WIND ENERGY PROJECTS
GRID-CONNECTED
CASE STUDY IN THE GAMBIA

Presented by
Modou Manneh
The Gambia
5th Nov 2013, Praia
CONTENT

• Country Overview
• Electricity Sub Sector
• Legal & Regulatory Framework
• Wind Information
• Wind Energy Projects
  – Batokunku Wind Turbine
  – Gamwind Project
  – Mbolo Women Association Project
• Challenges
• Opportunities
Overview of the Gambia

• Total surface area of 11,570 sq. km
• Population of approximately 1.8 million as at 2012
• Pop. growth rate of 2.7% per annum (2003 census).
• Real GDP growth averaged at 5.5% a year (2007-2011)
Electricity Sub-Sector

Players in the Grid Connection

Conventional
NAWEC---------National Utility
GEG -----------IPP

Renewable
Batomunkku ----IPP
Gamwind ----IPP
Legal and Regulatory Framework

• Energy Policy (2005)
• Electricity Act 2005
• Regulatory Act (PURA)- 2001
• PPA and FIT model for RE
• RE Bill –awaiting enactment
Wind information in The Gambia

A. Wind speed is moderate
B. According to RE Feasibility study Report 2007 Average wind speed is around 4.0m/s at 30m height
C. Higher along the coast
D. Lower in the inner land
E. Wind speeds higher between January – May
F. Lower in June -December
G. GAMWIND registered 14m/s at 35m
Wind Resources Map
Park Layout within Tujereng Area
Park Detailed Layout
Batokunku Wind Turbine- grid connected

- 1st grid-connected wind project in The Gambia
- Installed in March 2008
- Capacity-150 kVA
- Community owned
Batokunku Wind Turbine Cont.

- **Supply**
  - 80 households
  - 4 GSM base stations

- **Tariff**
  - D1 / kWh (3 US cent/kWh)
  - D9.20 / kWh (26 US cent/kWh) – NAWEC’s

- Surplus sent to the grid

- Draws from the grid
GAMWIND PROJECT – 2 x450kVA

Wind turbines

- One of the 6 demonstration projects of the GEF-UNIDO-GOTG Project
- Total Capacity - 900kVA (2 x 450kVA)
- Received project grant of 30% of total investment (GEF-UNIDO)
- Project total cost: US$ 839,000
GEF –UNIDO-GOTG Project in The Gambia

- Promotes RE based mini-grids for productive uses in rural areas (2012-2015)
- Estimated total project cost US$ 5.7 million
- Grant funding of about US$ 2 million from GEF
- Co-financing US$ 3.7 million from UNIDO, EUEI and project developers (private sector)
- Implementing agency – UNIDO
GAMWIND PROJECT – 2 x450kVA Wind turbines -Contd

• NAWEC and Gamwind signed PPA – 18th November, 2010
• Work started in June, 2012
• 1st Wind turbine installed and operational – 15th July, 2012
• 2nd Wind turbine installed and operational – 15th August, 2012
GAMWIND PROJECT – 2 x450kVA
Wind turbines: Works Construction

- All equipment supplied to the site by 28th May, 2012
- Foundations for the 2 wind turbines completed by 2nd July, 2013
- 15 tonne crane used to mount the blades and generator of 1st wind turbine
Gamwind Project – Construction Challenges

- Availability of suitable cranes
- Difficulty in hiring a crane from Dakar
- Interruption due to the heavy rains – making accessibility to the site difficult for the heavy crane
Gamwind Project – Construction Works in Action

- Blades and generator of 2\textsuperscript{nd} Wind Turbine lifted up using bulldozer/caterpillar with steel ropes – 11\textsuperscript{th} & 12\textsuperscript{th} August, 2012
Gamwind Project – Commissioning

- 33kV OH -line -13th August, 2012
- 20/33kV Substation -13th August, 2012
- 2nd Wind Turbine -15th August, 2012
Gamwind: KEY DATA

<table>
<thead>
<tr>
<th>TURBINE 1</th>
<th>PERIOD</th>
<th>PRODUCTION kWh</th>
<th>OPERATION Hrs</th>
<th>MAINTENCE Hrs</th>
<th>AVERAGE WIND SPEED</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUG 2012</td>
<td>116,653</td>
<td>4,003</td>
<td>81</td>
<td>5.18</td>
<td></td>
</tr>
<tr>
<td>JAN 2013</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FEB 2013</td>
<td>277,137</td>
<td>4,992</td>
<td>31</td>
<td>5.7</td>
<td></td>
</tr>
<tr>
<td>AUG 2013</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TURBINE 2</th>
<th>PERIOD</th>
<th>PRODUCTION kWh</th>
<th>OPERATION Hrs</th>
<th>MAINTENCE Hrs</th>
<th>AVERAGE WIND SPEED</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUG 2012</td>
<td>75,027</td>
<td>3,269</td>
<td>118</td>
<td>5.18</td>
<td></td>
</tr>
<tr>
<td>JAN 2013</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FEB 2013</td>
<td>262,920</td>
<td>4,973</td>
<td>33</td>
<td>5.7</td>
<td></td>
</tr>
<tr>
<td>AUG 2013</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Mbolo Women Association Project: Solar PV- Wind Turbine Hybrid System

- Beneficiary of the GEF-UNIDO-GOTG Project
- Total Capacity – 8.3kW
  - Wind Turbine: 1.5kW
  - Solar PV : 6.8kW
- Received grant of 27.8% of total investment
- Project total cost: US$185,000 + training of 30 Gambians on the system
Mbolo Women Association Project: Solar PV- Wind Turbine Hybrid System - Contd

• It runs a training Center (Fandema) for women
  – sewing,
  – tie & dye,
  – art & craft,
  – basic literacy
  – ICT

• It also runs an international school

• Initially powered by a generator
Mbolo Women Association Project:
Solar PV- Wind Turbine Hybrid System - Contd

ICT
Soap and cosmetic handmade
Ice and cold water

Sewing
Video club
Challenges for Wind Energy Development in The Gambia

• Acquiring identified sites
• Limited National Capacity
• Updating the wind energy data
• Availability of spare parts locally
• High initial investment cost
• High interest rates
Opportunities

- Energy Sector is one of the priority investment sectors of The Government of The Gambia.
- Moderate wind speed
- RE Bill awaiting enactment
- Standard PPA and FIT Developed
- Electricity Regulation in place-PURA
- Demonstrated experience in both grid and off-grid wind turbines
THANK YOU!
Abaraka! Jerejef!

Modou Manneh
Ministry of Energy
The Gambia
afmanneh@yahoo.com