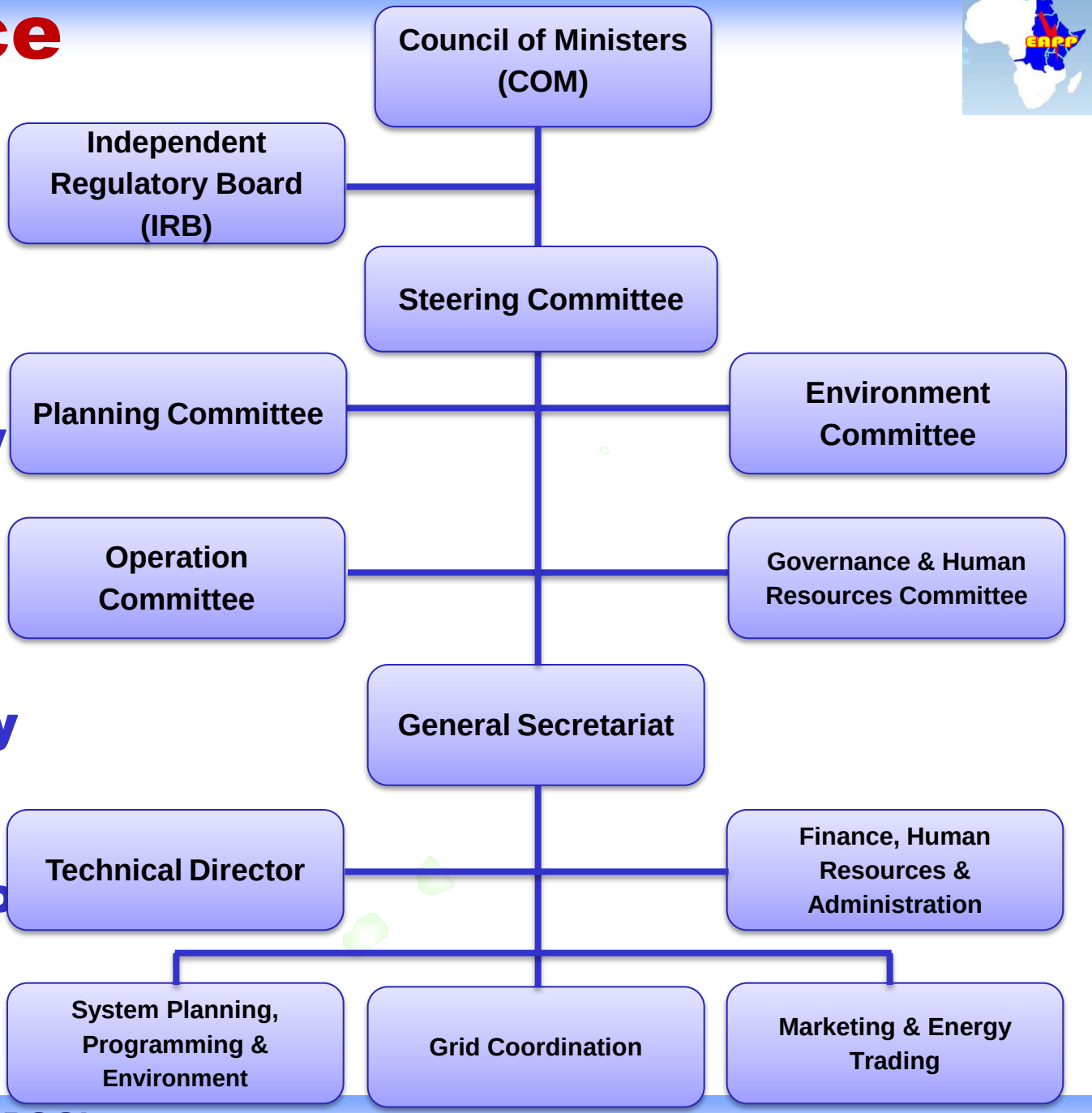
- EAPP's Mission is to interconnect all the Countries of Eastern Africa Region, So as to optimize Power Generation Resources Development in economically and environmentally sustainable manner and ensure efficient provision of adequate, secure and affordable quality power.

EAPP Objectives



Governance

- IGMOU and IUMOU define the governance structure
- IGMOU=Inter-Governmental MOU, signed by Energy Ministers
- IUMOU=Inter-Utility MOU, signed by utility CEOs
- Operational activities are to be guided by: the Corporate Plan (CP)



Member Utilities

Member Country	Member Utility
BURUNDI	REGIDESO
DRC	SNEL
EGYPT	EEHC
ETHIOPIA	EEP
LIBYA	GECOL
KENYA	KPLC, KENGEN, and KETRACO
RWANDA	EWSA
SUDAN	SETCO, and MWRE
TANZANIA	TANESCO
UGANDA	UETCL
CPGL (Burundi, DRC, & Rwanda)	SINELAC

Two types of members: Active and Affiliate. Affiliates are IPPs and do not vote.

