

# **Angola's Oil Industry — Celebrating a Century of Progress in Exploration and Production\***

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## **Abstract**

The year 2015 celebrates a full century of oil exploration and production in Angola. A variety of wide-ranging, high potential plays have led to a dramatic surge in Angola's oil production. A decade ago, Angola was producing approximately 750,000 bopd (barrels of oil per day), and now production of almost 2.0 million bopd has been achieved. In the late 1700s Portuguese colonialists discovered oil seeps and asphalt deposits at Libongos, about 60 km north of Luanda and shipped some of the oil to Lisbon and Rio de Janeiro to be used as a caulking material to prevent water leakage into their ships. First-ever drilling for oil was in 1915 about 40 km northeast of Luanda. Dande-4 drilled in 1916 was tested at 6 bopd and was subsequently abandoned, but it signified the first flow of oil in Angola. In 1956 the Benfica oil field, near Luanda, went on production representing the beginning of oil production in Angola. The first offshore oil field in Angola, Malongo, was discovered in 1968 in the Angola province of Cabinda by the American company, Gulf Oil. In 1996 Elf Petroleum discovered the Girassol oil field in Block 17 in 1300 meters of water about 140 kilometers off the coast of Angola. Additional drilling by Elf proved Girassol to be a giant-size oil field, with the oil-bearing reservoir of clastics of Oligocene age which were deposited as turbidites. This led to many more such discoveries. As a result, about 75% of Angola's current production now comes from such reservoirs. In 2011, 11 deepwater to ultra-deepwater pre-salt blocks in the Kwanza and Benguela Basins were awarded by Sonangol to a number of operators. Since that time, very encouraging pre-salt oil discoveries have been drilled by Maersk and Cobalt. In 2013 the LNG plant at Soyo, in northern Angola, commenced production at 5.2 million tonnes per year. On an energy-equivalent basis, this amounts to about 200,000 barrels of oil per day. The first shipment of LNG was to a Petrobras LNG deliquification plant in Rio de Janeiro and thereafter 4 shipments of LNG from Angola were delivered to customers in Asia.

## **Selected References**

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Leite Da Costa, J., T.W. Schirmer, and B.R. Laws, 2001, Lower Congo Basin, deep-water exploration province, offshore West Africa, *in* M.W. Downey, J.C. Threet, and W.A. Morgan (eds.) AAPG Memoir 74, Petroleum Provinces of the Twenty-First Century: Chapter 25, p. 517-530.

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# Angola's Oil Industry – Celebrating A Century of Progress in Exploration and Production

Presentation to the American Association of Petroleum Geologists  
Annual Conference & Exhibition  
May 31 – June 3, 2015  
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# Disclaimer Statement

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# Sources of Information

This presentation is based entirely on public domain published information, including:

- Sonangol *Universo* magazines.
- Oil company magazines, e.g., BP *Calemas*, Chevron *CABGOC* magazines.
- SPE *Journal of Petroleum Technology*, AAPG *Explorer*, *Upstream*, *World Oil*, *Offshore Engineer*, BP Annual Oil & Gas Production Reviews, USA EIA reports.
- Tako Koning's presentations about Angola to AAPG, SPE, CSPG, GSL & PESGB.
- **YOU ARE WELCOME TO HAVE A E-COPY OF THIS PRESENTATION**

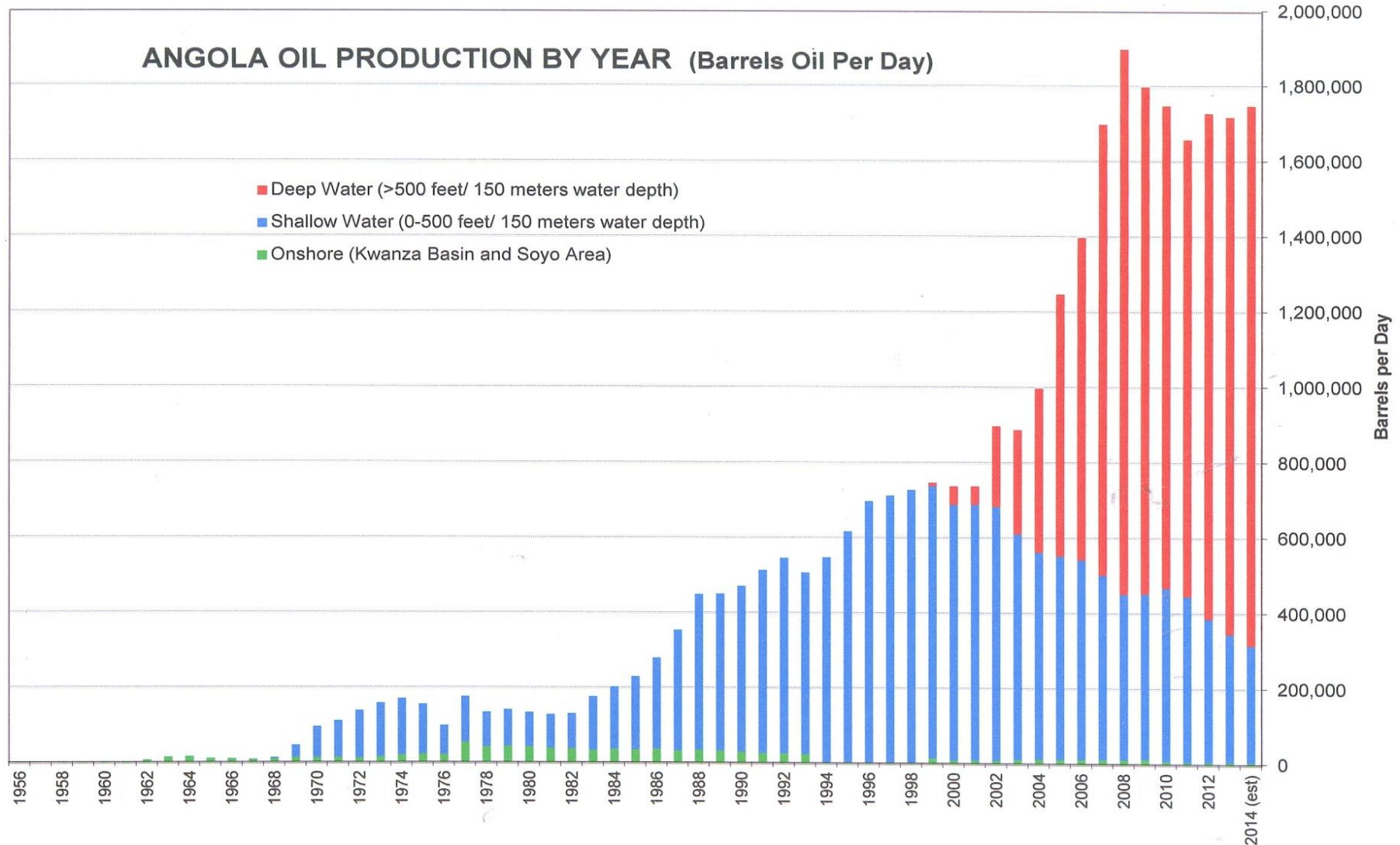
# Key “Take Away” Points of this Presentation

