Promoting RE through Community Driven Electrification using Wind Turbines

By

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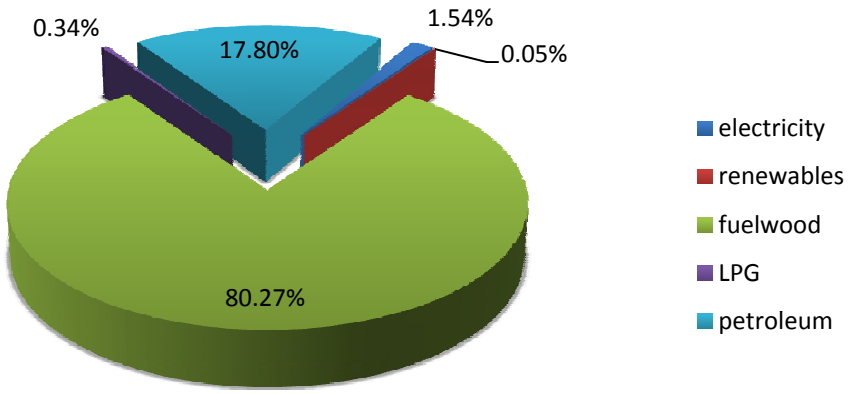
The Gambia

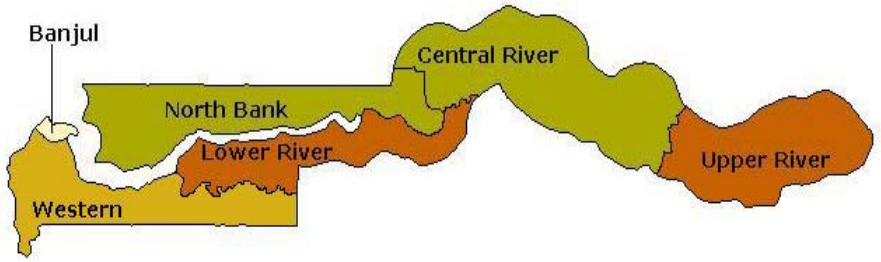
Energy in The Gambia

- Country Data
  - Pop. 1.8m
  - US $ 450 per capita
  - Area: 11,295 sq km
- Energy Situation
  - Typical energy scenario
  - High consumption of biomass (80%)
  - Electricity consumption
  - Renewables very low
  - All
- National Electrification
  - Urban 60%
  - Rural (nationwide) 30%

National Energy Balance



Map showing the rate of access to electricity in the different Regions of The Gambia



LGA	Electrification Rate
Banjul	93%
Western Region	22%
Upper River Region	14%
Lower River Region	12%
Central River Region	7%
North Bank Region	6%

Energy Policy Framework

- Energy Policy 2005
  - No natural resources
  - Heavy reliance on imports
    - All primary fuels
      - Transport fuels (diesel. Petrol, kerosene)
      - power generation (HFO)
        - Charcoal/ Firewood as well
- Key Focus on
  - Access (rural electrification)
  - Encourage IPPs
  - Renewable Energy
    - Renewable Energy Law (*absent*)

Regulatory Framework

PURA Act 2001

- PURA Act of 2001
- Regulates Electricity Market
  - Establishes the Regulator
  - Economic Regulation
    - Tariff Setting
  - Quality of Service
  - Customer Protection
  - Dispute Resolution

Electricity Act 2005

- Electricity Act of 2005
  - Promotes Private Sector Participation
  - Licensing framework
    - Generation Licences
    - Distribution Licences
    - Transmission Licences

