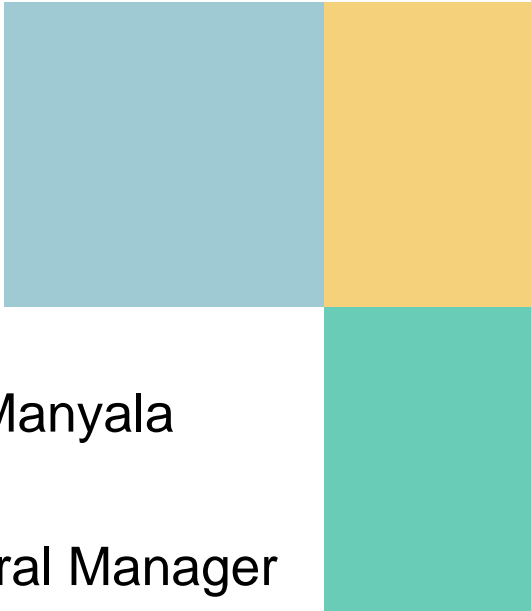
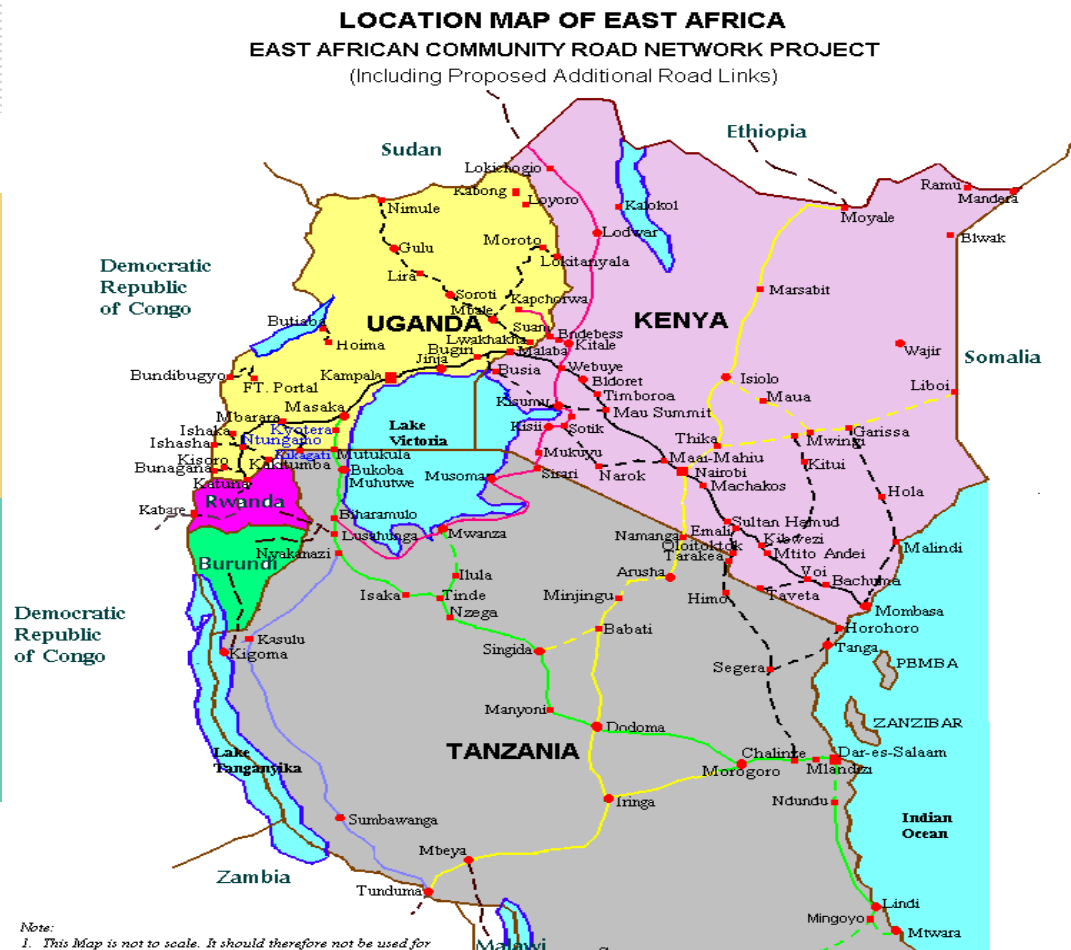


