Re-awakening of the onshore Kwanza Basin: Geology and prospectivity
Introduction
- Exploration history
- Tectonic reconstruction
- Geological history

Prospectivity highlights
- Tertiary system
- Cretaceous system
- Pre-Salt

Conclusions

Licensing round update
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Licensing round update
Hydrocarbon indicators from seeps and asphalt deposits for 200 years

Drilling phases in early, middle and late 1900s

1952-1978 11,500 line km shot and 133 wells drilled

13 discoveries by 1998

STOIIP 400 MMBOE

2010 new 2D data shot and processed

2014 new licensing round

2014 Pre-Qualification now open
5) Drift: U. Cretaceous and Cenozoic regressive megasequence (91.5 -0 Ma)

4) Drift: Upper Cretaceous (110-91.5 Ma)

3) Transition (115-100 Ma)

2) Rift (115-110 Ma)

1) Pre-rift (135-115 Ma)
**Introduction**

**Geological history**

**Tertiary**

**Key source rocks**
- **Cunga Mb** *Marine shales*

**Key reservoir intervals**
- **Quifangondo Fm** *Shallow marine sandstone*

**Key seal intervals**
- **Intraformational shale** *basinal / shallow marine shales*
**Geological history**

### Cretaceous

#### Key source rocks
- **Cuvo Fm** *Lacustrine – Type I&II*  
  - Syn-rift
- **Binga Fm** *Basinal shales*  
  - Post-rift
- **Cabo Ledo Fm** *Basinal shales*

#### Key reservoir intervals
- **Volcanic Tuffs** *Ash and pumices*
  - Syn-rift
- **Red Cuvo Mb** *Terrestrial sands*
  - Post-rift
- **Toca Fm equivalent** *Lacustrine carbonate banks*
- **Grey Cuvo Mb** *Marginal marine sandstone*
- **Binga Mb** *Shallow marine limestone*
- **Tuenza Mb** *Dolomite*
- **Cacoba Mb** *Shallow marine sandstone*
- **Catumbela / Quissonde Mb** *Shallow marine limstone*
- **Cabo Ledo Fm** *Shallow marine sandstone*
- **Itombe Mb** *Marine sandstone*

#### Key seal intervals
- **Intraformational seals** *basinal shales*
  - Syn-rift
- **Loeme Fm** *salt*
  - Post-rift
**Introduction**

**Stratigraphic correlation**

- **Quifangondo Fm**
  - Shallow marine sandstone
  - Excess of 30% Φ
  - 100-500 mD
  - Intraformational seals

- **Loeme salt**
  - Regionally extensive seal to the Pre-Salt

- **Binga Fm**
  - Shallow marine carbonate
  - Accounts for 35% of STOIIP in basin
  - Up to 22% Φ

- **Cuvo Fm**
  - Terrestrial sandstones
  - Up to 15.6% Φ
  - Fracture enhanced k
Offshore Kwanza Pre-Salt play

Discovered 700-1300+ MMBO (gross)
- Lontra: 250-500 MMBO
- Cameia: 200-500 MMBO
- Mavinga: <100 MMBO
- Bicuar: 150-300+ MMBO
Outline

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Onshore Kwanza surface geology
Post-salt lead – targeting a faulted anticlinal structure within the Tertiary Calomboloca Trough
SW-NE oriented cross-section showing Tertiary Calomboloca Trough and Cretaceous rafts
Cretaceous system

Post-salt lead – targeting a series of pinch outs in the labe and Pinda Formation equivalents
Introduction

Cretaceous system

SW-NE oriented cross-section showing major Cretaceous rafts
Pre-Salt lead – targeting Pre-Salt stratigraphic pinch outs of sag-phase Cuvo Formation sediments
Pre-Salt lead – targeting the Pre-Salt Cuvo Formation above a large basement horst
SW-NE oriented cross-section highlighting the Pre-Salt sag basin thickening towards the centre of the onshore Kwanza Basin.
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Onshore Kwanza surface geology
**Conclusions**

**Proven** hydrocarbon system

Multiple source, reservoir and seals

Kwanza offshore **Pre-Salt analogue**

New high quality 2D seismic survey

**2014 Licensing Round**

**Pre-Qualification open**
Pre-Qualification open

10 blocks onshore Lower Congo and Kwanza available

Interested participants must submit documentation by April 30th 2014

Data shows at Petroleum Geo-Services London and Luanda offices