- ***First-ever*** drilling in Angola happened exactly a century ago
- Angola is now producing ***1.8 million barrels of oil per day***; production has doubled in the past ten years.
- ***14<sup>th</sup>*** biggest oil producer in the world
- Angola suffered 27 years of terrible civil war from 1975 – 2002 and all infrastructure was destroyed. ***Revenues from the oil industry via taxes & royalties has contributed to the rebuilding of the country in terms of roads, railroads, airports, schools & hospitals.***
- In one century of oil activities in Angola, there has ***never*** been a major oil spill or blow out and ***Angola’s oil industry intends to keep it that way!***

# **Presentation Outline – This Will be a *Fast Overview of Many Slides***

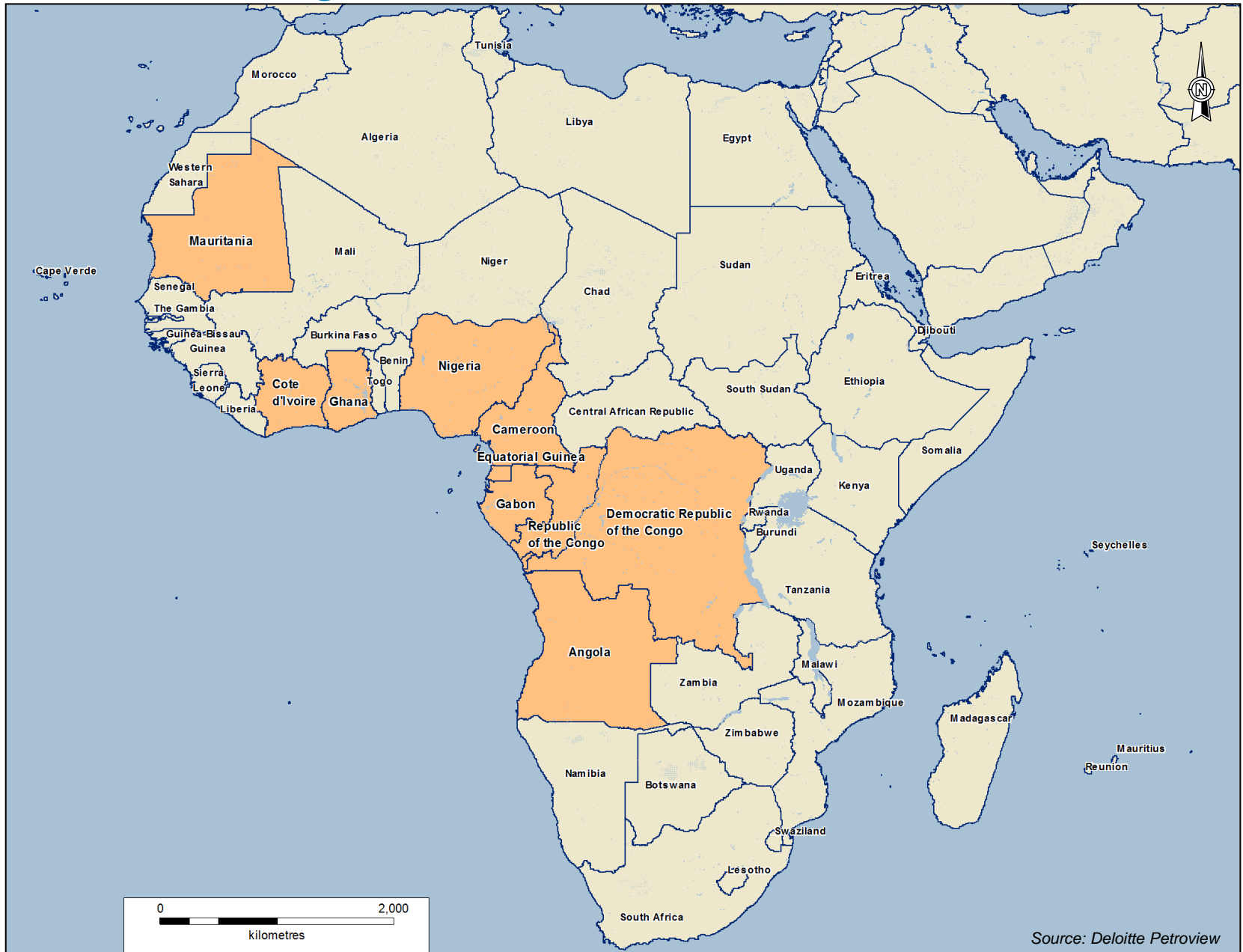
- **Angola in West Africa & Global Context**
- **Angola History – One Century Ago**
- **Angola History - Milestones**
- **Recent History to the Present**
- **Conventional Oil Fields**
- **LNG Project**
- **Pre-Salt Oil Play**
- **Angola's Oil Future**

# Angola's Oil Production 1956 - 2014



Sources: Sonangol Universo magazines, Website - Angola Finance Ministry, 2013 BP World Energy Review

# Oil Producing Countries on West Coast of Africa



Source: Deloitte Petroview

# West Africa Oil Production – Current Production in BOPD (Barrels Oil Per Day)

<b>Nigeria</b>	<b>2,200,000 BOPD</b>
<b><i>Angola</i></b>	<b><i>1,800,000</i></b>
<b>Congo Brazzaville</b>	<b>340,000</b>
<b>Equatorial Guinea</b>	<b>300,000</b>
<b>Gabon</b>	<b>240,000</b>
<b>Ghana</b>	<b>110,000</b>
<b>Chad</b>	<b>100,000</b>
<b>Cameroon</b>	<b>75,000</b>
<b>Ivory Coast</b>	<b>30,000</b>
<b>Congo DRC</b>	<b>25,000</b>
<b>Mauritania</b>	<b>2,000</b>

