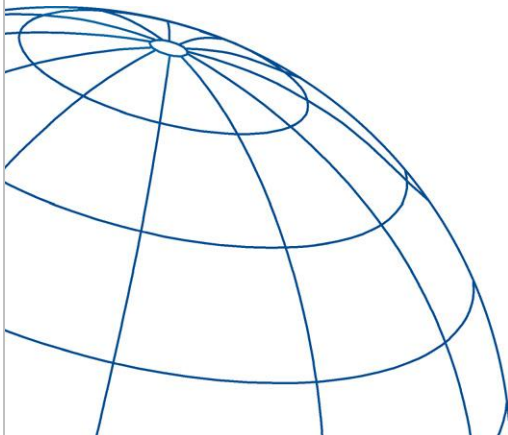


Rural Electrification with Renewable Energies in East Africa

Dr. Ole Langniß / David Lecoufle

Sarweystrasse 3
70191 Stuttgart • Germany
Phone: +49 711 8995-0
Fax: +49 711 8995-459
www.fichtner.de

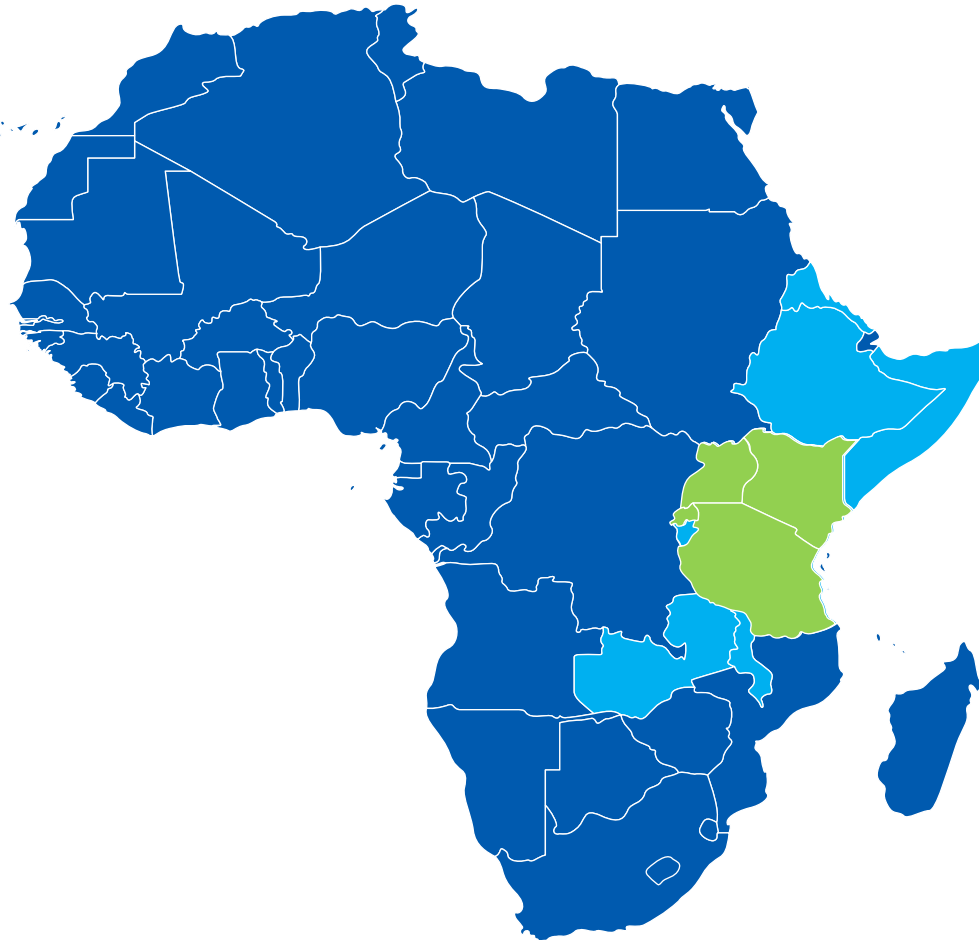
Please contact: Dr. Ole Langniß
E-mail: Ole.Langniss@energieanalyse.net



Agenda

1. East Africa and the Project countries
2. Background
3. Key figures of countries investigated
4. Comparison of policies and regulations
5. Technologies and Costs
6. Barriers
7. Opportunities

