Federal Ministry of Economics and Technology

gtz Partner for the Future. Worldwide.

The Biogas Market in Kenya
Status Quo and Potentials

Combined Biogas Business and Study Trip from Kenya and Tanzania

Hannover, November 13, 2009

Michael Franz, Klaus v. Mitzlaff
German Technical Cooperation (GTZ)

renewables Made in Germany

Structure

- Biogas in Kenya – Status Quo
- Background: situation in the energy sector in East Africa
- Potentials for large-scale biogas
- Framework condititions
- Obstacles
- Recommendations

Federal Ministry of Economics and Technology

gtz Partner for the Future. Worldwide.

Biogas in Kenya – Status Quo

Biogas traditionally:

- Used in particular in Kenya and Tanzania
- Small and very small installations
- Used for providing household energy and for supplying social institutions (cooking, heating, lighting)

renewables Made in Germany

Federal Ministry of Economics and Technology

gtz Partner for the Future. Worldwide.

Biogas in Kenya – Status Quo

- Industrial biogas not yet tapped in East Africa
- Two known applications o nly

A. BG Plant on sisal farm in Tanzania
   - Design not well adapted to sisal operations
   - Substantial operating problems
   - Components of low quality

B. Plant on sisal cum cattle farm in Kenya
   - Design well adated to farm operations
   - Fully operational since Sept. 2007

renewables Made in Germany

Biogas in Kenya – Status Quo

- The biogas plant in Kilifi
  - Operator: Biogas Power Company (EA) Ltd.; joint venture Kilifi Plantations (KE), agriKomp GmbH und Schnell Zündstrahlmotoren AG & Co. KG (DE)
  - Location: Kilifi Plantations Ltd.
  - 750 cbm digester
  - Inst. capacity: 150 kWel; actual production max. 90kW
  - 4t substrate / day, 200 cattle (40%), sisal waste (60%)

Biogas in Kenya – Status Quo

- The biogas plant in Kilifi
  - Implemented through tripartite PPP with GTZ
  - Pilot plant, risk reduced through German Dev. Cooperation
  - El. Production cost: 16 EURc / kWh
  - Compare:
    - grid electricty 15-17 EURc / kWh
    - Diesel generator: 23-42 EURc / kWh
  - Feedstock available for extension up to 1 Mwel if excess electricity can be sold to KPLC at fair tariff

Biogas in Kenya – Status Quo

- The biogas plant in Kilifi; lessons learnt
  - *Import of equipment*: professional agent and close liaison with authorites for clearance of plant equipment required
  - *Tariffs / grid connection*: need to liase at a very early stage with KPLC, Minstry of Energy and Energy Regulatory Commission to allow for structured and smooth process
  - *Local capacities*: need to bring qualified staff and train local staff
  - *Local manufacture*: local manufacture of pipes, wiring, and civil works should be possible and reduce costs

Biogas in Kenya – Status Quo

- Industrial biogas for electricity generation
  - Pilot plant realized, triggered sufficient interest
  - Challenges: regulatory framework / tariffs, lack of local experience and product information, lack of local capacities
  - Opportunities: energy crisis, well managed agro-industry (sisal, coffee, tea, horticulture, food, …), improving regulatory framework
  - In summary: following implementation of incentives e.g. through the FiT, the Kenyan biogas market presents large opportunities that can be developed quickly

Background: situation in the energy sector in East Africa

- Frequent power cuts due to technical faults, low capacity
- Companies have to install emergency backup power systems, mostly diesel (costs: 0,25-0,35 €/kWh)
- Kenya: High and – due to pass-through of fossil fuel costs – flucuating power costs (e.g. Kilifi: 0,1575 – 0,185 €/kWh)
- Improvement due to strong government and private sector efforts likely, but medium term; persistent risk of power cuts due to hydro power vulnerability to drought

Potentials for large-scale Biogas in Kenya

- Study conducted by DBFZ estimates potentials for Kenya
- Estimates based on individual and aggregated data collected by GTZ
- Data not complete: not all sectors, companies, substrates have been covered
- Estimates by DBFZ are conservative,
- Actual potential will be higher
- Estimate is based on agricultural and municipal wastes and waste waters only, not on renewable biomass