**Total 5,222,000 BOPD**

From: Oil & Gas Journal, SPE Journal of Petroleum Technology ,Upstream

# Global Oil Production – Top 20

From: BP 2014 Energy Report, US EIA

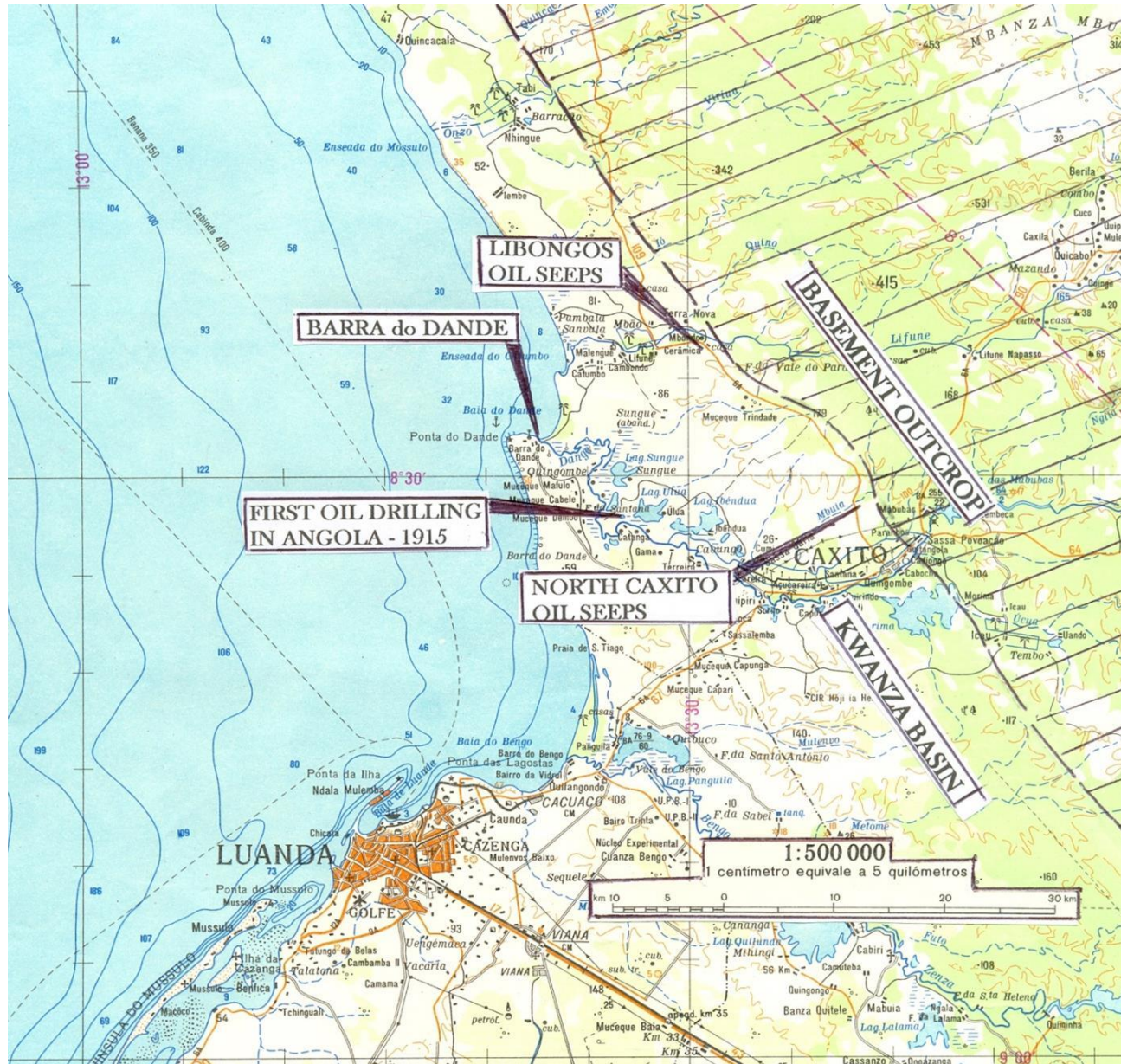
<b>1.) Russia</b>	<b>10,400,000 BOPD</b>
<b>2.) Saudi Arabia</b>	<b>10,000,000</b>
<b>3.) USA</b>	<b>9,500,000</b>
<b>4.) China</b>	<b>4,200,000</b>
<b>5.) Canada</b>	<b>3,400,000</b>
<b>6.) Iran</b>	<b>3,200,000</b>
<b>7.) Kuwait</b>	<b>2,600,000</b>
<b>8.) Mexico</b>	<b>2,500,000</b>
<b>9.) Iraq</b>	<b>2,400,000</b>
<b>10.) U.A.E.</b>	<b>2,400,000</b>

# Global Oil Production – Top 20

<b>11.) Nigeria</b>	<b>2,200,000 BOPD</b>
<b>12.) Brazil</b>	<b>2,100,000</b>
<b>13.) Venezuela</b>	<b>2,100,000</b>
<b>14.) <i>Angola</i></b>	<b><i>1,800,000</i></b>
<b>15.) Norway</b>	<b>1,600,000</b>
<b>16.) Kazakhstan</b>	<b>1,600,000</b>
<b>17.) Algeria</b>	<b>1,200,000</b>
<b>18.) Qatar</b>	<b>1,200,000</b>
<b>19.) Colombia</b>	<b>1,000,000</b>
<b>20.) U.K.</b>	<b>1,000,000</b>