EAPP Regional Master Plan

- The 1st Regional Master plan was completed on May 2011 – based on 2008 data
- The Regional Master plan intends to provide regional perspective to the national expansion planning practice
- Update of the EAPP Regional Master Plan started in January 2014
- In the 2011 Master Plan countries included were: Burundi, Djibouti, East DRC, Egypt, Ethiopia, Kenya, Rwanda, Sudan, Tanzania and Uganda. But the current update includes Libya, the entire DRC and South Sudan. In total 12 countries are included

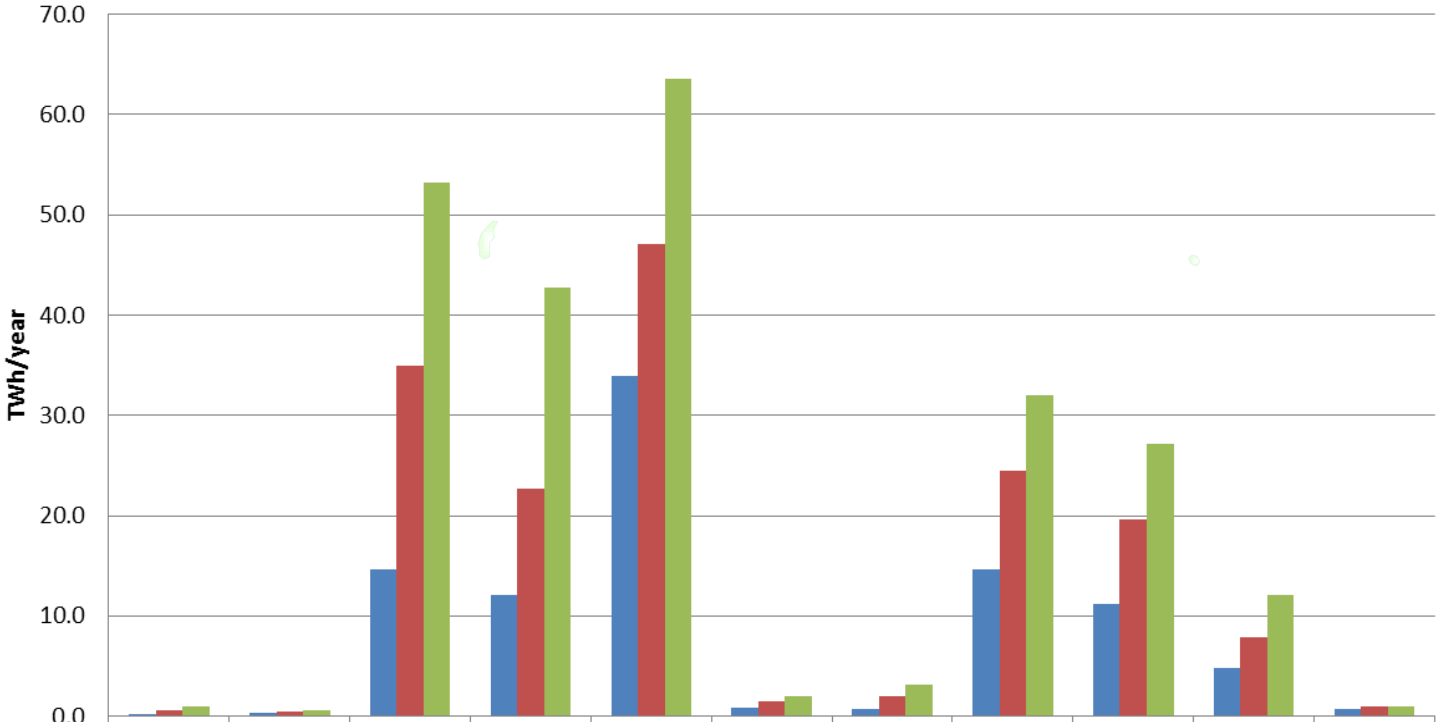
EAPP Regional Master Plan Cont.

- The 2011 Master Plan recommended six interconnectors. Two of the projects, namely Ethiopia-Kenya 2000MW, 500KV-HVDC and Kenya-Tanzania (1520MW, 400KV) are under construction
- The other critical interconnectors recommended were Ethiopia-Sudan (3200 MW, 500KV) and Sudan –Egypt (2000MW, 600KV)
- The Regional Master Plan study was based on least-cost planning

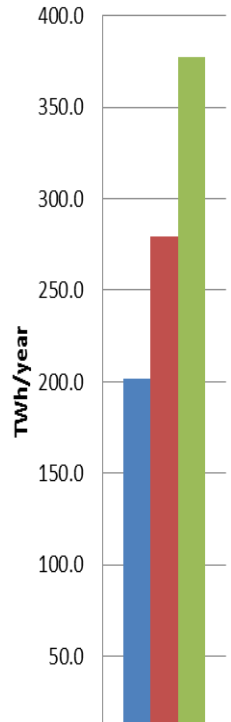
EAPP Regional Master Plan Update Electricity Demand (TWh)

	2000	2010	2015	2020	2025
Burundi	0.02	0.13	0.2	0.6	1,0
Djibuti	-	-	0.8	0.9	1.0
DRC	-	-	18.3	31.0	40.7
Egypt	78	146	201.5	279.6	377.8
Ethiopia	1.6	5.6	14.7	35.0	53.2
Kenya	4.7	9.0	13.3	41.6	61.3
Libya	-	-	33.9	47.1	63.6
Rwanda	0.2	0.33	0.8	1.5	1.9
South Sudan	-	-	0.7	2.0	3.2
Sudan	2.4	7.2	14.7	24.5	32.0
Tanzania	2.5	5.3	11.2	19.6	27.1
Uganda	1.3	3.0	4.8	7.8	12.1
Total	**91**	**177**	**315**	**491**	**674**
	TWh	TWh	TWh	TWh	TWh
Growth, % p.a.		7%	8%	9%	7%