# East Africa Energy Sector Situation & Investment Scenario



Ken Manyala

General Manager  
Kenya Investment  
Authority (KenInvest)

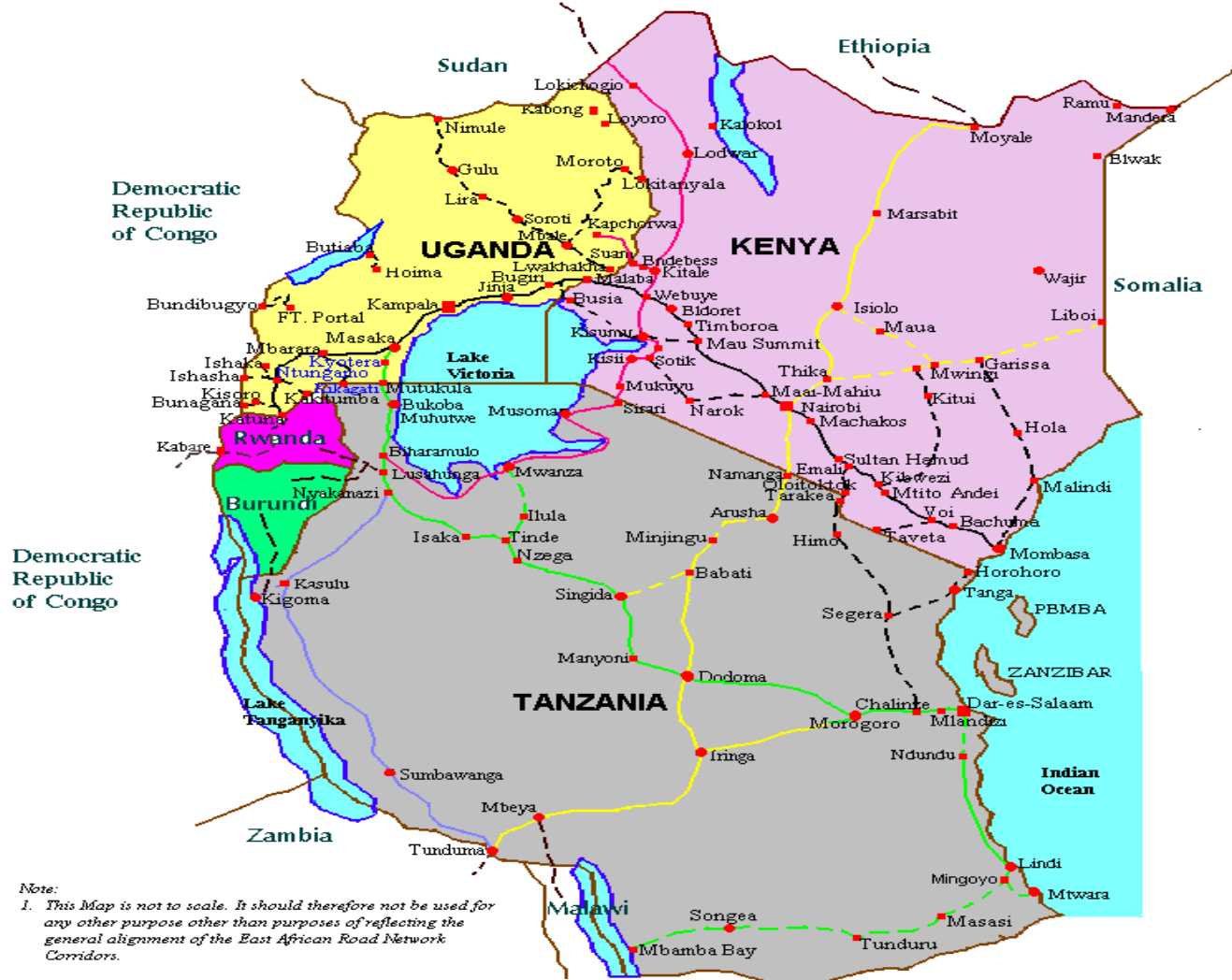


Note:  
1. This Map is not to scale. It should therefore not be used for any other purpose other than purposes of reflecting the general alignment of the East African Road Network Corridors.  
2. The additional road links are in dotted lines in colours similar to the Corridors of their alignment.

1. — Mombasa-Malaba-Katuna Corridor
2. — Dar-es-Salaam-Dodoma-Isaka-Mutukula-Masaka Corridor
3. — Biharamulo-Mwanza-Musoma-Sirari-Lodwar-Lokichogio Corridor
4. — Nyakanazi-Kasulu-Sumbawanga-Tunduma Corridor
5. — Tunduma-Iringa-Dodoma-Arusha-Namanga-Moyale Corridor
6. — Sections/Links connecting with East Africa neighbours; those of interregional connectivity



**LOCATION MAP OF EAST AFRICA**  
**EAST AFRICAN COMMUNITY ROAD NETWORK PROJECT**  
 (Including Proposed Additional Road Links)



*Note:*  
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6. - - - - - Sections/Links connecting with East Africa neighbours; those of interregional connectivity



# Why EAC an ideal Investment Destination

## Strategic Location

- Convenient Location for Hub operations
- Easy access to the greater region by road, railway, sea and air
- Access to regional and international Markets –preferential- (EAC union, COMESA, AGOA, TICAD, etc)
- Availability of other support services (finance, insurance, transport, and professional services)

## Human Resource

- Adequate and trainable human resource available in all types of skills required for operations
- Adequate universities and medium level colleges
- Extensive understanding and use of English language

