HQ Power

80MW Peat Power Plant
Rwanda, Gisagara district, Mamba sector

January 2017
What is peat?

- Peat is a form of biomass at early decomposition stage (circa 500 years in Africa)
- Peat is formed in anaerobic condition i.e. no oxygen (in wetlands, swamps)
- Peat has been used in Northern Europe for 2,000 years at least for housing heating and cooking, as an alternative to firewood or coal. Later peat has been used for electricity generation starting from 19th century.
- Peat heating characteristic (18-20MJ/kg) can be compared to lignite or mid/low-quality coal
- Rwanda peat reserve is estimated at 155 million tons (Ekono report 1993), equivalent to circa 500MW electrical power during 30 years
World of Peat
a mature technology

Finland is the world leader in peat resources utilisation with 55 peat-fired power plant boasting 7,800MWth installed capacity.

Selected Peat Power Plants around the world

<table>
<thead>
<tr>
<th>Name</th>
<th>Country</th>
<th>Capacity</th>
<th>Commissioning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shatura</td>
<td>Russia</td>
<td>1,020</td>
<td>1925</td>
</tr>
<tr>
<td>Kirov</td>
<td>Russia</td>
<td>300</td>
<td>1963</td>
</tr>
<tr>
<td>Keljonlahti</td>
<td>Finland</td>
<td>209</td>
<td>2010</td>
</tr>
<tr>
<td>Toppila</td>
<td>Finland</td>
<td>190</td>
<td>1977</td>
</tr>
<tr>
<td>West ofally</td>
<td>Ireland</td>
<td>150</td>
<td>2004</td>
</tr>
</tbody>
</table>

Peat in Europe

<table>
<thead>
<tr>
<th></th>
<th>Finland</th>
<th>Ireland</th>
<th>Sweden</th>
<th>Estonia</th>
<th>Latvia</th>
<th>Lithuania</th>
<th>EU Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel Peat Resources (ktoe)</td>
<td>1,100,000</td>
<td>47,500</td>
<td>370,000</td>
<td>10,000</td>
<td>57,000</td>
<td>4,000</td>
<td>1,589,000</td>
</tr>
<tr>
<td>Annual Peat Use (ktoe)</td>
<td>1,980</td>
<td>984</td>
<td>372</td>
<td>28</td>
<td>0</td>
<td>4</td>
<td>3,368</td>
</tr>
<tr>
<td>Number of Peat Fired Power Plants</td>
<td>55</td>
<td>3</td>
<td>20</td>
<td>40</td>
<td>0</td>
<td>7</td>
<td>125</td>
</tr>
</tbody>
</table>
Comparison Northern Europe vs. Rwanda

Whereas Swedish peatlands are located in forest, Rwanda peatland is free from trees and roots which has the advantage of (i) being environmental friendly as it avoids deforestation (ii) easing operations.
**Project Highlights**

The project will serve the Rwanda strategy of developing indigenous energy sources. This private investment of USD 350 million is structured under Project Finance principles.

### Project Rationale
- Generation tariff 40% less than current average
- 40% additional generation capacity from 190MW today to 270MW
- Ideal location of the power plant on the biomass (peat) resource

### Technical Configuration
- 80MW (2x40MW) installed capacity
- 4,200 ha. of peat land enough for min 30 years of operation
- 720,000 t/year peat extraction

### Legal Configuration
- BOOT basis with a 26 years PPA
- Government Guarantee covering the PPA and Concession Agreement
- Eligibility to Investment Certificate and fiscal incentives

The project will serve the Rwanda strategy of developing indigenous energy sources. This private investment of USD 350 million is structured under Project Finance principles.
Project Development Timeline

2012
Execution of Concession Agreement, Power Purchase Agreement and Government Guarantee (the “Project Agreements”)

2013
Engagements of Sponsor’s advisors
Execution of Soil and Peat Analysis
Approval of Feasibility Study
Approval of Environmental & Social Impact Assessment Report

2014
Engagement of Africa Finance Corp. as the MLA and the Lenders’ Advisor
EPC & Boiler Bidding
Access Road Improvements
Temporary transmission line for construction completed
Peat harvesting pilot

2015
EPC award
O&M Award
Lenders’ due diligence
Lenders’ negotiation with the Government

2016
PPA amendment executed
Signing of Financial documentation

2017
Reaching Financial close on January 2017
Start of construction in March.

Power Plant Commissioning by first quarter of 2020
Key Connected Projects

Transmission Line
(Government Obligation)
- Ongoing 220 kV line through Mamba – Rwabusoro – Kigoma - Bwishyura
- Will be procured by Government of Rwanda
- According to the PPA, the Government of Rwanda needs to complete the T-line within 27 months after PPA Effective Date

Access Road
(Government Obligation)
- 36 km. required upgrade
- Last 6 km. has been upgraded in early 2014 by the Rwanda Military Engineering Corps
- The road is completed pending punch list items
- The punch list to be completed by summer 2016

Peat Operations
- Engagement of Swedish peat harvesting professionals
- Milled peat with dry harvesting method
- 80 peat samples analysed by Tractebel and 700 peat samples analysed by Sweco
- Peat sample testing in February 2014
- Pilot Harvesting in September 2014
- Commercial Scale harvesting in 2017