EAPP Regional Master Plan Update Electricity Demand (TWh)



	BURUNDI	DRC	ETHIOPIA	KENYA	LIBYA	RWANDA	SOUTH_SUDAN	SUDAN	TANZANIA	UGANDA	DJIBOUTI
2015	0.2	0.3	14.7	12.1	33.9	0.8	0.7	14.7	11.2	4.8	0.8
2020	0.6	0.4	35.0	22.7	47.1	1.5	2.0	24.5	19.6	7.8	0.9
2025	1.0	0.6	53.2	42.7	63.6	1.9	3.2	32.0	27.1	12.1	1.0



	EGYPT
2015	201.5
2020	279.6
2025	377.7

Electricity Demand (TWh)
Ethiopia-Kenya-Tanzania

Year	ETHIOPIA (DD TWh)	KENYA (DD TWh)	TANZANIA (DD TWh)	Grand Total (DD TWh)
2015	14.7	13.3	11.2	39.2
2020	35	41.6	19.6	96.2
2025	53	61.3	27.1	141.4
Grand Total	102.7	116.2	57.9	276.8

EAPP Generation

- The growth in electricity demand in the region requires large investments in new generation. Significant investments in renewable energy in the form of hydro, geothermal and wind power take place from 2020 to 2025. On top of this, investments in fossil-based generation take place, mostly natural gas.
- Large investment in natural gas-fired power plants takes place in Egypt and Libya
- Significant geothermal investment in Kenya and Ethiopia
- Significant investment in hydro power in Ethiopia, Tanzania, Uganda and the DRC

EAPP Generation Cont.

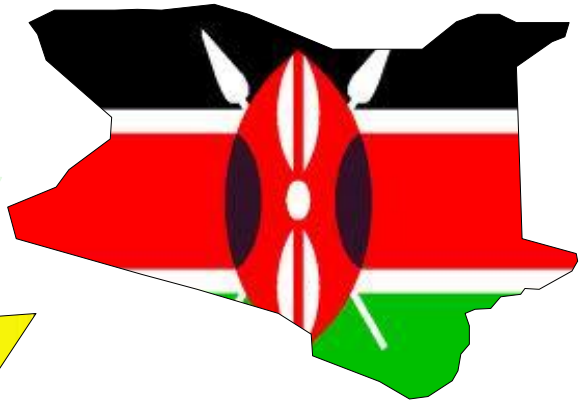
Type of Generation	Committed (MW)
Natural gas	28.043
Hydro	21.29
Coal	3.254
Oil	4.148
Geothermal	2.496
Wind	3.836
Other	1.697
Total	64.764

Ethiopia-Kenya-Tanzania

Ethiopia

Population 94 Mil.
Area in 000' Km²
1,104

Kenya



Population 44 Mil.
Area in 000' Km²
581

Tanzania

Population 45 Mil.
Area in 000' Km²
945

Generation - Ethiopia (Existing)

No.	Name of PP	Capacity (MW)	Type
1	Dir Dawa	40	MSD
2	Awash 7	35	MSD
3	Kaliti	14	MSD
4	Aluto	5	Geo
5	Ashegoda	120	WPP
6	Adama I	51	WPP
7	Tis Abbay 1	11	HYDRO
8	Tis Abbay 2	73	HYDRO
9	Finchaa	128	HYDRO
10	Gilgel Gibe I	184	HYDRO
11	Gilgel Gibe II	420	HYDRO
12	Maleka Wakana	153	HYDRO
13	Koka	43	HYDRO
14	Awash 2	32	HYDRO
15	Awash 3	32	HYDRO
16	Beles	460	HYDRO
17	Tekeze I	300	HYDRO
18	Amarti Neshe	98	HYDRO
19	Sor	5	HYDRO
20	AlutoLangano	7	Geothermal
	Total Installed Capacity	2,212	

Generation - Ethiopia (Committed/Under Cons.)

No.	Name of PP	Capacity (MW)	Type
1	Adama II	153	WPP
2	Reppi-EFW-50	20	Waste-to-Energy
3	Tendaue / Ende	70	STPP(Bagasse)
4	Wenji	16	STPP
5	Finchaa	10	STPP
6	Beles 1	20	STPP
7	Beles 2	20	STPP
8	Beles 3	20	STPP
9	Wolkayit	82	STPP
10	Omo Kuraz 1	20	STPP
11	Omo Kuraz 2	40	STPP
12	Omo Kuraz 3	40	STPP
13	Omo Kuraz 4	40	STPP
14	Omo Kuraz 5	40	STPP
15	Omo Kuraz 6	40	STPP
16	Kessem	16	STPP
17	Bamza-120	60	STPP
18	Melkasedi-137	60	STPP
19	Aluto Langano	70	Geo
20	Gilgel Gibe III	1870	HYDRO
21	Genale 3	254	HYDRO
22	Renaissance	6000	HYDRO
		8,961.00	