- Tariff Approval Guidelines & Model
- HSE Guidelines

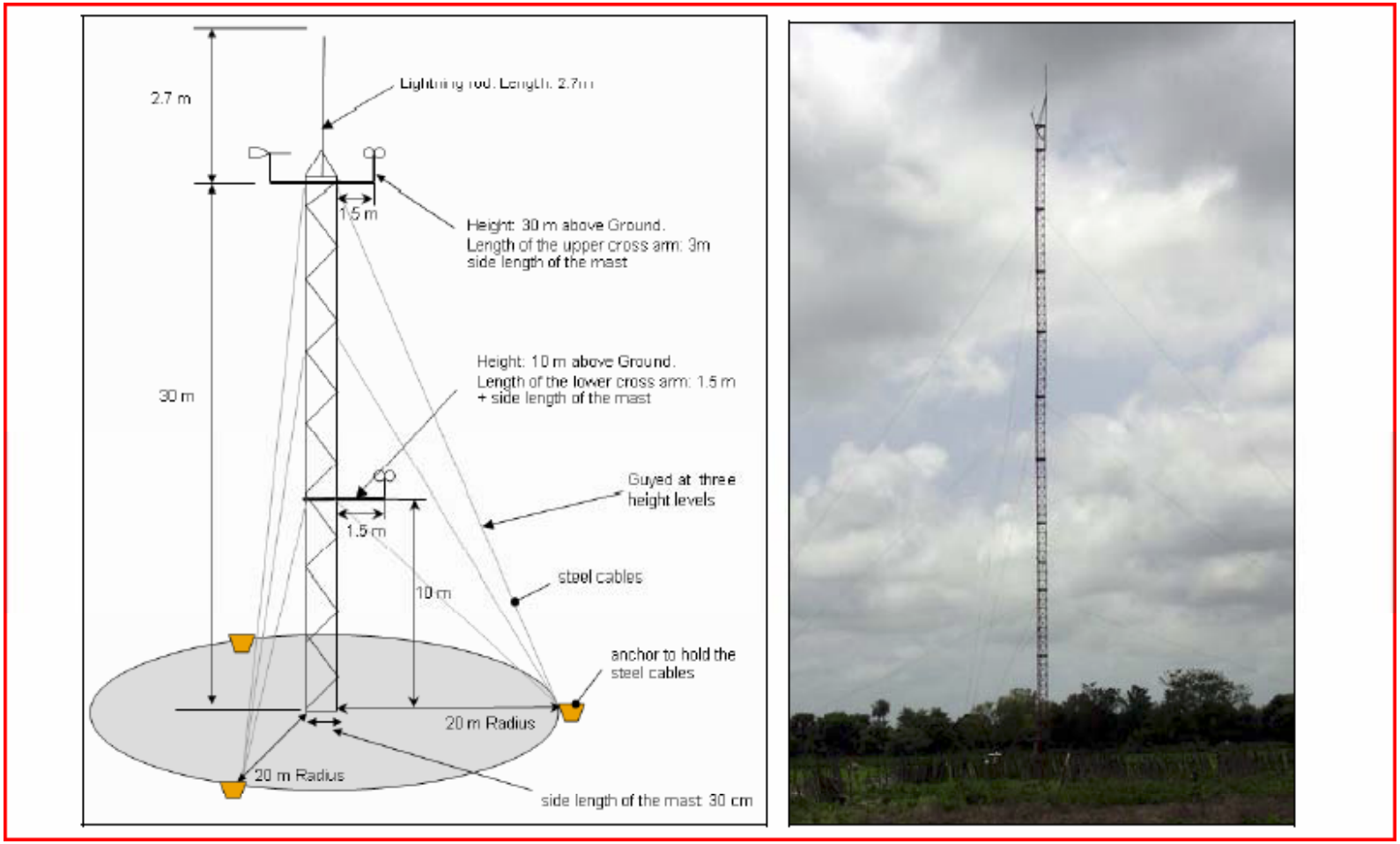
Private Sector in Electricity Market

- IPP offers
  - 25MWe successful IPP
    - Generation Licence issued
  - 150kW Wind IPP (grid-tied)
    - Generation Licence issued
    - Distribution Licence issued
- Mostly Unsolicited offers
  - Several offers but non successful