## Simple investment procedures, supported by presence of investment Promotion Agencies



# Why Energy

- Through NEPAD, Africa has set 7% per annum growth target to meet development goals.
- Energy role as a resource, a collective service and a factor of production affects all sectors of development.
- Poverty prevalence in EAC is a pressing challenge to achievement of EAC's development vision (GDP per capita EAC US\$ 345, population below poverty line - 44).
- There is consensus that energy services help reduce poverty and stimulate economic development, thus MGD goals realization.
- Modern energy services increase incomes by improving productivity, creating employment, and providing access to markets.



# Energy Access Situation

**The EAC region consider energy as an intermediate factor of production that would support its industrialization and peoples development processes**

- EAC has a population of 125M: more than 81% of population live without access to modern energy services;  
< 30% of households use liquefied petroleum gas;
- <40% of urban and <5 % rural households have access to electricity; and.
- <10% of schools, clinics and hospitals in rural areas have access to grid electricity.
- At least EAC should aim at reducing this low volume access by 50% in order to achieve its development goals:

**Among the EAC countries, Kenya has improved rural electricity access by almost 22%-This has increased rural economic activity**

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# Energy consumption distribution by country

## Biomass Resources:

- **Kenya:** account for 68% of primary energy consumption & 90% rural households=34.3 million metric tonnes.
- **Tanzania:** 90% households = 14 million metric tonnes.
- **Uganda:** 93% of total energy consumption = 20 million metric tonnes.