# Angola's Oil History – the Past

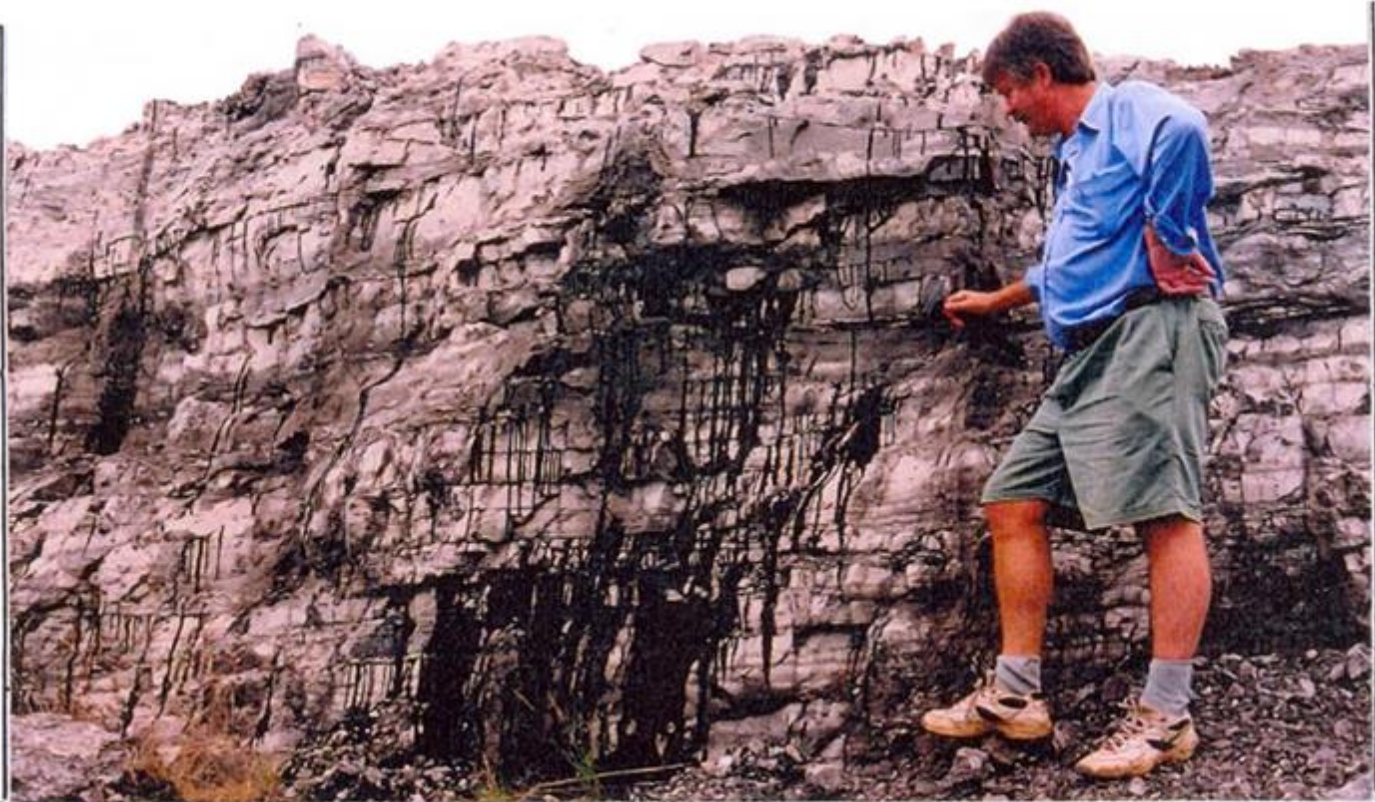


Source: T. Koning, AAPG Explorer magazine, April 2013



# Angola's Oil History – the Past

## The Libongos Oil Seeps – *Pre-Salt Oil*

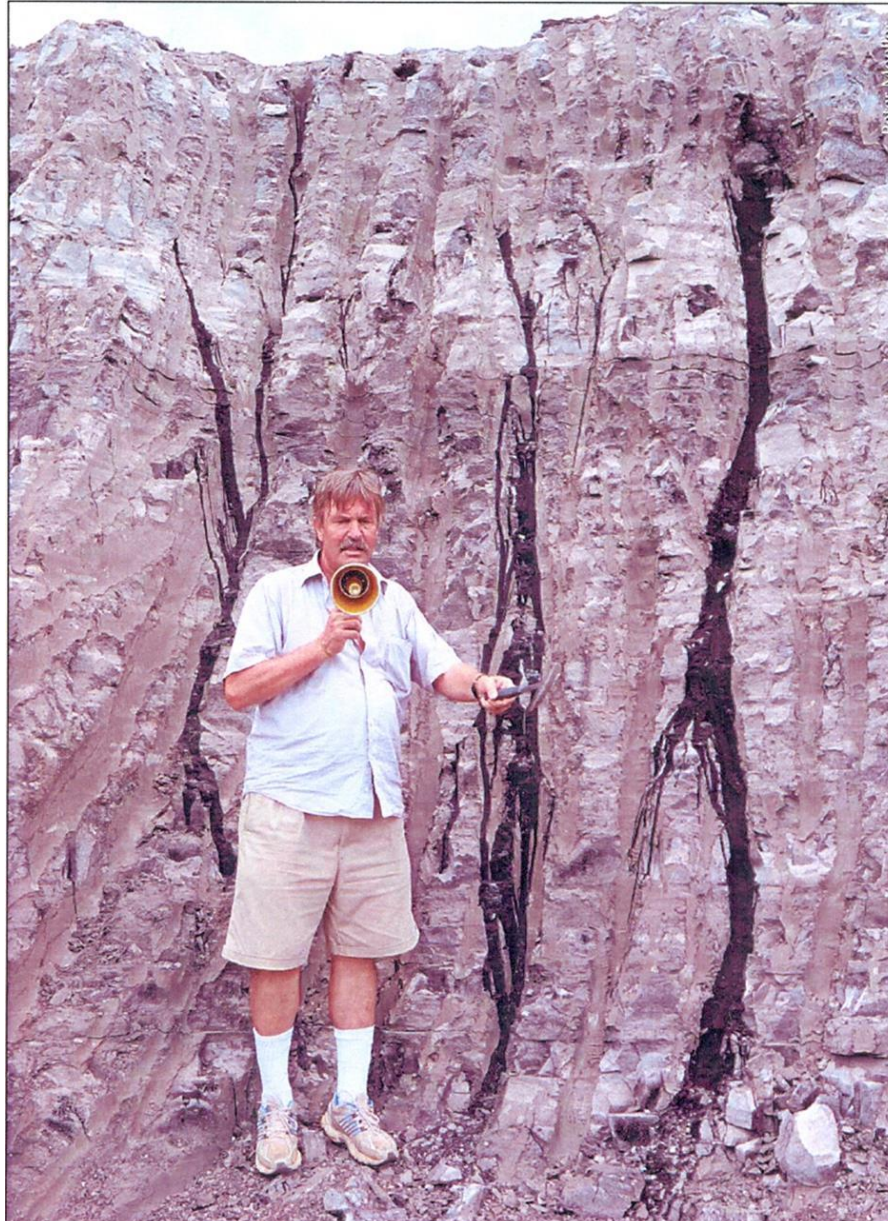


**Libongos oil seeps.** Here oil has migrated into Pinda-equivalent porous carbonates. This oil has been analyzed by Norsk Hydro and Chevron to be pre-salt oil. The oil-filled Pinda has been eroded exposing it at the surface and creating these oil seeps. Recent (2011 & 2012) pre-salt discoveries in the deepwater Kwanza Basin by Maersk Oil (Azul-1) and Cobalt International Exploration (Cameia-1) have focused attention on these oil seeps since they provide an important data point on the pre-salt of the Kwanza Basin.



# Angola's Oil History – the Past

## The Libongos Oil Seeps – *Pre-Salt Oil*





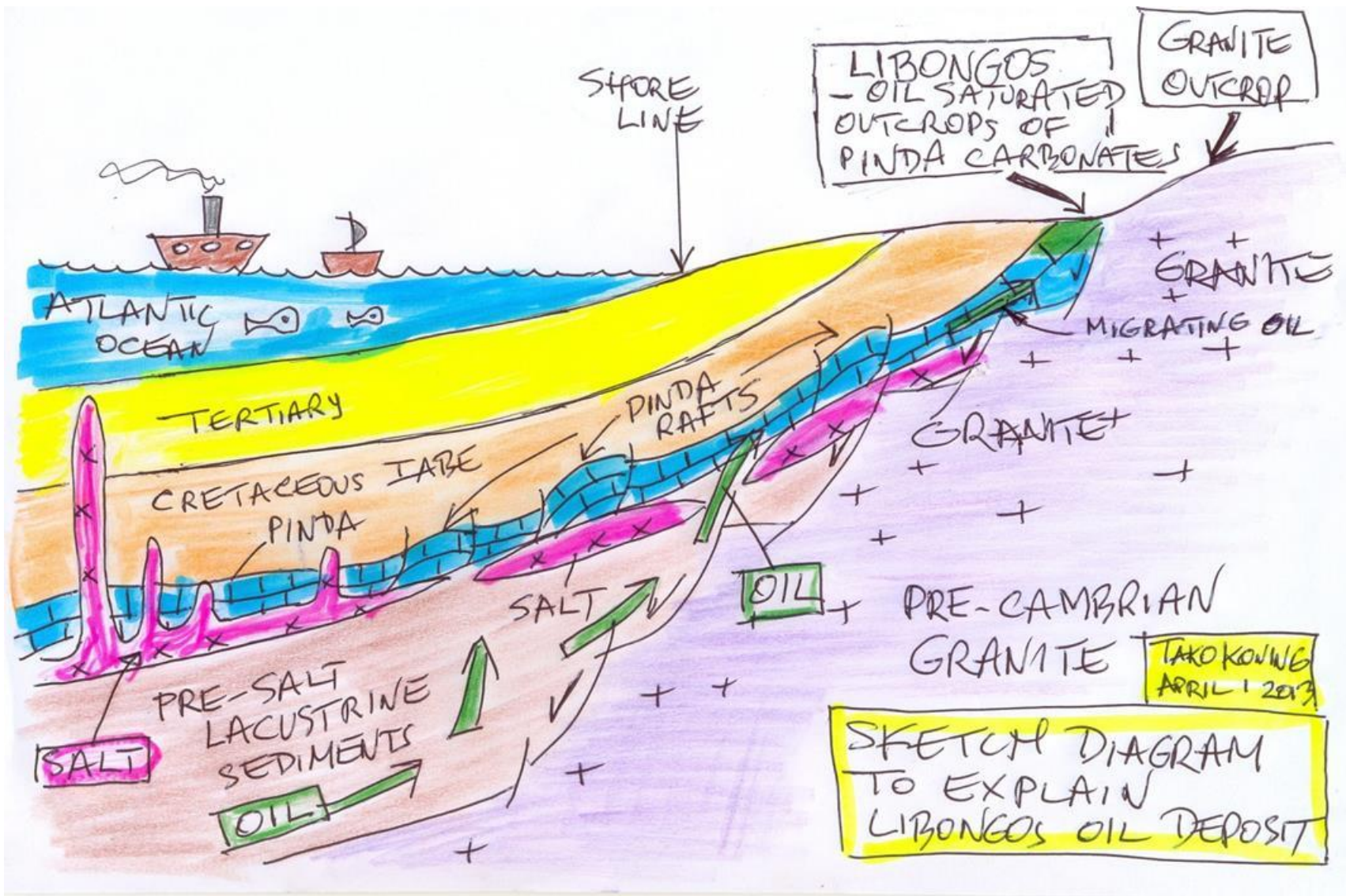
# Angola's Oil History – Dande-4 Drilled in 1916, Tested 6 BOPD – *Pre-salt Oil*





