Affordable, Sustainable, Green Power for Africa

A European Development Fund Project

Making communication technology more sustainable for rural market access, livelihood change and poverty reduction

Africa Power Ltd. will provide power in the poorest, most inaccessible regions
Mobile phones support businesses in Africa

- Local businesses grow the economy and reduce poverty
- BUT.....rural areas have no electric grid to power the cell phone towers
Current off-grid power solution

Diesel generators

- Extremely inefficient
- High maintenance
- Frequent replacement
- Polluting
- Open to theft

Cheap to install;
Expensive to run

240,000 off-grid towers in Africa with > 20% annual growth

Twin 12kW diesel generators and fuel tank
The solution for rural power

Project will install, operate and maintain green power systems

- Creates a holistic total solution, lowering costs & adding environment to the social and economic benefits in partnership with telecom companies

- Lowers total cost of ownership
  - Increasing the economic viability of rural towers

- Bank loans & investment increase leverage
  - EDF grant used as seed funding
  - Deploy €400M Green systems using €49M grant

- Expand power to other commercial businesses
  - potentially leading to remote, rural Village Power

- Self-sustaining business
  - Maintains, operates and installs systems “indefinitely” beyond the end of the project
Sustainable, green power solutions

Diesel battery hybrid
- Run diesel at high power; max. efficiency
- Charge battery / switch off / run down battery
- 45% CO₂ reduction – less pollution – lower cost

Solar / battery (+ wind)
- 100% Renewable – ZERO pollution

Solar / wind add-on
- Two forms of power - increases reliability

Ammonia Fuel Cell System (AFCS)
- Specifically designed for off-grid telecoms
- 80% reduction in CO₂; Zero local emissions
- 15 litres sterile water per day
Economic Benefits

- Each 10% penetration of cell phones increases GDP by 1%
  - Stimulates creation of businesses & local employment

- Empowers local businesses
  - Increases business efficiency
  - Mobile banking
  - Green power can be provided for other businesses
  - Spare power capacity available for “Village Power”

- Lowers cost of deploying rural towers
  - Faster connection of “last billion”
  - Greatest impact in rural areas

- Lowers operating costs – reduces cost of calls

*Mobile telecommunications access is considered by many experts to be the “single most transformative tool” for global poverty alleviation and human development.*

*Far beyond the reach of electricity grids—the “digital dividend” is bringing new hope and a better life for millions of people at the “bottom of the pyramid.”*

Jeffrey Sachs, special advisor to UN Secretary General on the Millennium Goals to End Extreme Poverty, at the Mobile World Congress Barcelona 2009
Environmental benefits

❖ 80% reduction in CO₂ emissions
  • Saving 380,000 tonnes CO₂ over 5 years
  • 4.7M tonnes CO₂ saved over 10 years
  • 80% reduction local pollutants
    • NOx; SOx; CO; particulates
  • Reduction in disposal of contaminated used engine oil

❖ Solar and AFCS are silent with zero pollutants
  • National game parks – Increased tourism
  • Improved quality of life in villages

❖ Carbon credits gifted to not-for-profit
  • €1m - €72m gifted over 10 years
  • Value of carbon credits uncertain - €3 to €18/tonne in past

We cannot guarantee that we will get approval from the UN to register these carbon credits, due to uncertainty over the future of these and other schemes. Nevertheless, Africa Power will make all reasonable efforts to register and sell them for the best price.
Societal benefits - Health

❖ Emergency medical services
  • The doctor is now a phone call away

❖ Health hotlines
  • Remote diagnoses via telemedicine
  • Disease testing via mobile phone microscopy

❖ Supporting community health workers
  • Gathering and managing health information
  • Coordinate drug & medical supply distribution

❖ Capture & analyse disease surveillance data

❖ Facilitating health education and training
  • Health education programmes

❖ AFCS makes 15 litres sterile water/day
  • 90,000,000 litres over 10 years
  • Clean water for oral hydration solutions
  • Rehydrate freeze-dried vaccines, eliminating the cold chain
Societal benefits - Education

Mobile education has greatest impact in rural areas

- Agricultural advice and training
- Broadband services for rural schools
  - It’s a lesson down a phone line; a text book in a text message;
- Successful pilot projects include
  - Text2Teach allows teachers to download short videos
  - Orascom has piloted text messages for adolescent girls improving literacy
  - Short stories sent by text improve reading skills and writing competitions
  - Immersive, engaging, educational games targeting language literacy
    - High quality learning accessible to low-income children in underdeveloped regions