Renewable Energy Resource Assessment

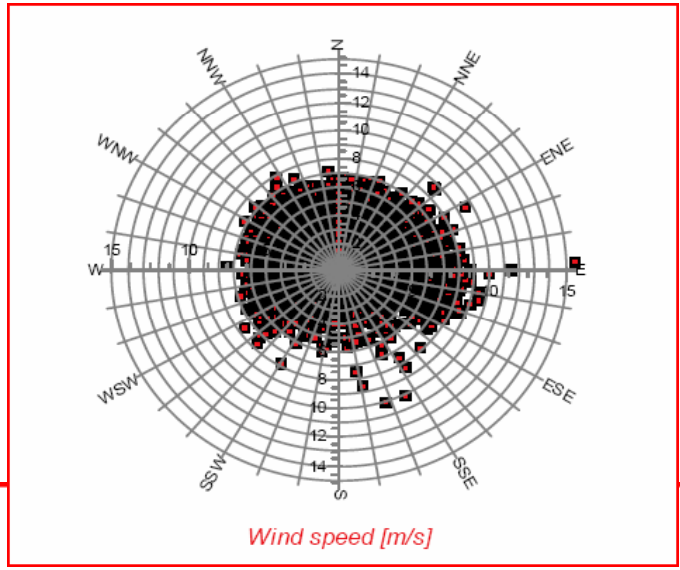
- Renewable Energy Study 2004/2005
  - ADB funded study
  - Resource assessment
    - 8 wind measuring stations (30m heigh)
    - Demand assessment
    - Solar Map
    - 1 year Wind Measurement
    - Feasibility of Solar / Wind Pilot Project
      - 5 MW Wind Farm in the coastal area

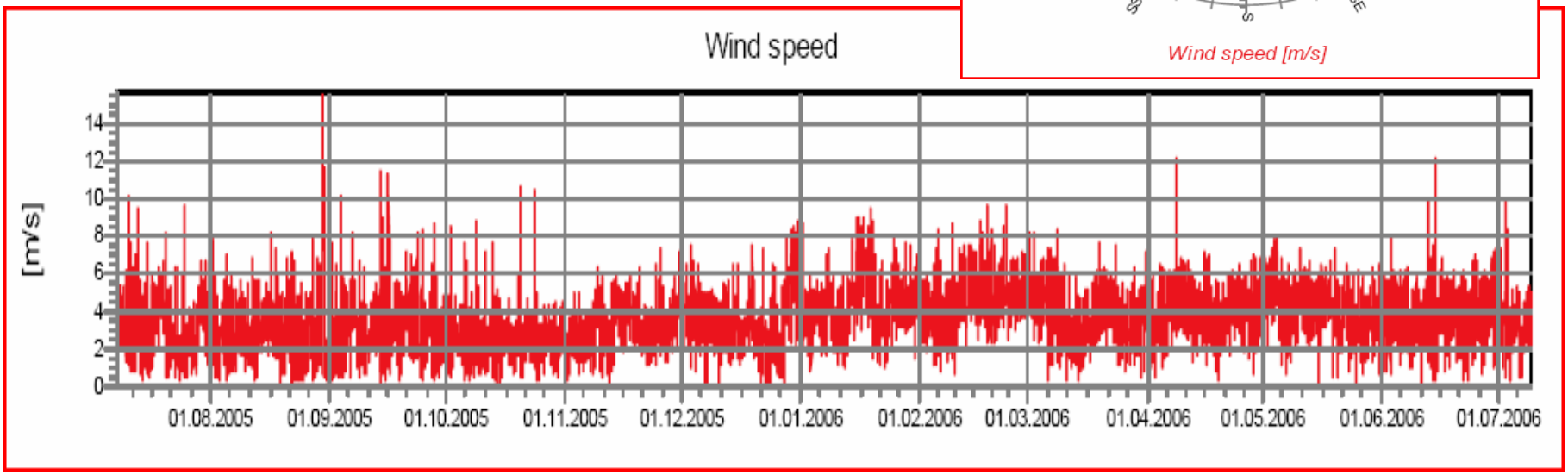
Wind Energy Measurements



Wind Energy

- Modest wind resources
- Mostly along the coast
  - Two pockets inland





The Project

The Equipment

- Funded by German investors
- Project finance
- Project concept / design
- LV network for all the homes
  - Entirely underground

German Investor

- Mr. Weissfedt
- Retired engineer
- Long career in wind energy
- Procured the turbine