# Angola's Oil History – the Past

## The Libongos Oil Seeps – *Pre-Salt Oil*



# **MILESTONES IN ANGOLA'S OIL HISTORY**

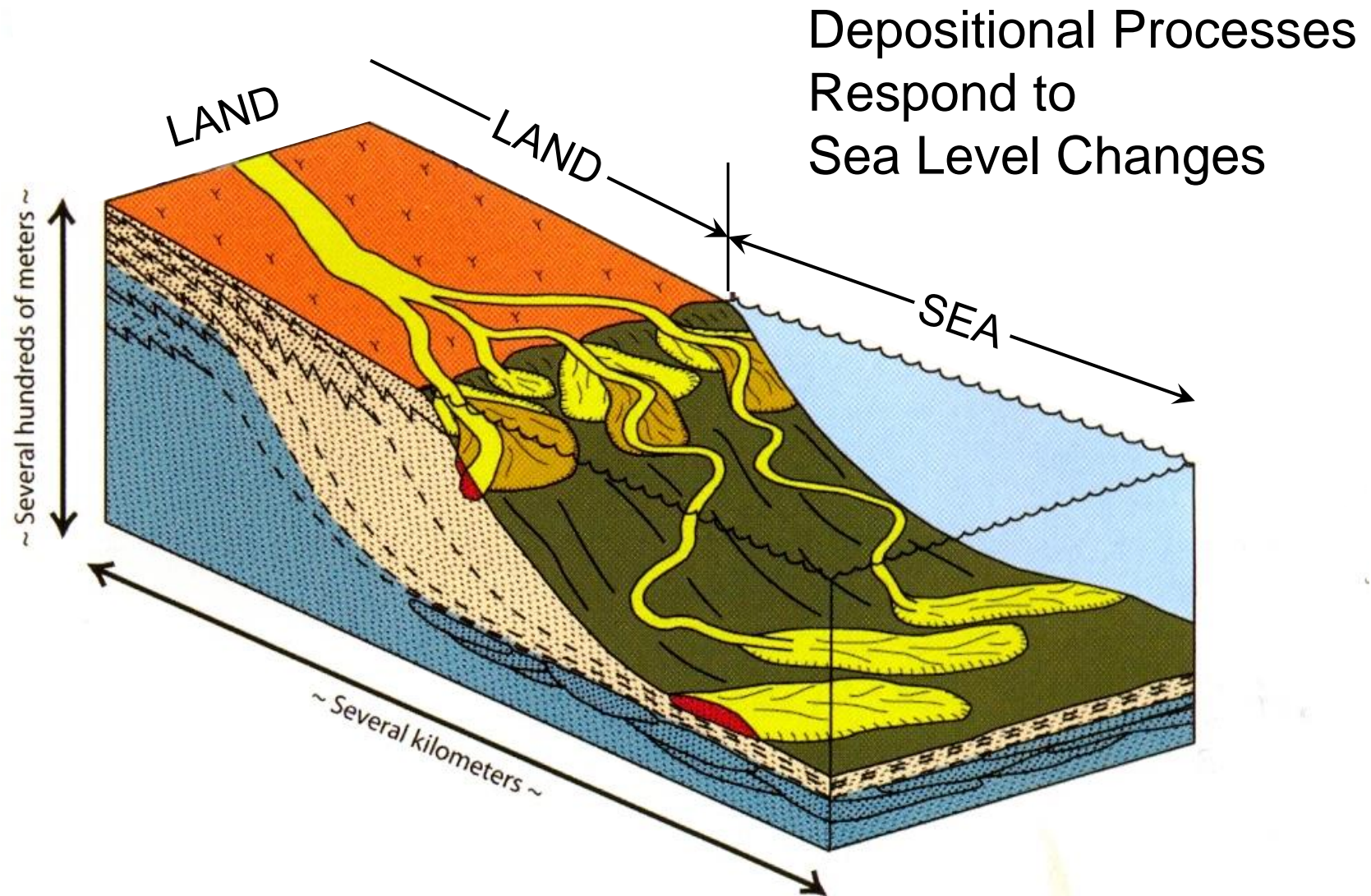
- **1915 first ever oil drilling by PEMSA, a Portuguese oil company**
- **1916 Dande-4 drilled to 870 meters and tested at 6 barrels of oil per day**
- **13 wells drilled 1915 – 1921, all dry holes**
- **1955 Benfica oil field discovered just south of Luanda**
- **1956 Benfica oil field on production, represented start of Angola's oil production**

# **MILESTONES IN ANGOLA'S OIL HISTORY**

- **1968 first offshore oil discovery, by Gulf Oil in Cabinda**
- **1969 first offshore oil production**
- **1975 Texaco discovered Essungu oil field, offshore Block 2**
- **1996 Elf discovered the giant Girassol oil field in Tertiary turbidite clastics**
- **2011 Chevron produced 4 billion barrels of oil from shallow water Block 0**
- **2014 Total produced 2 billion barrels of oil from deepwater Block 17**



