RPS Energy

working with

The Ministry of Mines, Industry and Energy,

Equatorial Guinea

Assisting Natural Resource Development
Role of RPS (and legacy companies).............

- Technical advisors to MMIE since 1994
  - Monitoring of activities
  - Database management
  - Resources quantification
  - Commercial analysis
  - Strategy advice
Regional Hydrocarbons & Potential

- EASTERN GULF of GUINEA
  - “Very Rich” Petroleum Province – “Best in Class”
  - Huge potential for reserves addition
  - High Exploration Success
  - Established infrastructure

![GAS RESERVES (USGS 2002)]

- EQUATORIAL GUINEA
- NIGER DELTA
- NIGERIA
- CAMEROON
- SÃO TOME & PRÍNCIPE
- EASTERN GULF of GUINEA
- DOUALA

Legend:
- Red: Gas
- Green: Oil
- Yellow: Oil & Gas

Produced Known To Find

BCF: 0 20000 40000 60000 80000 100000 120000 140000 160000
>7kms sedimentary section
World class sandstone reservoirs
Proven & prolific mature source rocks
Structural and stratigraphic traps
Excellent seismic quality – dhi’s
Oligo-Miocene source mature towards and under Niger Delta thrust front

Miocene fan and channel sands provide excellent reservoirs, derived from north-east

Pliocene canyon systems sourced from north and north-west

Around 3.5 billion boe discovered
Exploration Drilling History

- **Wells per year**
- **Cumulative wells**

**Years**:
- 1992
- 1993
- 1994
- 1995
- 1996
- 1997
- 1998
- 1999
- 2000
- 2001
- 2002
- 2003
- 2004
- 2005
- 2006
- 2007
- 2008

**Cumulative wells**:
- Belinda
- Ceiba
- Zafiro

**Per Year**:
- 0
- 2
- 4
- 6
- 8
- 10
- 12
- 14
- 20
- 40
- 60
- 80
- 100
- 120

**Cumulative**:
- 0
- 20
- 40
- 60
- 80
- 100
- 120
TO 1992……
Drilling from 1967 within the 200m isobath found the Alba condensate discovery which was deemed non-commercial. 13 wells in Niger Delta, 6 wells in Rio Muni

1992-99……
Exploration on Zafiro trend to the 1,000m isobath (33 wells). Ceiba Field discovered 1999.

1999-2004……
Exploration westwards along the Niger Delta Deformation Front (3 wells) beyond 2,000m isobath and around Alba (10 wells) but mostly along and inboard of the Ceiba Trend (31 wells)

2005-2009……
Rio Muni outstep drilling (5 wells) Distal Niger Delta Gas fairway (6 wells) and opening of Douala Basin (11 wells)
Upstream Gas Activity in Northern Equatorial Guinea

**Zafiro Field (ExxonMobil)**

**Alba Field (Marathon)**
Discovered 1983, developed Miocene (Isongo) sands in structural closure.

**Gas Discoveries ExxonMobil 2003 Ophir 2008**
Miocene sands. Combination stratigraphic/structural traps.

**Deep Gas Discoveries**
- Alba Deep
- East Luba
- Turmalina
- Esmeralda
- Langosta

**Douala Basin Discoveries (Noble)**
Discovered 2005-9 Miocene sands in stratigraphic/structural traps.
Main Flare Centers:
- Nigeria 700 Bcf/y
- Cameroon 45 Bcf/y
- Equatorial Guinea 70 Bcf/y

EGLNG
- 1 train operational
- 2 trains considered

Nigeria LNG
- 4 trains operational
- 6 trains committed
- 8 trains considered

Punta Europa
- Methanol
- Propane, Butane

Zafiro Flare Gas
- Capture project – Afgas/Sonaf JV for Sonagas
Punta Europa and EGLNG Today

- large potential for expansion
- good deepwater loading facilities
Alba Historical Gas Production Profile

Alba Averaged Daily Gas Production

- Flared Gas
- Sales Gas
- Gas Injection

Alba Flared, Injected & Sales Gas MMcfd

Major Re-injection

Methanol Plant Problems

Flare Peak/Zero Gas Sales - Methanol Plant Shutdown

Methanol Plant & Power circa 150MMcfd

Pre-injection Historical Flaring

Dec-91 to Dec-08
Discovered Gas Volumes

- Zafiro associated + Gas caps + others: ~0.7 TCF
- Alba: ~5 TCF
- Noble Discoveries: ~2 TCF

Discoveries: ~0.5 TCF
Remaining Reserves and Contingent Resources

as at Sept 2008

- Compression on Alba and gas gathering on Zafiro are taken as reasonably certain.
- Blocks B & D discoveries could be relatively easily developed through Zafiro and Alba respectively. The large P10/3C resources in block B implies more appraisal is needed.
- Blocks I & O will need new stand-alone developments.

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**RESERVES 4376 BCF**

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**CONTINGENT RESOURCES 5460 BCF**
Gas Supply Options - Nigeria imports

Other Indies & Addax
~ 3.5 Tcf

NNPC/ExxonMobil JV up to 10 Tcf
600 MMcfd

Moni Pulo
~ 1.0 Tcf
200 MMcfd

easily enough gas for Train 2 ...... & for Train 3
Gas Supply Options - Cameroon imports

- Rio del Rey non-associated ~1.7Tcf
- Rio del Rey flare ~0.7Tcf 65MMcfd
- Isongo Field & Douala Basin ~1.0Tcf
- Sanaga Sud excess & Kribi ~0.75Tcf
Gas Gathering System

Nigeria Interconnector

Rio del Rey interconnector

South Cameroon Interconnector

Zafiro Field

Alba Field

Pentacorupa

Malabo

BIOKO

Ophir Discoveries

Noble Discoveries
Pipeline Scenario, Cameroon to EG

100 MCFD potential from Rio del Rey fields

Undefined potential from Douala Basins

Forum 18: Monitoring underutilised gas resources
Poster Title: Bioko Island as the Regional Gas Hub for the Eastern Gulf of Guinea
Author: Alan Soulsby, RPS Energy, UK & Gabriel Nguema Lima, Ministry of Mines Industry & Energy, Equatorial Guinea
Bioko - Hub of the Gulf of Guinea
Conclusions

• 8 YEARS OF SUCCESSFUL GAS BUSINESS DEVELOPMENT TO DATE
  - exploration
  - development
  - gas commercialisation through Bioko Island as a natural hub

• much more still to do
  - further exploration and development
  - further gas commercialisation

• now is the time to study development of a gas gathering system

• Government support for creation of 3G