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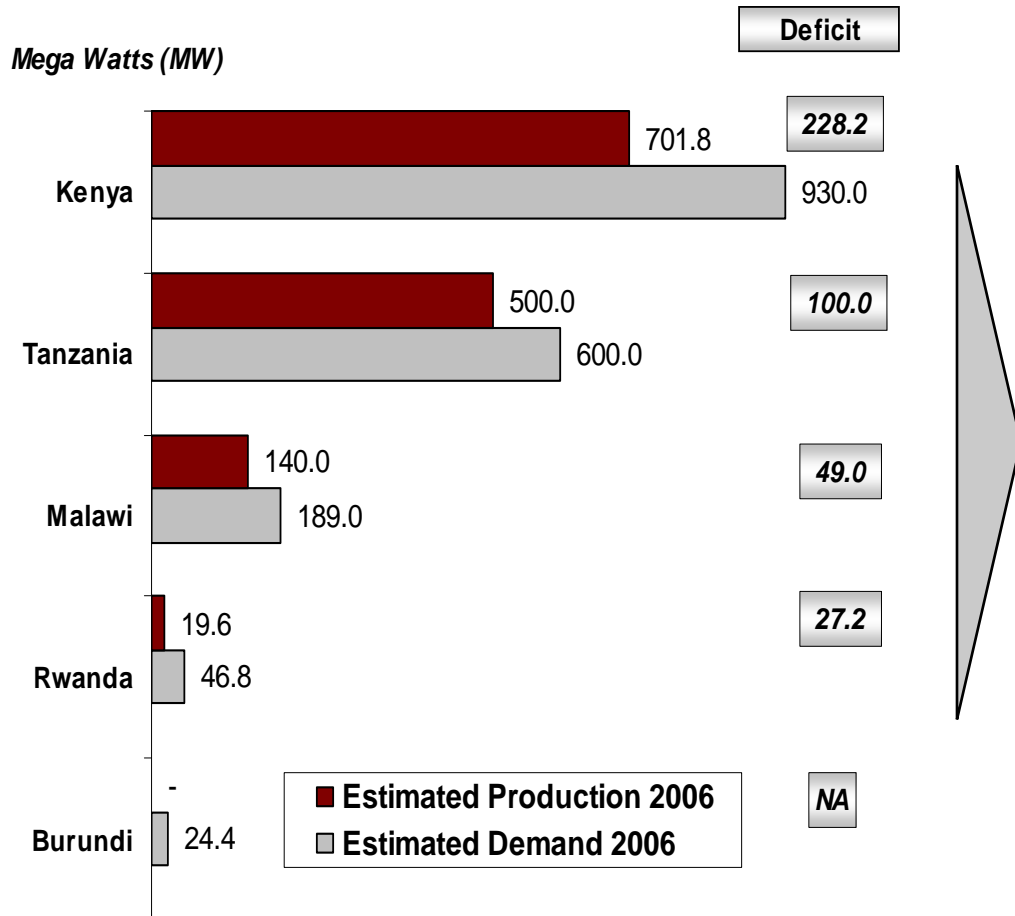


# Major sources of energy in the EAC

- Geothermal
- Wind
- Hydro
- Solar
- Natural gas
- Biomass
- Coal



# East Africa Power Production and Demand, 2006



- 75% of the region's power is reliant on hydro
- Kenyan and Ugandan dependence on limited hydro resources (e.g. Mtera and Kidatu dams in Lake Victoria). With increased economic activities in both countries, the has been increased demand for energy
- Operations of Rwanda's *Electrogaz* are reported not sufficient and power shortages has been identified as "a major economic threat" as expressed by
- Rwanda's President Kagame expressed that power supply remains a challenge for the region, at the 21st Common Market for Eastern and Southern Africa (COMESA) Council of Ministers

# Evidence of future expected demand

- Kenya and Uganda plans in constructing a standard gauge railway network demonstrates potential demand for abundant supply of power,
- Planned modern railway construction from Lamu port through to Southern Sudan would require massive power supply to make transportation cost effective,
- The development of Standard Railway network connecting Tanzania-from Dar-es-salaam to Burundi and then to Kigali-Rwanda will require massive electricity,
- In Kenya the up-coming massive **Special Economic Zones** for industrial development poses great demand for power



# Existing Regional Power Connection Systems

- Kenya - Uganda power grids interconnected through a 132kV double circuit line.
- Tanzania and Uganda have a cross border supply through a 132kV line.
- Kenya and Tanzania have a cross border supply through a 33kV line.
- Rwanda and Burundi power grids are interconnected through a 70kV line.