The Community

The Village

- Village is called Bata-*kunku*
  - ''Garden by the sea''
  - 100m from the coast
- Provided two plots of community land
  - For the transformer
  - For the turbine
- Labour for construction
- Became the first electric-cooperative

The System

- 150KW turbine
  - From Germany
  - 35m height
- 250 kVA transformer
- Net-metering
  - Surplus power sold to the grid
  - Power also bought from the grid as well
  - when there is insufficient wind

The PPA

- Was the most difficult part of implementation
- Utility was not willing to connect a small IPP
  - Intermittency
  - Fear of power quality issues
  - Lack of experience with such PPAs
- Regulator had to intervene
  - Draw the parties together
  - Denying Grid access was not acceptable
    - Congestion was not an issue
  - Generator was grid-tied!
  - Final price fixed
    - Utility pays more though

Regulatory Intervention

- Application reviewed
- Generation Licence issued
  - Can produce and sell energy (IPP)
- Distribution Licence issued
  - Exclusive right to provide electricity to designated area.
  - Develop a customer service mechanism
  - All Tariffs regulated

Tariff Structure

- PPA Tariff
  - Buying D7.58/kWh
  - Selling D8.34 / kWh
- Customer Tariff

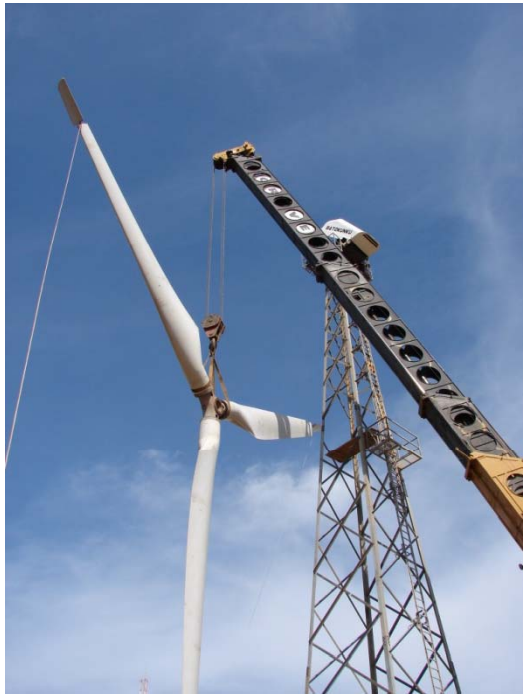
  0 -99kWh/month = D1.00/kWh

  > 99 kWh/month = D8.34

  Commercial = D9.43 /kWh

  (GSM operators)

Construction



Limitations included :

- Lack of a crane
  - Crane limited to 35m

Logistics and O&M

- Major logistical issue was the crane
  - Lack of a crane
    - Crane limited to 35m
- Land use issues
- Technical expertise
  - Flown in from Germany
    - For highly technical components
- O& M
  - Local company contracted
    - Training of local technicians
    - Skills transfer

Energy Management

- Licences issued to the Village Development Committee (VDC)
- VDC
  - Manages billing
  - Local jobs
  - Collects and deposits cash
  - Community managing energy services
    - Applications for connections

Lessons learnt

- Distributed generation using renewables
  - Wind speeds so far impressive (6-10m/s)
- Repowered turbines from Europe can be given new life
- Communities can reliably manage their own energy service
- Regulators can empower communities through licensing
  - Ownership, reliable
  - Grid tied renewables can help in rural electrification

Lessons Learnt (cont'd)

- Need for new Wind Energy Policy
- Development of Simplified RE PPA
  - Feed-in Tariffs
- More Wind Data measurement required
- Huge market for re-powered turbines
- Model can be replicated in other villages
  - Energy sold goes towards community projects
    - Poverty eradication

Current Projects

- 900 kVA Wind Farm submitted for Licence Application
  - Following repowered model to save costs
  - Falls under the 35m range of turbines
- Will see The Gambia having installed capacity of 1MW by 2011.
- Projects in 60kW Solar hybrid being submitted under GEF in March 2011

Thanks