

January 2017

 **THEMIS**

PROJECT DEVELOPMENT
&
TRANSACTION ADVISORY



HQ Power

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



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

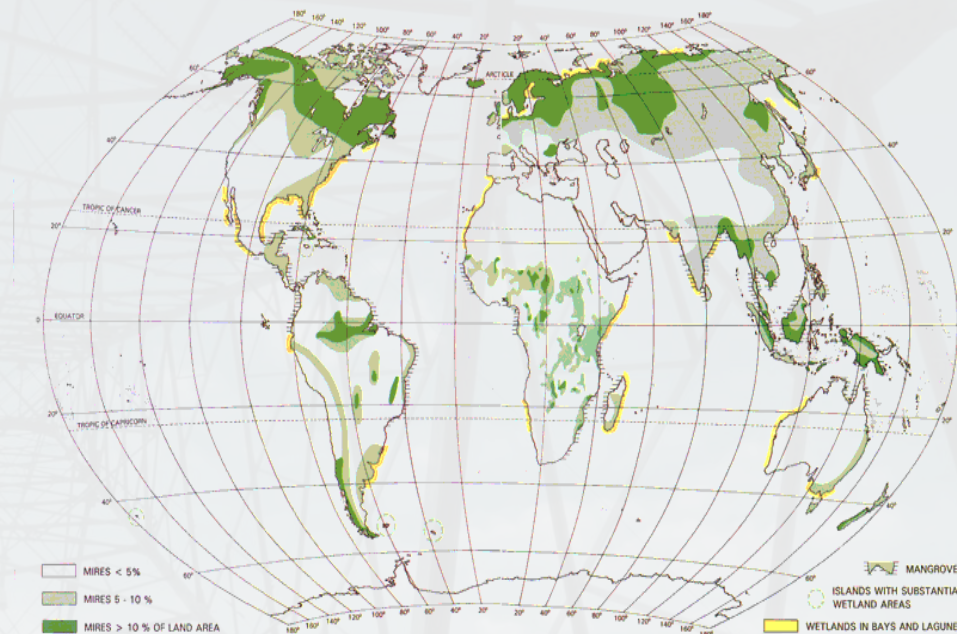
World of Peat a mature technology



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

| Name | Country | Capacity MW | Commissioning |
|-------------|---------|----------------|---------------|
| Shatura | Russia | 1,020 | 1925 |
| Kirov | Russia | 300 | 1963 |
| Keljonlahti | Finland | 209 | 2010 |
| Toppila | Finland | 190 | 1977 |
| West ofally | Ireland | 150 | 2004 |



| Peat in Europe | Finland | Ireland | Sweden | Estonia | Latvia | Lithuania | EU Total |
|-----------------------------------|-----------|---------|---------|---------|--------|-----------|-----------|
| Fuel Peat Resources (ktoe) | 1,100,000 | 47,500 | 370,000 | 10,000 | 57,000 | 4,000 | 1,589,000 |
| Annual Peat Use (ktoe) | 1,980 | 984 | 372 | 28 | 0 | 4 | 3,368 |
| Number of Peat Fired Power Plants | 55 | 3 | 20 | 40 | 0 | 7 | 125 |

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.



Rwanda peatland



Sweden peatland

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

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



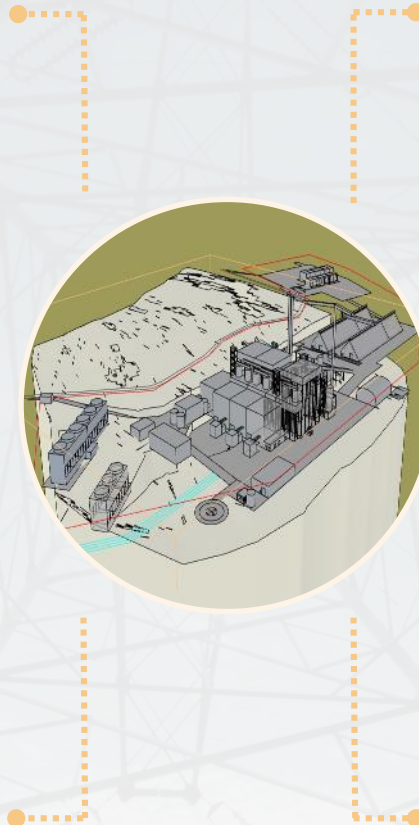
Transmission Line

(Government Obligation)