Candidate Power Plants Ethiopia

No.	Name of PP	Capacity (MW)	Earliest Commissioning year
1	Baro 1	166	2020
2	Baro 2	479	2020
3	Beko Abo Low	935	2020
4	BirBir R	467	2020
5	Geba 1	214.5	2020
6	Geba 2	157	2020
7	Genale 5	100	2020
8	Genale 6	246	2020
9	Genji	216	2020
10	Gibe IV	1472	2020
11	Gibe V	660	2020
12	Gojeb	150	2020
13	Halele	96	2020
14	Karadobi	1600	2021
15	Lower Dabus	250	2020
16	Lower Didessa	500	2020
17	Sor 2	5	2017
18	Tams	1000	2020
19	Tekeze 2	450	2020
20	Upper Dabus	326	2020
21	Upper Mendaya	1700	2023
22	Wabi Shebele	87.5	2020
23	Werabesa	340	2020
24	Yeda 1	162	2020
25	Yeda 2	118	2020
26	Aleltu East	189	2020
27	Aleltu West	264.6	2020
28	Aba Samuel	6	2020
29	Nazret wind	300	
30	Mekele soth	100	
31	Sheno wind	100	
32	Chacha wind	100	
33	Iteya wind	100	
34	Sululta	100	
35	Gondar West	50	
36	Tendaho	100	
37	Corbetti	75	
38	Abaya	100	
39	Tulu Moye	40	
40	Dofan Fantale	60	
41	Wind different areas	5475	

19,056 MW

Generation - Kenya(Existing)

No.	Name	Capacity MW	Type
1	Kipevu 1 Diesel	60	MSD
2	Kipevu new GT	27	OCGT
3	Olkaria 1	44	Geo
4	Olkaria 2	101	Geo
5	OrPower 4a	13	Geo
6	OrPower 4b	35	Geo
7	Iberafrica IPP	56	MSD
8	Tsavo IPP	74	MSD
9	Mumias	26	STPP
10	Aggreko IPP	120	MSD
11	Olkaria Well Head	4.4	Geo
12	Rabai diesel IPP	90	MSD
13	Iberafrica 3 IPP	52	MSD
14	Kipevu III Diesel	115	MSD
15	Ngong	5.1	WPP
16	Eburru	2.3	Geo
17	Tana	20	HYDRO
18	Small hydro	10.9	HYDRO
19	Kamburu	90	HYDRO
20	Gitaru	216	HYDRO
21	Kindaruma	44	HYDRO
22	Masinga	40	HYDRO
23	Kiambere	164	HYDRO
24	Sondu Miriu	60	HYDRO
25	Turkwell	105	HYDRO
26	Sangoro	20	HYDRO
Total IC		1595	2173MW By Nov.

Generation – Kenya (Committed/Under Cons.)

No.	Name	Capacity MW	Type
1	THIKA	87	MSD
2	GULF	83	MSD
3	Triumph	80	MSD
4	Kindaruma_opt	24	HYDRO
5	ORP4	16	Geo
6	OLK1B	140	Geo
7	OLK4	70	Geo
8	OLKWH1	40	Geo
9	MENW	90	Geo
10	MENWH	50	Geo
11	OLK1B_2	70	Geo
12	OLKWH2	30	Geo
13	Ngong2	13.6	WPP
14	Ngongl2	6.8	WPP
15	Kwala	18	Cogen
16	LNG	700	CCGT
17	Aelous	60	WPP
18	Menengai_I	100	Geo

No.	Name	Capacity MW	Type
19	Silali	150	Geo
20	Isiolo	100	WPP
21	Coal	960	STPP
22	LTWP	150	WPP
23	LTWP2	150	WPP
24	Kipeto	100	WPP
25	Prunus	50	WPP
26	Suswa	35	Geo
27	OLK1B_3	70	Geo
28	Menengai_2	400	Geo
29	OLK_V	140	Geo
30	Baringo	140	Geo
31	Suswa2	35	Geo
32	Silali2	70	Geo
33	Coal2	960	STPP
34	Silali3	75	Geo
35	AGIL	140	Geo
36	GEOT	140	Geo
Total		5,543.40	

Candidate Power Plants Kenya

No.	Name	Capacity MW	Type
1	KY_New_Geo	7799.3	Geo
2	KY_Nuclear	900	Nuclear
3	Karura	90	HYDRO
4	LowerGrand	140	HYDRO
Total		8,929	

Generation – Tanzania (Existing)

No.	Name	Capacity MW	Type
1	Songas 1	37.7	OCGT
2	Songas 2	108.2	OCGT
3	Songas 3	36.4	OCGT
4	Ubongo GT	98.4	OCGT
5	Tegeta IPTL	98.4	MSD
6	Tegeta GT	42.3	OCGT
7	Ubongo EPP	98.4	OCGT
8	TANWAT	2.3	STPP
9	TPC	16.7	STPP
10	Zuzu	4.9	STPP
11	Mtera	80	HYDRO
12	Kidatu	204	HYDRO
13	Hale	21	HYDRO
14	Kihansi	180	HYDRO
15	Pangani Falls	68	HYDRO
16	Nyumba	8	HYDRO
17	Mwengga	4	HYDRO
Total		1,109	53% RE

Generation – Tanzania (Committed/Under Cons.)