East Africa and the Project countries



- Kenya
- Rwanda
- Tanzania
- Uganda

East African Community (EAC) - an intergovernmental organisation comprising five countries in East Africa: Kenya, Uganda, Tanzania, Rwanda and Burundi

Key figures of countries investigated

	Kenya	Rwanda	Tanzania	Uganda
Total population (million)	41	11	46	34
Annual population growth	2.6%	2.6%	2.6%	3.2%
Population density in 2010 (per km ²)	70	400	50	140
Share of rural population	76 %	81%	73 %	84%
GDP per capita (\$ /cap)	808	1097	532	503
Share of population with less than 1.25 USD per person per day	43%	63%	67%	51%
Electrification rate	urban 51 %	16%	12%	10%
Rural electrification rate	15%	1%	2%	3%
Annual per capita power consumption	148 kWh/a	22 kWh/a	83 kWh/a	40 kWh/a
Total installed capacity (MW)	1698 MW	87 MW	1838 MW	672 MW
Total annual generation	6.9 TWh	245 GWh	4.6 TWh	2,1 TWh
Share of renewable energy on total generation	60%	36%	60%	71%

France	Germany
125 918 MW	163 766 MW

Key figures of countries investigated: minigrids

	Kenya	Rwanda	Tanzania	Uganda
Existing minigrids	12	6	16	1 + 3
Cumulative capacity	7.7 MW	740kW	42 MW	3 MW + 600kW
Average capacity	640 kW	120kW	2.6 MW	3 MW / 200 kW
Minigrids under licensing / construction	29	12	16*	NA
Cumulative capacity	4.5 MW	9.2MW	47 MW*	NA
Average Capacity	300 kW	770kW	2.9 MW	NA

* Tanzania, mainly grid connected but allowing to connect new villages

Off-grid and pico applications

- Strong governmental will to supply rural schools and hospitals with PV-Systems
- Solar Home Systems for Private households still have a low penetration because of high CAPEX
- Pico-applications have a high penetration by private sector such as solar lanterns with USB phone chargers



Off-grid and pico applications

Name	Size	Application	Price
Picosolar lantern	~1.5 W	Lighting	10-12 € / Wp
Picosolar lantern with USB interface	~3.0 W	Lighting - cell phone charging	10-12 € / Wp
Small plug and play SHS	~20 W	Lighting, cell phone, other DC appliances	5 – 6 € / Wp
SHS	50 W up	DC appliances	3 – 7 € / Wp