**Education through mobile devices can be a transformative force for good. In the face of disease, it can mean a clean bill of health; in an economic downturn, it can mean a skilled workforce ready to earn again; in a warzone, it can be the language of diplomacy and dialogue.**

Queue Rania Al Abdulla of Jordan Foreword to GSMA report on mLearning – Nov., 2010
Societal benefits

Safety and security
- Real-time information reduced human-elephant conflict in Kenya
- Cell phone towers support police and border patrol communications
- Improved family cohesion
- Refugee centres

Agriculture and knowledge
- Market prices
- Lower cost seed, fertilizer
- Weather forecasts
- Agricultural advice
- Manuals and safety advice

“When you give access [to communications] to a human being, you unleash the power of human innovation and entrepreneurship”
Mohsen Khalil, Director at World Bank Group September 2007
3.9.1. Integrating Europe's Energy & Development Policies: a win-win game

... The EU is therefore committed to support developing countries in promoting sustainable and secure energy supply and use...

Africa... can by-pass the need to build expensive transmission grids and "leap-frog" to a new generation of clean, local low carbon energy sources and technologies... for mobile telecommunications.

This is a real "win-win" opportunity, increasing the penetration of clean renewable energy and bringing electrification to some of the world's poorest citizens.

A special effort will be needed in Sub-Saharan Africa, where rates of access to electricity are the lowest in the world.

Source: AN ENERGY POLICY FOR EUROPE Brussels, 10.1.2007
Cost / benefit analysis

A €49.2M grant will provide the following benefits:

- Over €400M directly invested into green power systems: an eight-fold leverage
- 380,000 tonnes CO₂ avoided (5 years); 4.7M tonnes CO₂ avoided over 10 years
- Self-sustaining business: on-going support, maintenance & more installations
- Efficient: <6% on overheads
- Co-funded: Grant is <9% cost of project
- Between €1M and €72M in carbon credits gifted to poverty alleviation (10 yrs)

This assumes that the carbon credits are approved by the UN and can be sold.
Summary

- Cell phones engender poverty reduction
  - Rural areas need power

- Project will deliver affordable, sustainable, green power to rural communities

- €49.2M EDF grant will deploy over €400M green power – an 8-fold leverage
  - Efficient: Overheads account for <6% costs
  - Co-funded: Grant represents <9% total costs

- Stimulates job creation

- Sustainable, holistic solution
  - People
  - Planet
  - Profits

- Self-sustaining – on-going maintenance & growth

- Lowers costs, leading to “Village Power”
Thank you

Any Questions?

Dr. Alastair Livesey
alivesey@AfricaPowerLtd.com
Tel. +44 1403 711973
Back-up slides
17,000 Towers p.a. = 43% African need (13% Global)

7,000 Towers p.a. = 18% African need (5% Global)

Numbers represent annual requirements, assuming a 5-year replacement cycle
Ammonia Fuel Cell System (AFCS)

- Ammonia (NH₃) is cracked to 75% H₂ plus 25% N₂ (inert/vented)
- Hydrogen powers a fuel cell to provide
- 48v DC electricity to run the radio equipment
  - All secured in a locked 8 foot shipping container
  - Sufficient surplus manufacturing capacity of NH₃ to run 5 million cell towers
A joint venture company, formed by

Full service energy and clean-tech investment bank
- Alternative energy and clean technology specialist
- Ardour Capital International (London, Berlin)
- Ardour Capital (East Africa) Kampala, Uganda

Specialist strategy and sustainability consultancy
- International expertise in clean tech, carbon, water and climate change
- Advisor to GSMA Development Fund “Green Power for Mobile” project and co-author of GSMA report “Community Power”

Mechanical, electrical and civil engineering firm
- Designs and installs telecoms base stations
- Over £950 million in assets across Middle East and North Africa
- Drake and Scull Foundation – improving the lives of underprivileged
Allocation of project costs (phase 1)

- Power Systems = €54M
- Overheads = 11% of phase 1 costs
- Grant = 73% of phase 1 costs

Forecast Gross Expenditure (Phase 1 use of funds) €67M
Allocation of total project costs

- Power Systems = €407M = 8-fold leverage
- Overheads = 5.6% of total project cost
- Grant = 8.8% of total costs