No.	Name	Capacity MW	Type
1	Kinyerezi_1	335	OCGT
2	Kinyerezi_2	240	CCGT
3	Kinyerezi_3	600	OCGT
4	Kinyerezi_3CC	300	CCGT
5	Kinyerezi_4	300	OCGT
6	Kinyerezi_4CC	150	CCGT
Total		1925	

Candidate Power Plants Tanzania

No.	Name	Capacity MW	Type
1	Kakono	53	HYDRO
2	Kihansi II	120	HYDRO
3	Mpanga	144	HYDRO
4	Masigira	118	HYDRO
5	Ruhudji	358	HYDRO
6	Rumakali	520	HYDRO
7	Rusumo (80MW) – 26.7 for Tanzania (1)	26	HYDRO
8	Songwe (3 plants)	170	HYDRO
9	Steiglers Gorge	300	HYDRO
10	Steiglers Gorge	600	HYDRO
11	Steiglers Gorge	300	HYDRO
12	Ikondo	340	HYDRO
13	Taveta	145	HYDRO
14	Malagarasi Stage (Igamba III) - (2)	44.8	HYDRO
Total		3,239	

Summary of Generation Ethiopia-Kenya-Tanzania

Country	Installed Capacity (MW)	Committed / Under Construction (MW)	Candidate Power Plants (MW)
Ethiopia	2,212.00	8,961.00	19,056.00
Kenya	1,595.00	5,543.00	8,929.00
Tanzania	1,109.00	1,925.00	3,239.00
Total	4,916.00	16,429.00	31,224.00

EAPP Transmission

- **Comparison between the 2011 Master Plan results and Draft MP Update 2014 results (range covering the 8 scenarios)**

Until 2025	2011 MP	2014 MP (draft) – range across 8 scenarios	Recommended capacities
Egypt-Sudan	6,000 MW	3,157 – 9,720 MW	700 MW in 2020; 1,600 MW in 2025
Sudan-Ethiopia	6,400 MW	4,253- 12,635 MW	1,800 MW in 2020; 2,400 MW in 2025
Ethiopia-Kenya	2,000 MW	0 (2,000 MW committed)	
Kenya-Tanzania	1,520 MW	0 (1,000 MW committed)	

EAPP Transmission Cont.

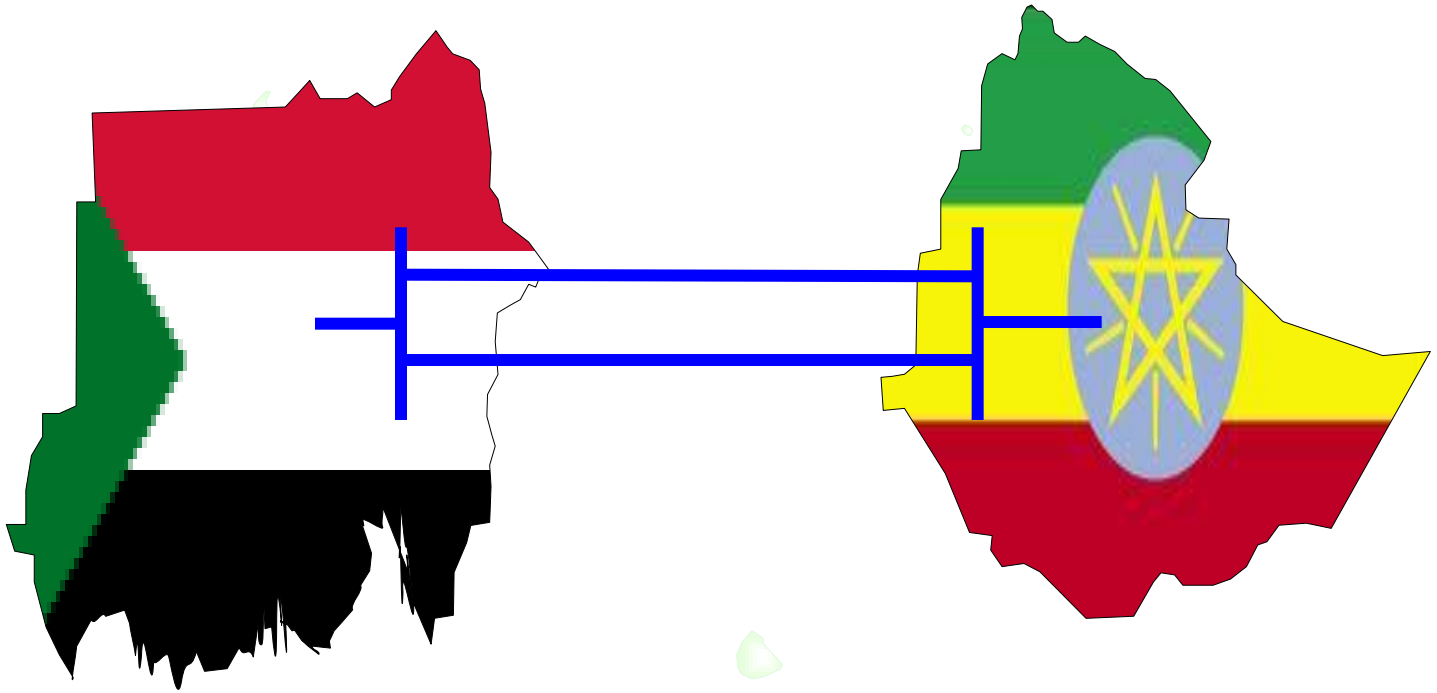
Until 2025	2011 MP	2014 MP (draft) – range across 8 scenarios	Recommended capacities
Kenya-Uganda	(445 MW committed)	492 – 613 MW (445 MW committed)	300 MW in 2020 and 600 MW in 2025
Tanzania-Uganda	700 MW	1,280 – 1,640 MW	
Uganda - DRC	-	771 – 937 MW	500 MW in 2025
Uganda – South Sudan	-	389 – 886MW	
DRC – Rwanda			300 MW in 2025
Rwanda – Tanzania:			200 MW in 2020; 1,000 MW in 2025