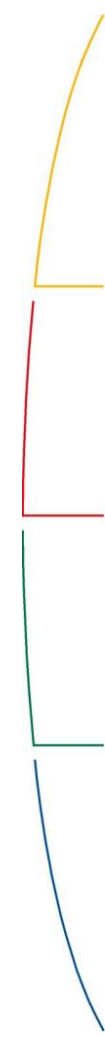
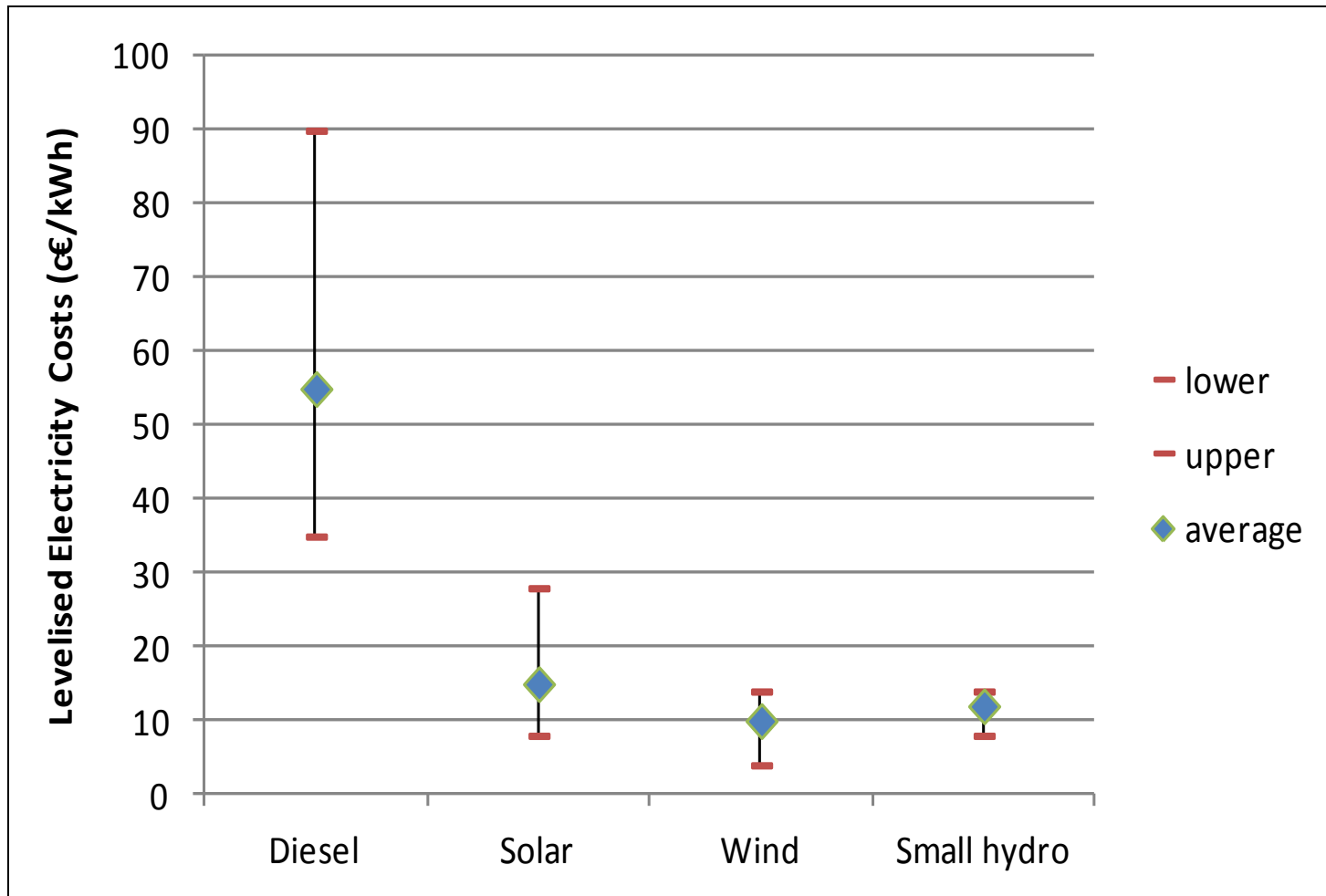


Comparison of policies and regulations

	Kenya	Rwanda	Tanzania	Uganda
Roadmaps for rural electrification	Rural Electrification Master Plan	Electricity Access Roll-Out Program (EARP)	Scaling Up Renewable Energy Program (SREP)	Rural Electrification Strategy and Plan (RESP)
Special Agency for rural electrification existing?	Rural Electrification Authority	no	Rural Electrification Agency (REA)	Rural Electrification Agency (REA)
Targets for rural electrification	40% by 2017, 60% by 2022, 100% by 2030	100% of health facilities and government offices, 50% of schools, 140,000 households by 2013	12% of rural population (2.2 million people) by 2025	22% by 2021, 50% by 2030, 100% by 2040
Share of off grid / minigrid electrification on total target	6% of investment	5% of the target population	25% of the investment until 2025	6% of investment over the next decade
Estimated costs for next electrification target (million USD)	573	867	720 by 2025	951 by 2022
Regulation allows IPPs?	yes	yes	yes	yes
IPPs for rural electrification existing?	yes	no	yes	yes
Regulation allows IPDs	yes	no	yes	yes

Technologies and Costs

LCEs for different technological options in minigrids



Barriers

- Affordability
- Upfront costs for end-user connection to the grid
- Capacity - lack of knowledge and skills
- Minigrids financial viability
- Financing facility
- Access to equity and long term project financing
- Uniform tariffs vs. specific cost covering tariffs
- Small size of markets

Opportunities

- Large natural resource of renewable energies
- Decreasing costs of renewable energies
- Growing economies
- Increasing demand for energy
- Ambitious policies for “Access to Energy”
- Opening the market for private investments
- Private businesses and banks expressed great enthusiasm about further deployment of renewable energies

Areas for further discussion/support

- Soft loans
- Capacity building (managerial, technical)
- Strengthen entrepreneurship
- Transition policies
- Transition technologies
- Second hand markets

Case-Study: Kisavu Real Estate Development

- 3000 detached houses for low-income households and middleclass
- 40 km from Nairobi, 10 km to the closest grid
- 400 houses were supplied with individual solar home systems to avoid high connection costs
- Now connected, most households do not use anymore the SHS
- Real estate developer interested in own generation to supply inhabitants with low cost electricity



Thank you for your attention!