- Ongoing 220 kV/220kv 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

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



Access Road

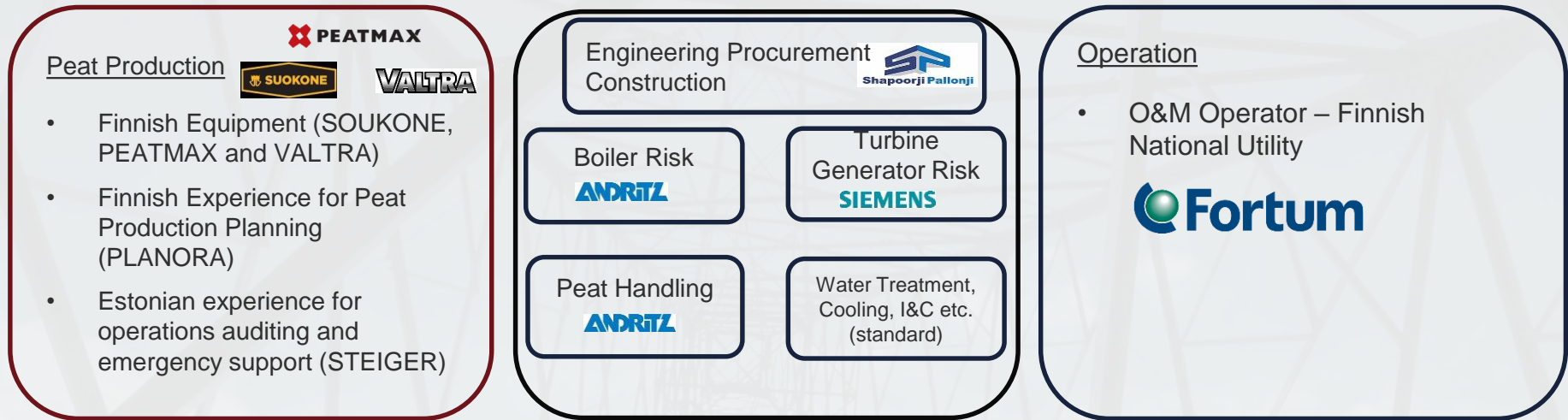
(Government Obligation)

- 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

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

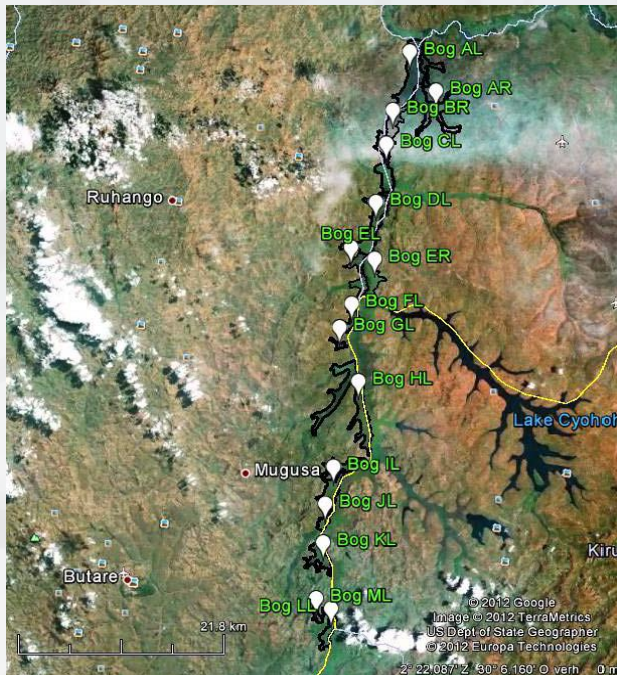



- **Peat Production Risk**
Mature and simple technology (farming type) + Top 2 European Supplier (Peat Max and Suokone + 6 Swedish peat professionals involved since 2013 + Technical study (2013) + Test Site (2014) + successful Peat Production pilot (September 2014)
- **Boiler Risk**
Mature technology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



|  HICE CONSULT HYDROINFORMATICS & CIVIL ENGINEERING CONSULTING Avenue de la Justice / P.O. Box : 4671 Kigali, Rwanda www.hiceconsult.com / e-mail : hiceconsult@gmail.com Tel : (250) 078 8350447 / 0728350447 | | | |
|---|----|-------|-------|
| GEOTECHNICAL LABORATORY | | | |
| PEAT ANALYSES REPORT | | | |
| Name of Project: HAKAN PEAT POWER PROJECT - SOIL INVESTIGATION FOR Client: YUMN LTD | | | |
| Location: Buye, Gisagara District, Southern Province, RWANDA | | | |
| Site: HL-B and HL-A | | | |
| Sample ID: HL-B5-L2-9 | | | |
| Date of Test: 26/11-12/12/2013 | | | |
| Test | | Value | Unit |
| Moisture, 105°C | | 89.80 | % |
| Ash, 550°C | DB | 18.80 | % |
| | AR | 1.92 | % |
| Volatile | DB | 49.80 | % |
| | AR | 5.08 | % |
| Fixed Carbon | DB | 31.40 | % |
| | AR | 3.20 | % |
| Carbon (C) | DB | 52.50 | % |
| | AR | 5.36 | % |
| Hydrogen (H) | DB | 4.49 | % |
| | AR | 10.51 | % |
| Nitrogen (N) | DB | 0.94 | % |
| | AR | 0.10 | % |
| Oxygen (O) | DB | 22.46 | % |
| | AR | 82.04 | % |
| Chlorine (Cl) | DB | 0.017 | % |
| | AR | 0.002 | % |
| Sulphur (S) | DB | 0.81 | % |
| | AR | 0.08 | % |
| Gross Cal. Value Const Volume (DB) | | 19.09 | MJ/kg |
| Gross Cal. Value Const Volume (AR) | | 1.95 | MJ/kg |
| Net Cal. Value Const press (AR) | | -0.35 | MJ/kg |
| Net Cal. Value Const press (DB) | | 17.95 | MJ/kg |
| Net Cal. Value Const press (DB Ashfree) | | 22.10 | MJ/kg |

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)



THANK YOU!