Existing Interconnections

- Existing Interconnections as of August 2013
  - Kenya – Uganda Interconnection
  - Ethiopia-Sudan 230 KV Double CKT
  - Ethiopia-Djibouti 230 KV Double CKT
  - DRC, Burundi and Rwanda associated to Ruzizi II (45 MW)
  - Cross Border electrification between Countries

Ethio-Sudan Interconnector

– Ethiopia - Sudan (Completed 2012)

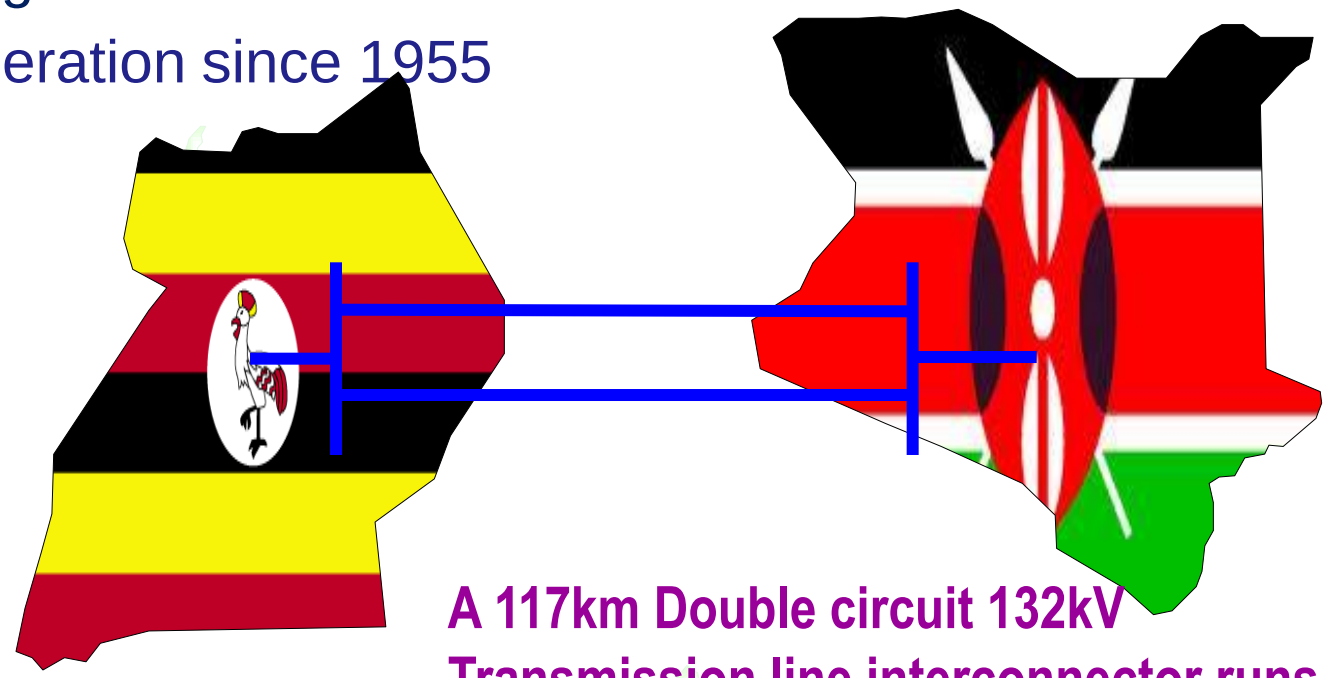


230KV, 290MW Double circuit line

Currently 100 up to 170 MW has been exported from Ethiopia to Sudan

Kenya -Uganda Interconnector

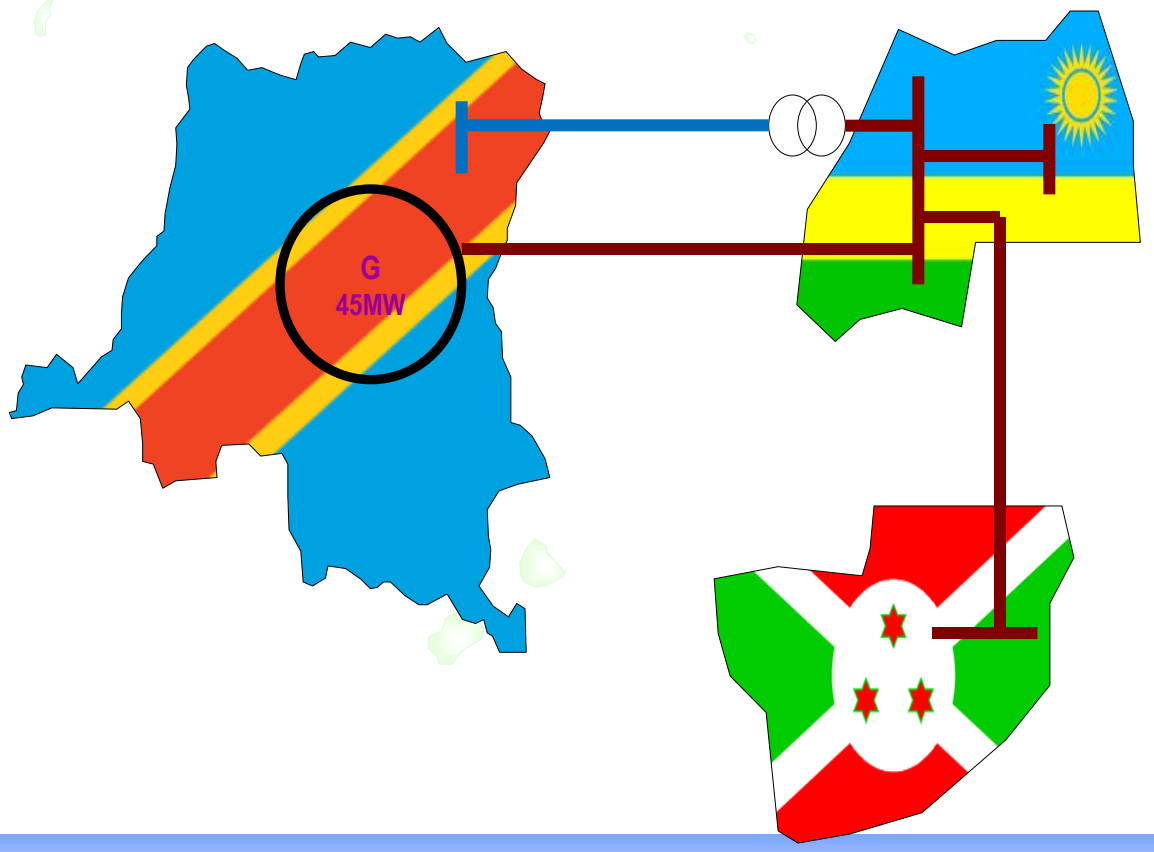
- Kenya Uganda Interconnection
  - In Operation since 1955