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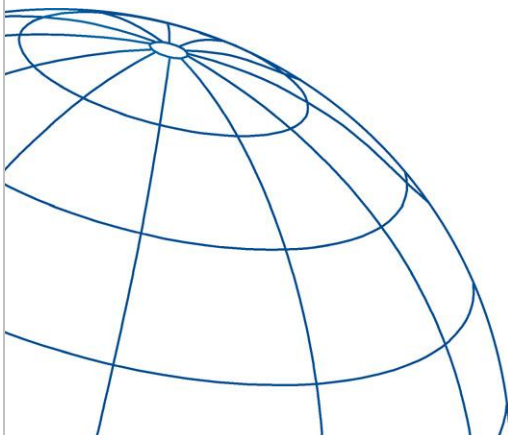
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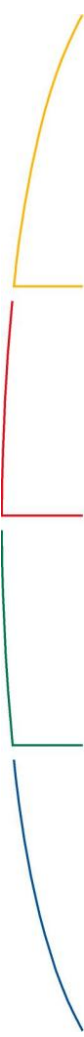
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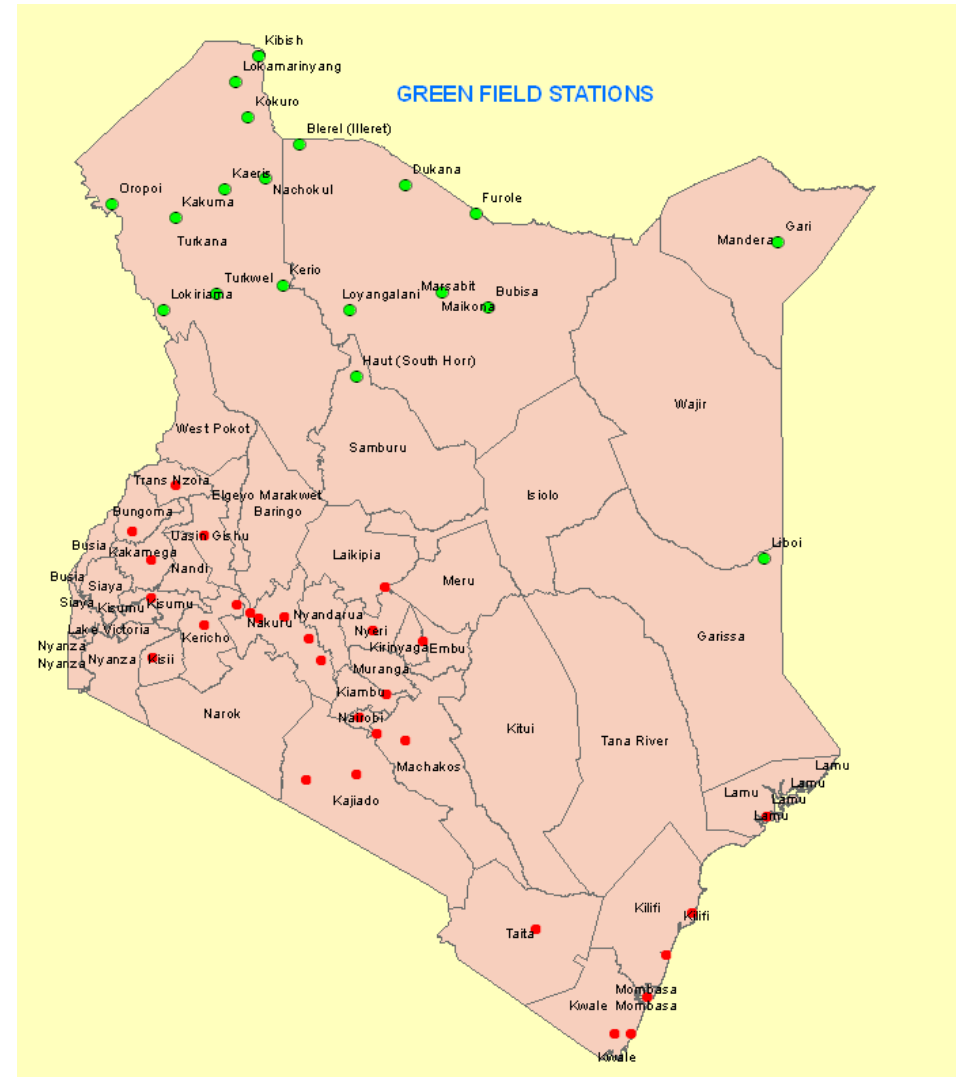