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# Existing Power Systems: Kenya

- Interconnected system has a total installed capacity of 1, 232 MW made up of:
  - 707 MW of hydro, including 30 MW of non firm import from Uganda
  - 398 MW of thermal
  - 127 MW of geothermal
  - 0.35 MW of wind
  - Large discovered deposits of Coal in Kitui
- KenGen (GoK) owns 83%, IPP own 17%.
- Of the 83%, 30% of generation has been sold to public through an IPO.
- Transmission system comprises 220 kV, 132 kV, and 66 kV lines
- System load concentrated in Nairobi and Mombasa

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## Projects expected to be commissioned by 2012 (240 MW)

- 20 MW Sang'oro Hydro – expected cost US\$ 54 m
- 5MW Ngong wind – cost US\$15 m
- 25 MW Chemelil Bagasse – US\$20m
- 140 MW Olkaria IV- cost US\$336m (work on 6 appraisal wells at a contract price of US\$ 36m is ongoing with 4 already completed)
- 20 MW – Kindaruma third unit to cost US\$25m



# Projects expected to be commissioned after 2012

- 140 MW Menengain1- cost US\$336 m
- 200 MW CNG – cost US\$ 200m
- 60 MW Mutonga Hydro – cost US\$ 226m
- 100 MW Marsabit wind- cost US\$ 180m
- 300 MW coal Plant at Mombasa – cost US\$ 800 m (Feasibility study ongoing)



## Future transmission projects expected to be implemented

- 450 km Nairobi – Mombasa double 400 kV line to facilitate 600MW transmission - estimated cost US\$ 200m
- 212 km Rabai-Malindi- Garsen 220 kV line with 108 km 132 extension from Garsen to Lamu – cost US\$ 91m
- Phase II of above, 230 km 132 kV line is proposed between Garsen and Garissa with 132 kV substations at Bura, Hola and Garissa
- 200 km Lessos double circuit – Olkaria 220 kV line – estimated cost US\$46m



# Existing Power Systems: Tanzania

- System comprises of 6 hydro plants.
- Total effective hydro capacity of the grid system is 555 MW.
- Installed capacity of thermal generating sets has increased to 302 MW.
- Transmission voltages are 220 kV, 132 kV, and 66 kV.
- Dar-es Salaam is the major load centre.
- TANESCO remains under state control.
- Over the long term, Tanzania has the potential to become a power exporter to the region. Tanzania has ample resources for power generation but lacks the infrastructure necessary to harness them: hydro, gas, coal, oil and bio fuels