A 117km Double circuit 132kV Transmission line interconnector runs from Tororo (Eastern Uganda) to Lessos (Western Kenya)

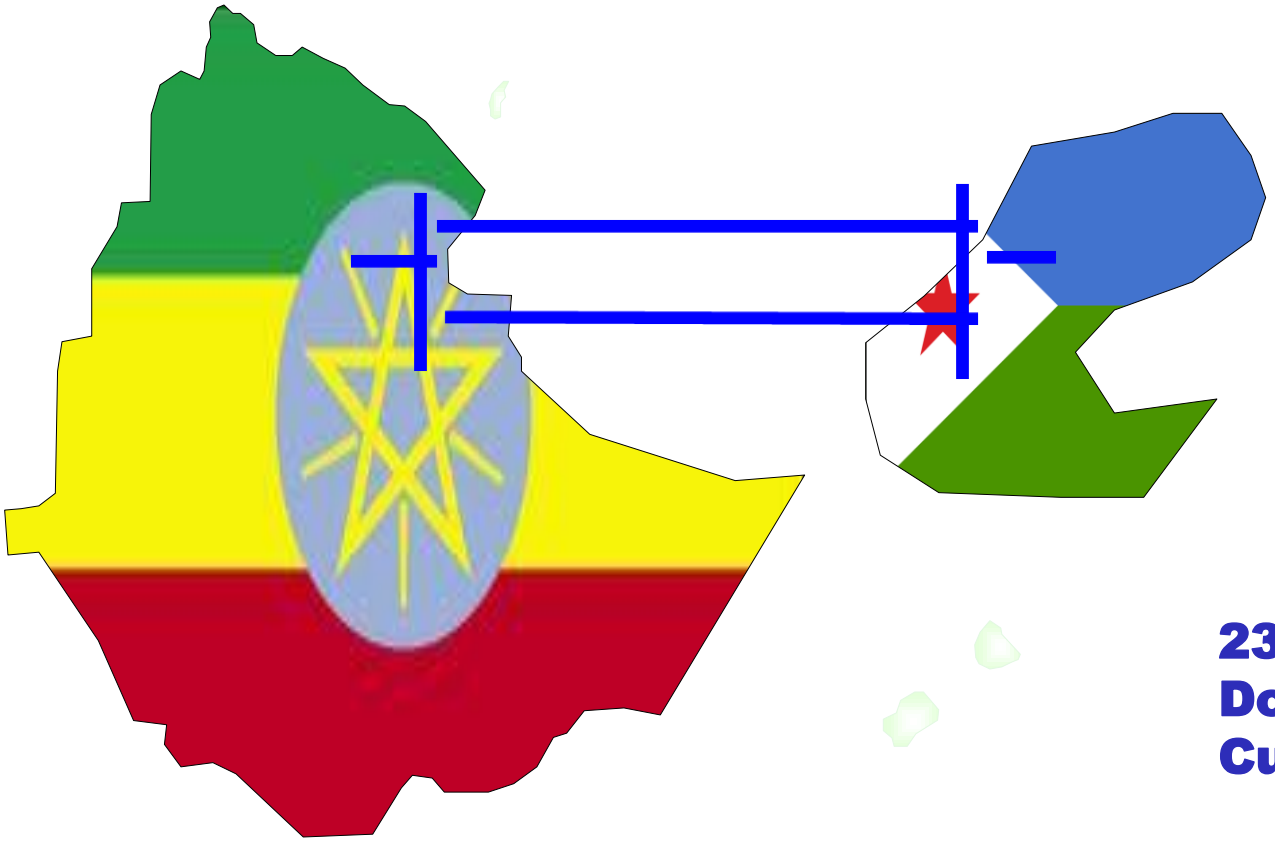
SINELAC Interconnector

- DRC, Burundi and Rwanda associated to Ruzizi II (45 MW)