Forecast Gross Expenditure (Five years from launch)
€550M

- †Purchase of Power Systems
- ‡Direct Running costs
- •Interest Payments on loans
- ‣Overhead Salaries
- ․Tax (liability)
- …Other Overheads
- ‧Development & Improvements
## Financial summary

<table>
<thead>
<tr>
<th>Power Systems</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cumulative no. of Power Systems</td>
<td>20</td>
<td>358</td>
<td>1,033</td>
<td>2,663</td>
<td>5,308</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Capital Deployed</th>
<th>Euros</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cumulative Green Power deployed</td>
<td>3,556,653</td>
<td>32,408,115</td>
<td>86,419,197</td>
<td>215,218,142</td>
<td>406,849,777</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Income Statement (P&amp;L)</th>
<th>€ '000's</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income</td>
<td>243</td>
<td>7,690</td>
<td>28,953</td>
<td>75,266</td>
<td>166,483</td>
<td></td>
</tr>
<tr>
<td>Direct Costs (Running costs, direct staff)</td>
<td>(87)</td>
<td>(2,304)</td>
<td>(8,846)</td>
<td>(23,090)</td>
<td>(51,499)</td>
<td></td>
</tr>
<tr>
<td>Gross Profit</td>
<td>156</td>
<td>5,385</td>
<td>20,107</td>
<td>52,176</td>
<td>114,985</td>
<td></td>
</tr>
<tr>
<td>Overhead costs</td>
<td>(1,621)</td>
<td>(3,507)</td>
<td>(5,192)</td>
<td>(8,289)</td>
<td>(12,737)</td>
<td></td>
</tr>
<tr>
<td>EBITDA</td>
<td>(1,466)</td>
<td>1,879</td>
<td>14,915</td>
<td>43,886</td>
<td>102,248</td>
<td></td>
</tr>
<tr>
<td>Depreciation on Assets</td>
<td>(235)</td>
<td>(3,344)</td>
<td>(10,561)</td>
<td>(26,593)</td>
<td>(55,703)</td>
<td></td>
</tr>
<tr>
<td>Net Interest Earned (Paid)</td>
<td>216</td>
<td>214</td>
<td>(1,369)</td>
<td>(6,681)</td>
<td>(17,160)</td>
<td></td>
</tr>
<tr>
<td>Tax</td>
<td>371</td>
<td>313</td>
<td>(746)</td>
<td>(2,653)</td>
<td>(7,346)</td>
<td></td>
</tr>
<tr>
<td>Net profits after tax</td>
<td>(1,113)</td>
<td>(938)</td>
<td>2,239</td>
<td>7,959</td>
<td>22,039</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Environmental</th>
<th>Tonnes CO₂ &amp; Euros</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cumulative Tonnes CO₂ Avoided</td>
<td>189</td>
<td>8,039</td>
<td>41,360</td>
<td>128,766</td>
<td>328,154</td>
<td></td>
</tr>
<tr>
<td>Cumulative value of Carbon credits (deployed to aid projects) (€12.5/T)</td>
<td>2,363</td>
<td>100,485</td>
<td>516,994</td>
<td>1,609,571</td>
<td>4,101,930</td>
<td></td>
</tr>
</tbody>
</table>
## Income Statement (P&L)

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income</td>
<td>243</td>
<td>7,690</td>
<td>28,953</td>
<td>75,266</td>
<td>166,483</td>
</tr>
<tr>
<td>Direct Costs (Running costs, direct staff)</td>
<td>(87)</td>
<td>(2,304)</td>
<td>(8,846)</td>
<td>(23,090)</td>
<td>(51,499)</td>
</tr>
<tr>
<td>Gross Profit</td>
<td>156</td>
<td>5,385</td>
<td>20,107</td>
<td>52,176</td>
<td>114,985</td>
</tr>
<tr>
<td>Overhead costs</td>
<td>(1,621)</td>
<td>(3,507)</td>
<td>(5,192)</td>
<td>(8,289)</td>
<td>(12,737)</td>
</tr>
<tr>
<td>EBITDA</td>
<td>(1,466)</td>
<td>1,879</td>
<td>14,915</td>
<td>43,886</td>
<td>102,248</td>
</tr>
<tr>
<td>Depreciation on Assets</td>
<td>(235)</td>
<td>(3,344)</td>
<td>(10,561)</td>
<td>(26,593)</td>
<td>(55,703)</td>
</tr>
<tr>
<td>Interest paid on loans</td>
<td>0</td>
<td>0</td>
<td>(1,470)</td>
<td>(6,899)</td>
<td>(17,289)</td>
</tr>
<tr>
<td>Interest received on deposits</td>
<td>216</td>
<td>214</td>
<td>101</td>
<td>218</td>
<td>129</td>
</tr>
<tr>
<td>Tax</td>
<td>371</td>
<td>313</td>
<td>(746)</td>
<td>(2,653)</td>
<td>(7,346)</td>
</tr>
<tr>
<td>Net profits after tax</td>
<td>(1,113)</td>
<td>(938)</td>
<td>2,239</td>
<td>7,959</td>
<td>22,039</td>
</tr>
</tbody>
</table>
# Cash Flow