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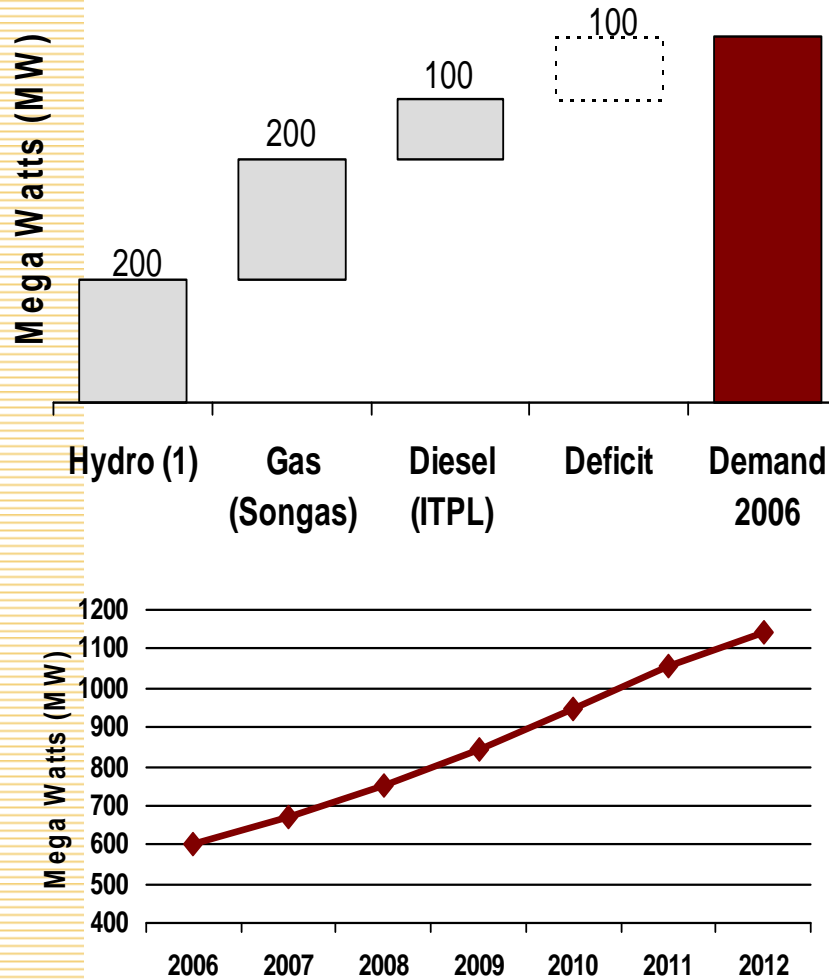
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# Power situation & demand



- Tanzania has traditionally relied in hydroelectric power
- Current drought has limited hydro generation to 200 MW from 350 MW installed capacity
- With strong growth in commercial, industrial, agricultural and residential demand adding load to the grid, demand is projected to almost triple to 1,600 MW by 2020
- A limitation in power supply also limits the country's development: local mining and other industries rely on expensive imported diesel generators for power supply
- Reliance on privately-owned diesel generators is not only expensive for industry but also limits revenue for Tanzania
- If Tanzania can offer power through the grid, the country will experience a boost in industry demand as existing energy-constrained sectors and new companies develop

# Potential Power Generation Projects

Potential Supply	Potential Capacity (MW)	Identified Projects Description
<b>Hydro</b>	2100	<ul style="list-style-type: none"> <li>Development of the Stiegler's Gorge dam, and power generation facilities</li> <li>Identification of other viable hydropower alternatives</li> </ul>
<b>Gas</b>	500	<ul style="list-style-type: none"> <li>Further expansion of power generation capacity from Songo Songo and Mnazi Bay fields</li> </ul>
<b>Coal</b>	600	<ul style="list-style-type: none"> <li>Development of IPPs using the Mchuchuma and Kiwira coal deposits in the Lake Malawi region</li> </ul>
<b>Biofuels</b>	200	<ul style="list-style-type: none"> <li>Development of sugar, palm oil and jatropha plantations</li> <li>Production of ethanol from sugar; biodiesel from palm oil and jatropha and use for power generations</li> </ul>
<b>Oil</b>	450	<ul style="list-style-type: none"> <li>Shell, Petrobras and others have already acquired rights for a number of offshore exploration blocks</li> <li>Over the longer-term, potential may exist for oil-based power generation</li> </ul>



# Existing Power Systems: Uganda

- Supplied by 2 main hydro electric plants.
- Total installed capacity is 300 MW.
- Main transmission voltage is 132 kV with the sub-transmission system operating at 66 kV.
- A 200 MW hydro project in Bujagali is considered to be in service in late 2009.
- Generation and distribution have been deregulated and fully unbundled.