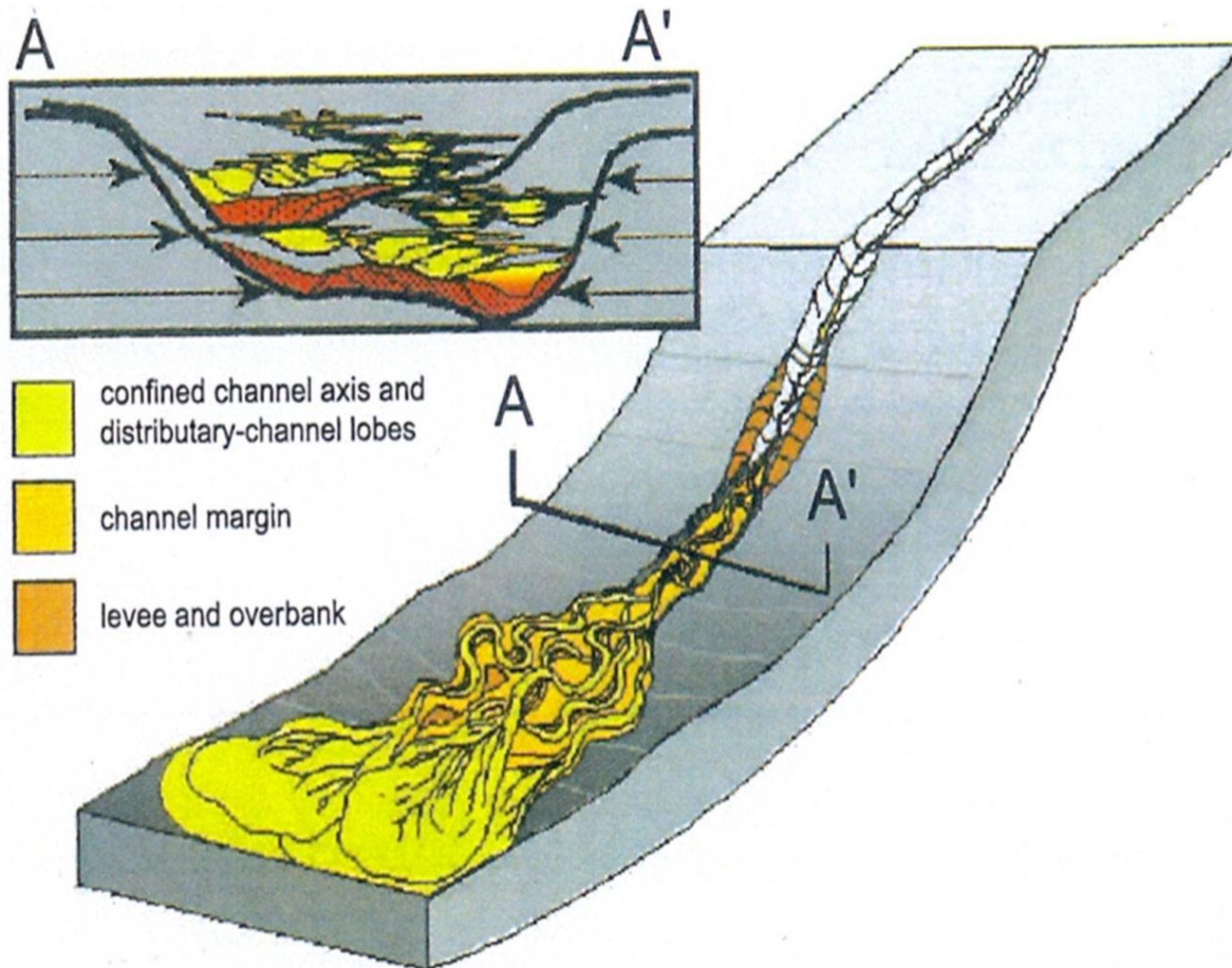
# Geology – It All Starts with Good Geology





# Geology – Lower Congo Basin, Esso Block 15, Slope Channel System in Oligocene-Miocene Malembo formation

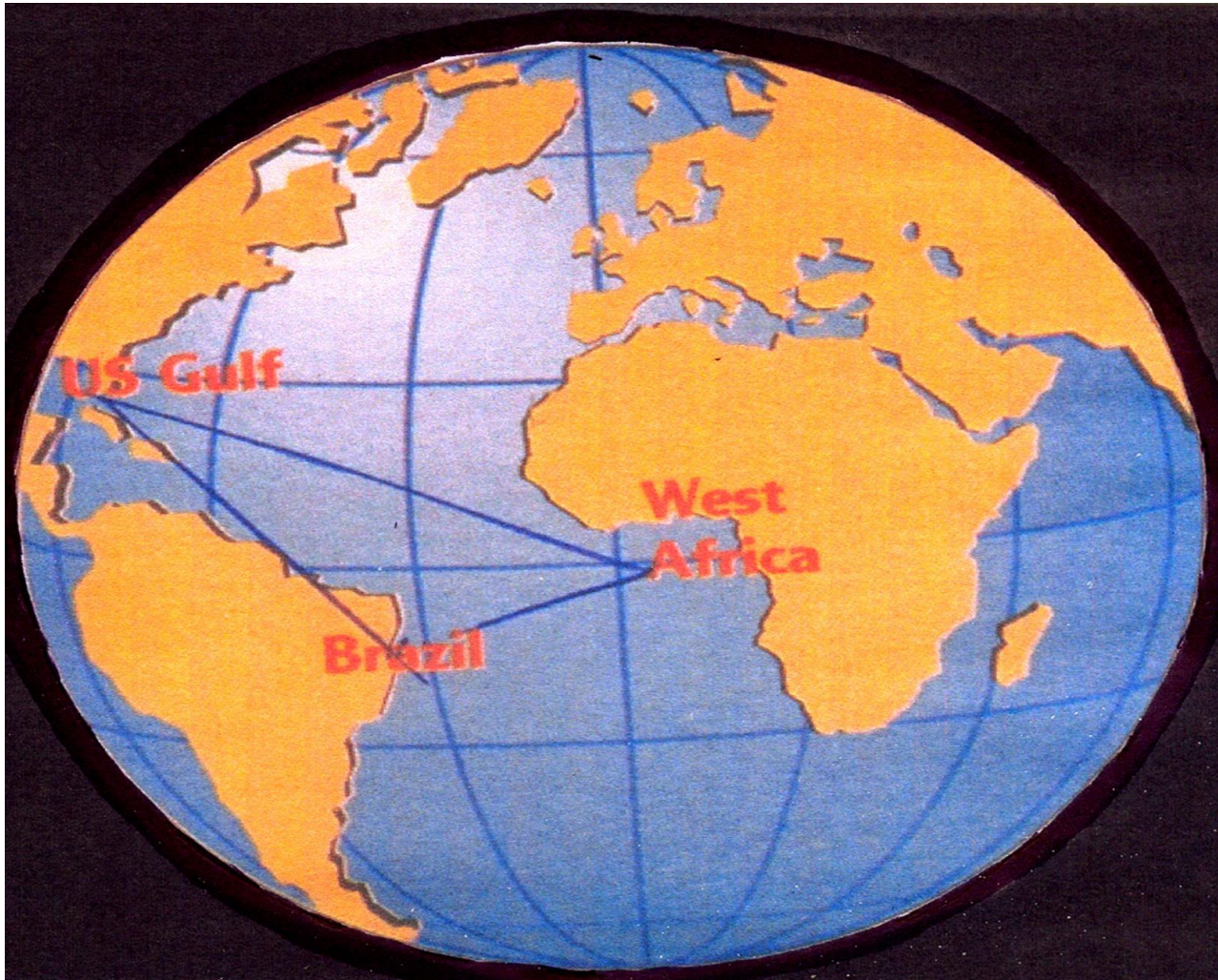
From: Porter et al, Exxon, 2006, AAPG Memoir 88