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EBITDA</strong></td>
<td>(1,466)</td>
<td>1,879</td>
<td>14,915</td>
<td>43,886</td>
<td>102,248</td>
</tr>
<tr>
<td><strong>Tax paid</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>(63)</td>
<td>(2,653)</td>
</tr>
<tr>
<td><strong>Capex</strong></td>
<td>(3,640)</td>
<td>(28,928)</td>
<td>(54,137)</td>
<td>(129,028)</td>
<td>(192,030)</td>
</tr>
<tr>
<td><strong>Grant</strong></td>
<td>24,200</td>
<td>25,000</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Debt</strong></td>
<td>0</td>
<td>0</td>
<td>24,500</td>
<td>65,982</td>
<td>107,182</td>
</tr>
<tr>
<td><strong>Equity</strong></td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>30,000</td>
<td>0</td>
</tr>
<tr>
<td><strong>Net cash</strong></td>
<td>19,099</td>
<td>(2,049)</td>
<td>(14,722)</td>
<td>10,777</td>
<td>14,747</td>
</tr>
<tr>
<td><strong>Cash b/fwd</strong></td>
<td>0</td>
<td>19,316</td>
<td>17,481</td>
<td>1,390</td>
<td>5,486</td>
</tr>
<tr>
<td><strong>Cash c/fwd</strong></td>
<td>19,099</td>
<td>17,267</td>
<td>2,759</td>
<td>12,167</td>
<td>20,233</td>
</tr>
<tr>
<td><strong>Average Balance</strong></td>
<td>21,650</td>
<td>21,417</td>
<td>10,120</td>
<td>21,779</td>
<td>12,860</td>
</tr>
<tr>
<td><strong>Interest</strong></td>
<td>216</td>
<td>214</td>
<td>(1,369)</td>
<td>(6,681)</td>
<td>(17,160)</td>
</tr>
<tr>
<td><strong>Adjusted closing balance</strong></td>
<td>19,316</td>
<td>17,481</td>
<td>1,390</td>
<td>5,486</td>
<td>3,073</td>
</tr>
</tbody>
</table>
## Balance Sheet

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fixed Assets</strong></td>
<td>3,405</td>
<td>28,989</td>
<td>72,565</td>
<td>175,000</td>
<td>311,327</td>
</tr>
<tr>
<td><strong>Cash</strong></td>
<td>19,316</td>
<td>17,481</td>
<td>1,390</td>
<td>5,486</td>
<td>3,073</td>
</tr>
<tr>
<td><strong>Taxation</strong></td>
<td>371</td>
<td>684</td>
<td>(63)</td>
<td>(2,653)</td>
<td>(7,346)</td>
</tr>
<tr>
<td><strong>EDF Grant</strong></td>
<td>(24,200)</td>
<td>(49,200)</td>
<td>(49,200)</td>
<td>(49,200)</td>
<td>(49,200)</td>
</tr>
<tr>
<td><strong>Debt</strong></td>
<td>0</td>
<td>0</td>
<td>(24,500)</td>
<td>(90,482)</td>
<td>(197,664)</td>
</tr>
<tr>
<td><strong>Net Assets</strong></td>
<td>(1,108)</td>
<td>(2,046)</td>
<td>193</td>
<td>38,151</td>
<td>60,190</td>
</tr>
<tr>
<td><strong>Shares</strong></td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>30,005</td>
<td>30,005</td>
</tr>
<tr>
<td><strong>Retained profit</strong></td>
<td>(1,113)</td>
<td>(2,051)</td>
<td>188</td>
<td>8,146</td>
<td>30,185</td>
</tr>
<tr>
<td><strong>Share Equity</strong></td>
<td>(1,108)</td>
<td>(2,046)</td>
<td>193</td>
<td>38,151</td>
<td>60,190</td>
</tr>
</tbody>
</table>