Reserve Slides



Case-Study: SREP KENYA

- Scaling Up Renewable Energy Program, April 2013
- 7 existing hybrid minigrids as fuel savers
- Retrofitting / installation of 24 hybrid minigrids with solar (3.8 MW) and 12 minigrids with wind (1.1 MW)
- Another 20 minigrids identified for further projects



Case-Study: WENRECO UGANDA

- 3 MW hydro isolated grid in the North-West of Uganda
- Wenreco is IPP / IPD but transmission is public. 1 of 7 IPP's and 1 of 6 IPD in Uganda
- End-user tariff set by ERA at 11c€ vs 15c€ for main grid
- Wenreco applied for increase in end-user tariff
- Introduction of pre-paid meters (with cell phones)



Country specific opportunities

Rwanda	
	No studies about wells yet undertaken at Bugarama.
	Bring online four geothermal power plants 75MW each at an estimated cost of USD900m.
	Peat projects account for an additional 300MW
	At the Kayonza site, the utility EWSA is tendering out 10MW.
	Potential off-grid lighting solutions consumer market of around 1 million households exists
	The e.quinox solar energy supply model to be replicated across rural Rwanda if it proves it can finance itself
	Major applications of solar energy: Solar systems for health centers, schools and other governmental buildings; Solar home systems (SHS); Pico applications like solar lanterns or solar charger; Very large open-field power plants with capacities of some Megawatts.
	Less than 10 % of the total off-grid rural population would have an interest in a 10-50 Wp PV system and another 30-40 % would be interested in a micro system.
	Feed-in tariff structure for the plants up to 10 MW of installed capacity.
	The largest hydropower market segment are plants of several MW per project to supply electricity into the national electricity grid soon through IPPs, then hydro-power activities of less than one MW, and pico hydro (<10 kW).
	Hydropower Atlas in 2007 identified 271 potential hydropower sites in the capacity range of 0.3 and 22MW.
	Power plants up to 50kW capacity can be operated without license.
	Self-contained off-grid schemes are encouraged.
	Theoretically, the Government has removed duties and taxes on solar equipment.
	The regulatory and policy environment for microfinance is very strong.
Tanzania	
	Upgrade, rehabilitate and expand transmission, in particular with the “backbone” project to provide a 400 kV line between Iringa and Shinyanga.
	For the so-called Small Power Producers (SPPs), a special tariff is granted with no differentiation between technologies, yet explicitly for renewable energies.
	Support mechanism - set of tariffs

Country specific opportunities

Kenya	
	Small-hydro: wider foothills of Mount Kenya and other water towers;
	Off-grid rural electrification element into RE tea and sugar industry power generation programmes.
	Decentralised renewable energy schemes conducted
	Masinga dam wall project and High Grand Falls project (700MW)
	Accelerate co-generation of at least 200MW, generate at least 100MW of electricity using municipal/industrial solid waste, and facilitate 800MW of co-generation capacity from bagasse and agro-residues by 2022.
	Introducing wind power generation in existing diesel isolated/off-grid power stations.
	Targeting the use of solar PV to supply the isolated/off-grid stations to partly displace the thermal generation.
	Expansion of piloting hybrid mini-grids in rural areas.
Uganda	
	Facilitates the development of IPPs, in particular based on Renewable energies.
	Develop the next dam project (Karuma, 600 MW).
	A REFIT program has been fixed.
	GETFIT program provides a premium to the REFIT.
	About 6% of planned grid extension and densification is foreseen for minigrids and solar PV deployment.