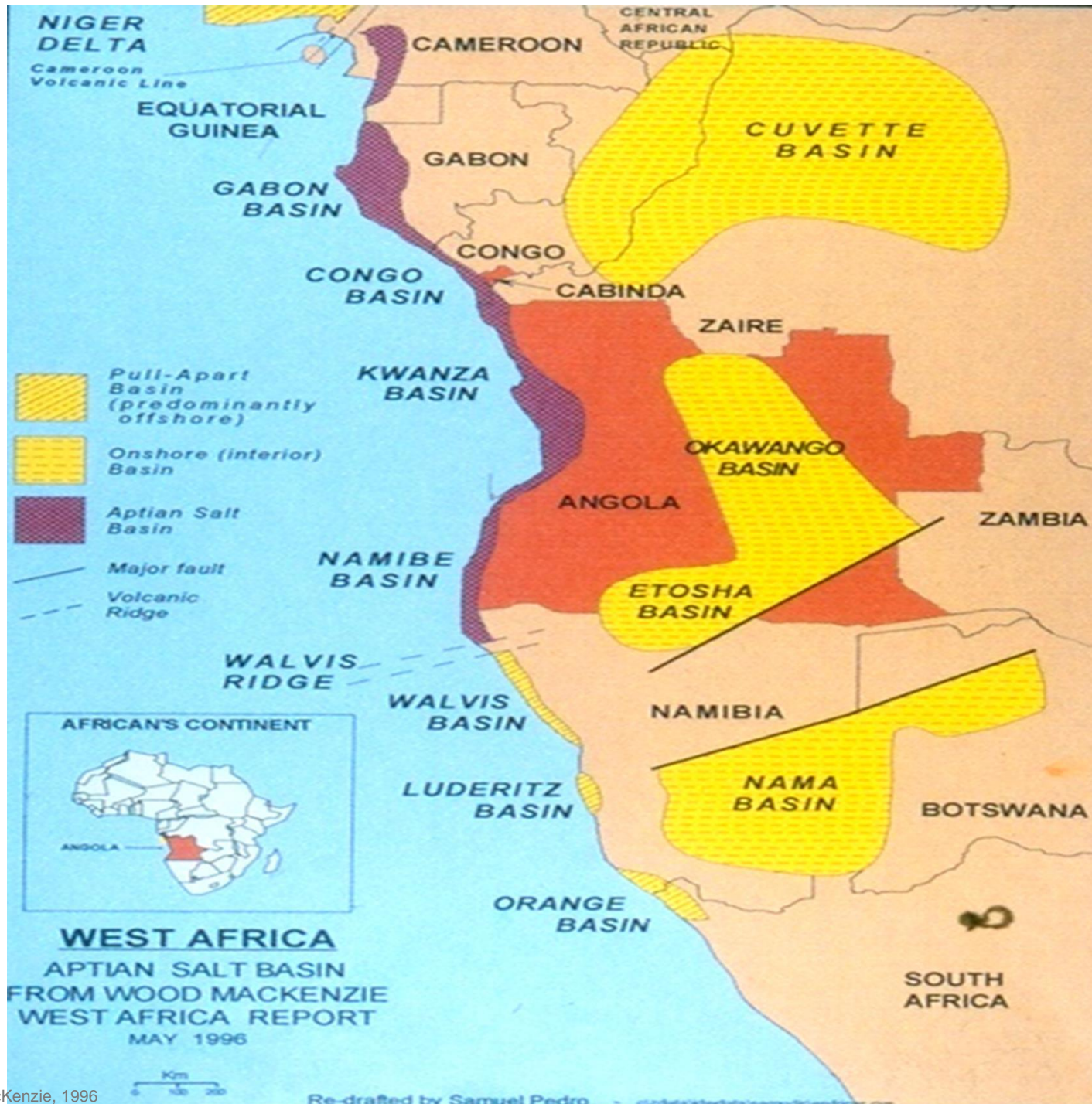
# Major Oil & Gas Fields Continue to be Discovered in Angola in Past Six Years

- ENI has drilled 8 oil discovery wells on Block 15/06 (9 wells, 8 discoveries)
- MAERSK has drilled 3 oil discovery on Block 16
- TOTAL has drilled 3 oil discoveries on Block 17/06 (3 wells, 3 discoveries)
- PETROBRAS has drilled 1 oil discovery on Block 18/06
- PLUSPETROL has drilled 1 oil discovery on Cabinda South Block
- Pre-salt oil & gas discoveries by Maersk, Cobalt and ConocoPhillips