Ethio-Djibouti Interconnector

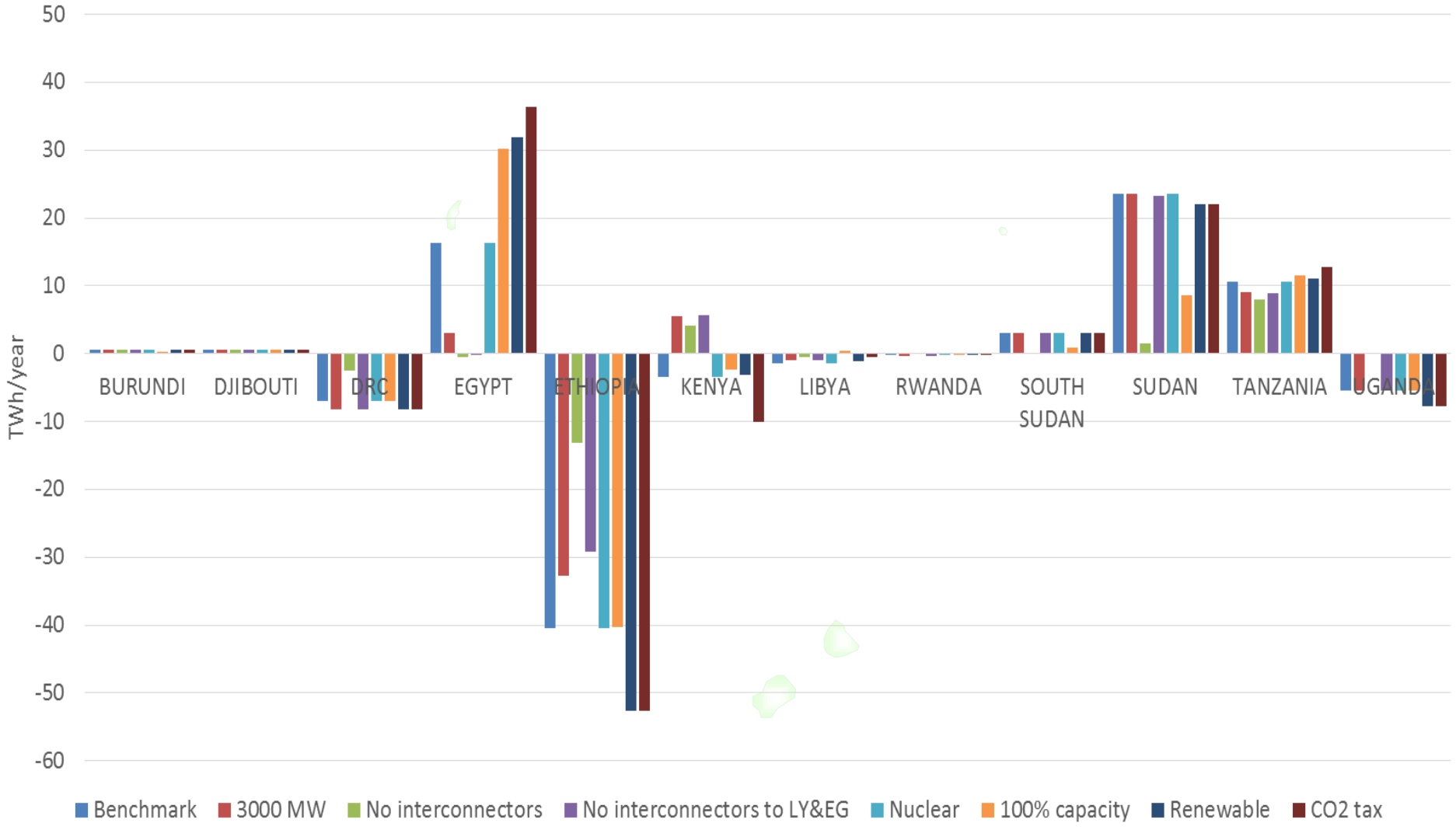
- Ethiopia-Djibouti Completed and tested 2012 (150MW)



230KV, 950 KM
Double circuit
Currently 60 – 75MW

Import – Export balance-2025

(with out the full implementation of Kenyan 5,000 MW plan)



Major EAPP Achievements

- Master Plan and Grid Code for the Region_2011 Currently being updated
- Developed the regional market development Road Map to 2025
- Developed Market Design to start Electricity Market in the region. Templates for trade developed
- Established the Independent Regulatory Board (IRB) in March 2012
- Developed Transmission Standards for the Region
- Developed a 4 year Corporate Plan
- Manage and update a database of regional power systems
- Follow up the implementation of power interconnection projects
- Capacity Building for utilities and EAPP organs

Ongoing Activities

- Support for Enhanced Implementation & Operationalization of Coordination Centre and Independent Regulatory Board (2012-2014)
  - Supported by RNE/SIDA
- Technical Assistance & Capacity Building (project Started in October 2012)
  - Supported by EC
- Renewable Energy Assessment & Feasibility Study of selected projects
  - Supported by USAID
- USAID – Power Africa Support for EAPP

Way Forward

- Continuity of Commitment and support from stakeholders and development partners
- Implementation of the EAPP Regional Master Plan - Construction of Transmission Lines
- Completion of Pilots. Proof of Concept of trade within the EAPP Countries
  - (Pilots Projects now in Progress)
- Completion of interconnectors in the region
- Construction of the EAPP Headquarters and the Coordination Center (CC)
- Power Trade
- Capacity Building

THANK YOU


Olkaria Geothermal PP, Kenya


Ubungo Gas PP, Tanzania


Grand Ethiopian Renaissance Dam (6000MW)