Potentials for large-scale Biogas in Kenya

- Proposed Feed-in Tariffs for Kenya (GTZ/DBFZ)

Source	Installed Capacity (MW)	Electricity production (MWh/a)
Municipal waste NBI	37.5	296,589
Sisal	20	156,842
Coffee	10	80,189
Sugar filter cake	4.1	30,723
Pineapple production	2.35	18,064
Chicken	1.9	15,271
Distillery stillage	1.1	8,353
Instant tea	0.7	5,241
Horticulture	0.65	5,043
Milk processing	0.55	4,269
	78.85	**620,584**

Framework conditions

- Currently no biogas-specific regulation in East Africa
- Power production of biogas falls under „Standardized PPA (TZ)“ or „Feed- in Law“ (KE)
- Kenya: biogas covered by „biomass“ tariffs, which are too low
- Expressed interest from investors and from government → request to GTZ to provide recommendations based on „hard data“ → DBFZ study
- Recommendations have been provided → implementation ..?

Framework conditions

- Proposed Feed-in Tariffs for Kenya (GTZ/DBFZ)

Suggested tariff steps	Production costs (USD ct/kWh_{el})	Basic-FiT (USD ct/kWh_{el})		
		+ 5%	+ 10%	+ 15%
0 - 50 kW_{el}	18.05	18.96	19.86	20.76
50 – 250 kW_{el}	12.52	13.15	13.77	14.40
250 – 500 kW_{el}	10.00 [1]	10.50	11.00	11.50
> 500 kW_{el}	9.00 [1]	9.45	9.90	10.35

[1] Production costs for 250-500 and >500 kW_{el} are estimates

Framework conditions

- Difference costs for proposed tariffs in Kenya

	Scenario 1	Scenario 2	Scenario 3
Description	Emphasis on small plants	Emphasis on medium sized plants	Emphasis on large plants
Mean Remuneration (USD/kWh$_{el}$)	0,1492	0,1392	0,1352
Total biogas remuneration [USD]	111,924,734	104,429,143	101,386,635
Current generation mix (0.08 USD / kWh), difference costs in USD	51,924,734	44,429,143	41,386,635
Least Cost Power Development Plan (0.11 USD USD / kWh), difference costs in USD	29,424,734	21,929,143	18,886,635
100 MW thermal power (0.17 USD USD / kWh), difference costs in USD	-15,575,266	-23,070,857	-26,113,365

Obstacles

- Little experience with agro-industrial biogas in EA
  - investors: hesitant due to limited knowledge of technology
  - Policy: as above, also no experience with power wheeling
- Local technical capacities limited, few biogas experts, but good pool of skilled technicians that could be trained
- Framework as of yet unattractive; however improvement likely

Summary

- Estimated potential (~80MWel) and provided tariff recommendations (GTZ / DBFZ study)
- Considerable unexplored potentials in agriculture and waste management
- Large share of the potential concentrated in MW-range
- Electricity production for own consumption already viable
- Similar but smaller potentials in neighboring countries
- Obstacles exist, e.g. framework as of yet unattractive

Federal Ministry of Economics and Technology

gtz Partner for the Future. Worldwide.

Recommendations

- Build strong partnerships with viable local partners
- Focus on high potentials (low hanging fruits) e.g. own consumption or spatially highly concentrated substrate potentials, e.g. sisal, food production, horticulture, coffee
- Make use of local production of components and local civil construction companies in order to reduce costs
- Build technical capacities for biogas plant engineering, construction and operation
- Policy: establish attractive incentives, constantly monitor framework and successes, adapt where necessary

renewables Made in Germany

GTZ-services

Promoting B2B-partnerships for Investment

- Target Market Analysis; Business Guides
- Identification of projects and partners
- Framework support with stakeholders
- Support to technical capacity development
- Delegation trips to Germany
- Business trip to East Africa (early 2010)
- Local contacts, linkages and facilitation

Thank you very much for your attention!

Further information

Michael Franz

Regional Energy Advisor

GTZ REAP-EA

michael.franz@gtz.de

+254 20 2731834 / 826 / 828