Expropriation and Resettlement
- Land valuation done by two independent valuation agency
- Resettlement Action Plan was prepared by Sponsor and approved by the Local authorities in April 2014.
- The relocation of 151 affected people started in April 2014 and was completed in July 2014.
Summary of Technology

- **Peat Production Risk**
  - Mature and simple technology (farming type) + Top 2 European Supplier (Peat Max and Suokone + 6 Swedish peat professionals involved since 2013 + Technical study (2013) + Test Site (2014) + successful Peat Production pilot (September 2014)

- **Boiler Risk**
  - Mature technology by Andritz + Peat analysis (780 samples) + Peat Sample analysed by Boiler manufacturer in Finland

- **Turbine / Generator**
  - Standard technology + Reputable European Supplier (SIEMENS)

- **Peat Handling**
  - Peat handling and conveyor manufacturer from Finland

- **Water Treatment + Cooling**
  - Standard Technology + Water analysis

- **Operation**
  - O&M Operator – Finnish National Utility

**FORTUM, Finnish Power Utility (one of the biggest utility companies in Europe with the largest experience on peat power plants) will operate the Plant**
Peat Sampling & Analysis

- **Purpose:** Determination of Peat Specifications to finalize technical design of the power plant
- **Scope of Work:** 2013-2014: Detailed planning by SWECO
  Sampling and testing of 700 specimens from bogs HL and IL, 1500ha
- **Contractor:** HICE Consult – Peat Sampling and Peat testing
  BELAB – Swedish Laboratory to verify the analysis by Hice laboratory in Rwanda.

### PEATECHNICAL LABORATORY

**PEAT ANALYSES REPORT**

**Name of Project:** HAKAN PEAT POWER PROJECT - SOIL INVESTIGATION FOR
**Client:** YUWIN LTD
**Location:** Buye, Gitagiza District, Southern Province, RWANDA
**Site:** HL-B and HL-A
**Sample ID:** HL-B5-L2-9
**Date of Test:** 26/11-12/12/2013

<table>
<thead>
<tr>
<th>Test</th>
<th>Value</th>
<th>Unit</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>89.50</td>
<td>%</td>
<td>CEN/TS 14774:1</td>
</tr>
<tr>
<td>Ash, 550°C</td>
<td>18.80</td>
<td>%</td>
<td>CEN/TS 14775</td>
</tr>
<tr>
<td>AR</td>
<td>1.92</td>
<td>%</td>
<td>CEN/TS 14775</td>
</tr>
<tr>
<td>Volatile</td>
<td>49.80</td>
<td>%</td>
<td>ISO 562</td>
</tr>
<tr>
<td>AR</td>
<td>5.08</td>
<td>%</td>
<td>ISO 562</td>
</tr>
<tr>
<td>Fixed Carbon</td>
<td>31.40</td>
<td>%</td>
<td>Calculated</td>
</tr>
<tr>
<td>AR</td>
<td>3.20</td>
<td>%</td>
<td>Calculated</td>
</tr>
<tr>
<td>Carbon (C)</td>
<td>52.50</td>
<td>%</td>
<td>ASTM D5373</td>
</tr>
<tr>
<td>AR</td>
<td>5.36</td>
<td>%</td>
<td>ASTM D5373</td>
</tr>
<tr>
<td>Hydrogen (H)</td>
<td>4.49</td>
<td>%</td>
<td>ASTM D5373</td>
</tr>
<tr>
<td>AR</td>
<td>10.51</td>
<td>%</td>
<td>ASTM D5373</td>
</tr>
<tr>
<td>Nitrogen (N)</td>
<td>0.94</td>
<td>%</td>
<td>ASTM D5373</td>
</tr>
<tr>
<td>AR</td>
<td>0.10</td>
<td>%</td>
<td>ASTM D5373</td>
</tr>
<tr>
<td>Oxygen (O)</td>
<td>22.46</td>
<td>%</td>
<td>Calculated</td>
</tr>
<tr>
<td>AR</td>
<td>82.01</td>
<td>%</td>
<td>Calculated</td>
</tr>
<tr>
<td>Chlorine (Cl)</td>
<td>0.017</td>
<td>%</td>
<td>ASTM D4208</td>
</tr>
<tr>
<td>AR</td>
<td>0.002</td>
<td>%</td>
<td>ASTM D4208</td>
</tr>
<tr>
<td>Sulphur (S)</td>
<td>0.81</td>
<td>%</td>
<td>ASTM D4239</td>
</tr>
<tr>
<td>AR</td>
<td>0.08</td>
<td>%</td>
<td>ASTM D4239</td>
</tr>
</tbody>
</table>

Gross Cal. Value Comst Volume (DB) | 19.09 | Ml/kg | ISO 1928
Gross Cal. Value Comst Volume (AR) | 1.95  | Ml/kg | ISO 1928
Net Cal. Value Comst press (AR)   | -0.35 | Ml/kg | ISO 1928
Net Cal. Value Comst press (DB)   | 17.65 | Ml/kg | ISO 1928

AR = As Received
DB = Dry Basis
* = water included
Peat Extraction Pilot September 2014

Drinking, peat and river water

Milled peat and bricks

Secondary ditches (1.5m deep)