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# Combined Energy Forecast for East Africa

Year	Energy (GWh) Low	High	Peak Demand (MW) Low	High
2002	8,788	8,875	1,503	1,518
2005	9,752	10,834	1,637	1,832
2010	11,900	15,717	1,996	2,668
2015	14,465	21,855	2,417	3,689
2020	17,683	30,478	2,943	5,113
2025	21,742	42,724	3,609	7,131
2002-25	4.0%	7.07%	3.88%	6.96%

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# EAC Regional Power Systems – Future Plans

- Tanzania and Kenya to be interconnected - 330kV line (ZTK Arusha – Nairobi)
- Rwanda, Tanzania and Burundi to be interconnected through Rusumo Falls Project (NBI)
- Rwanda and Burundi plan a 132kV interconnection
- Kenya - Uganda 220kV to be interconnection (Lessos -Jinja estimated to cost US\$ 94M)
- 220kV line Rusumo – Kyaka to Uganda

## Others

- Zambia-Tanzania-Kenya (expected cost: US\$ 1 B)
- 400 kV Kenya – Ethiopia link (cost: US\$600M)

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# Candidate Hydro Projects

Project	Location	Capacity (MW)	Capital Cost (US\$ *10' 6
Bujagali 5 <sup>th</sup> unit	Uganda	50	26.4
Kalagala	Uganda	450	511.6
Karuma	Uganda	200	428.9
Ayago North	Uganda	304	557.6
Ayago South	Uganda	234	437.2
Murchison falls	Uganda	420	511.7
Masindi	Uganda	720	1, 633.3
Ewaso Ngiro	Kenya	220	385.9
Mutonga	Kenya	60	196.7
Low Grand Falls	Kenya	140	378.3
Upper Kihansi	Tanzania	120	81.2
Mpanga	Tanzania	144	190.8
Masigira	Tanzania	118	157.0
Ruhudji	Tanzania	358	384.0
Rumakali	Tanzania	222	351.3
Mandera	Tanzania	21	42.1
Stiegler's gorge	Tanzania	1200	1, 067.7

# Energy Generation and Access Plans

- EAC and NEPAD has prioritized reform & investment in energy.
- August 2005: EAC energy ministers recognized need to develop strategy to scale up modern energy access by promoting investment in cost-effective technologies that are high impact, low cost, and scalable.
- East Africa Energy Master Plan – agreement to interconnect electric grids and create a common power market with the benefits of lower cost electric power and increased liability.
- 1<sup>st</sup> Retreat of Ministers of EAC (Kigali, April 08) recognized energy infrastructure requirements for the region -2010.

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## Energy Generation and Access Plans: Kenya

- Kenya Rural Electrification Program: \$ 14 m GoK program to increase electrification to 26% by 2015, + 6% rural households.
- Ministry of Energy's Strategic Plan: 4 yr, \$ 250 m program to upgrade existing infrastructure and conduct geothermal exploration.
- Government of Kenya's solar project for Schools: \$ 2.5 m program (2005-09), providing solar photovoltaic systems to 25 schools per year.
- GoK Energy Sector Recovery Program funded by World Bank: \$ 153 m to upgrade existing grid infrastructure & system.

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# Energy Generation and Access Plans: Tanzania

- Tanzania Rural Electrification Master Plan: to increase no. of new connections from 40, 000 to 100, 000 per yr.
- GoT: \$ 100 m program to increase natural gas generation capacity.
- GoT Energy for Rural Transformation Program: \$80 m (presented to World Bank Board for funding) for 300, 000 new urban and rural connections.
- UNDP solar program: Solar PV and Microfinance – Mwanza Province.
- SIDA solar program: \$ 5 m country wide program for PV solar dissemination.

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## Energy Generation and Access Plans: Uganda

- Uganda Rural Electrification Strategy and Plan: provides policy guidelines and contains targets to connect 400, 000 customers to the grid by 2012.
- Rural Electrification Fund: to subsidize initial capital investments in commercially unviable areas.
- GoU Energy for Rural Transformation program: WB funded- 1<sup>st</sup> phase deploying \$49 million.
- Grid Extension Program in Kibale: SIDA supported \$11.5 million.
- Cogeneration of bagasse.

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# Welcome to East Africa

## Thank you

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