# The Golden Triangle for Deepwater Oil & Gas Exploration: The Gulf of Mexico – Brazil & West Africa



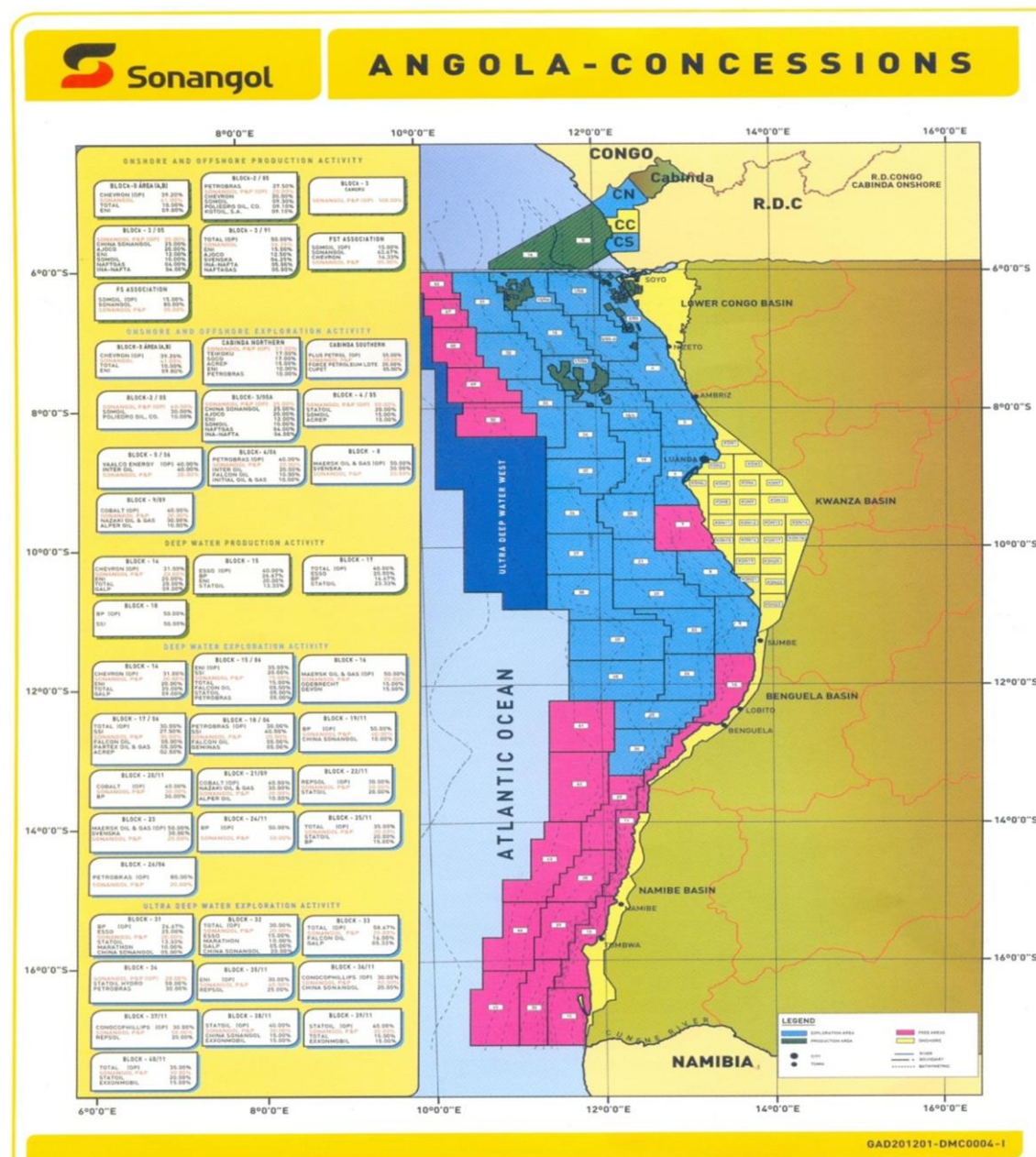




# Lower Congo Sedimentary Basin - Key Points

- Basin covers 115,000 sq km from shoreline to water depths of 3500 meters
- Since the discovery of Girassol in 1996, exploration has focused on the deepwater turbidite sands associated with the ancestral Congo River.
- *Excellent seismic imaging has led to the high rates of exploration success (85%)*

# Angola Oil Concessions





# Oil Companies Present in Angola: Operators of Blocks

▪ Chevron	American
▪ Esso	American
▪ Vaalco	American
▪ Cobalt	American
▪ ConocoPhillips	American
▪ Total	French
▪ BP	British
▪ ENI	Italian
▪ Repsol	Spanish
▪ Petrobras	Brazilian
▪ Pluspetrol	Argentinean
▪ Statoil	Norwegian
▪ Maersk	Danish
▪ Sonangol P&P	Angolan (state oil company)

# Oil Companies Present in Angola: Non-operators

▪ Naftagas	Prodoil	Initial Oil
▪ Partex	SOCO	Marathon
▪ Odebrecht	Svenska	Ajoco
▪ Teikokou	Falcon	Petrogal
▪ Sinopec	China	Sonangol
▪ ACR	Somoil	Grupo Gema
▪ Force	Interoil	Galp Enegia
▪ Partex	Etc etc	

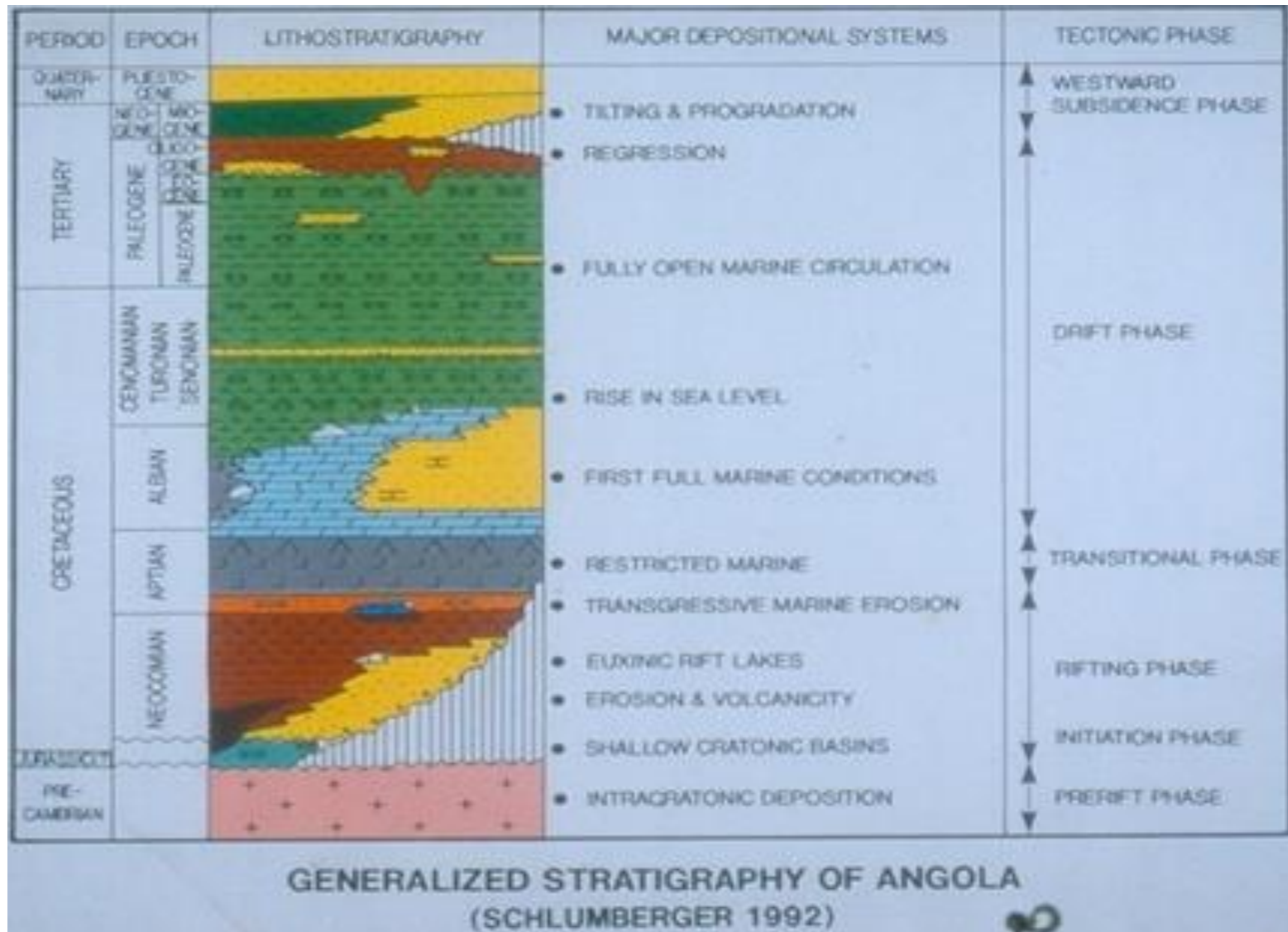


# Current Angola Oil Production – By Operator in BOPD - Data from Minfin Website

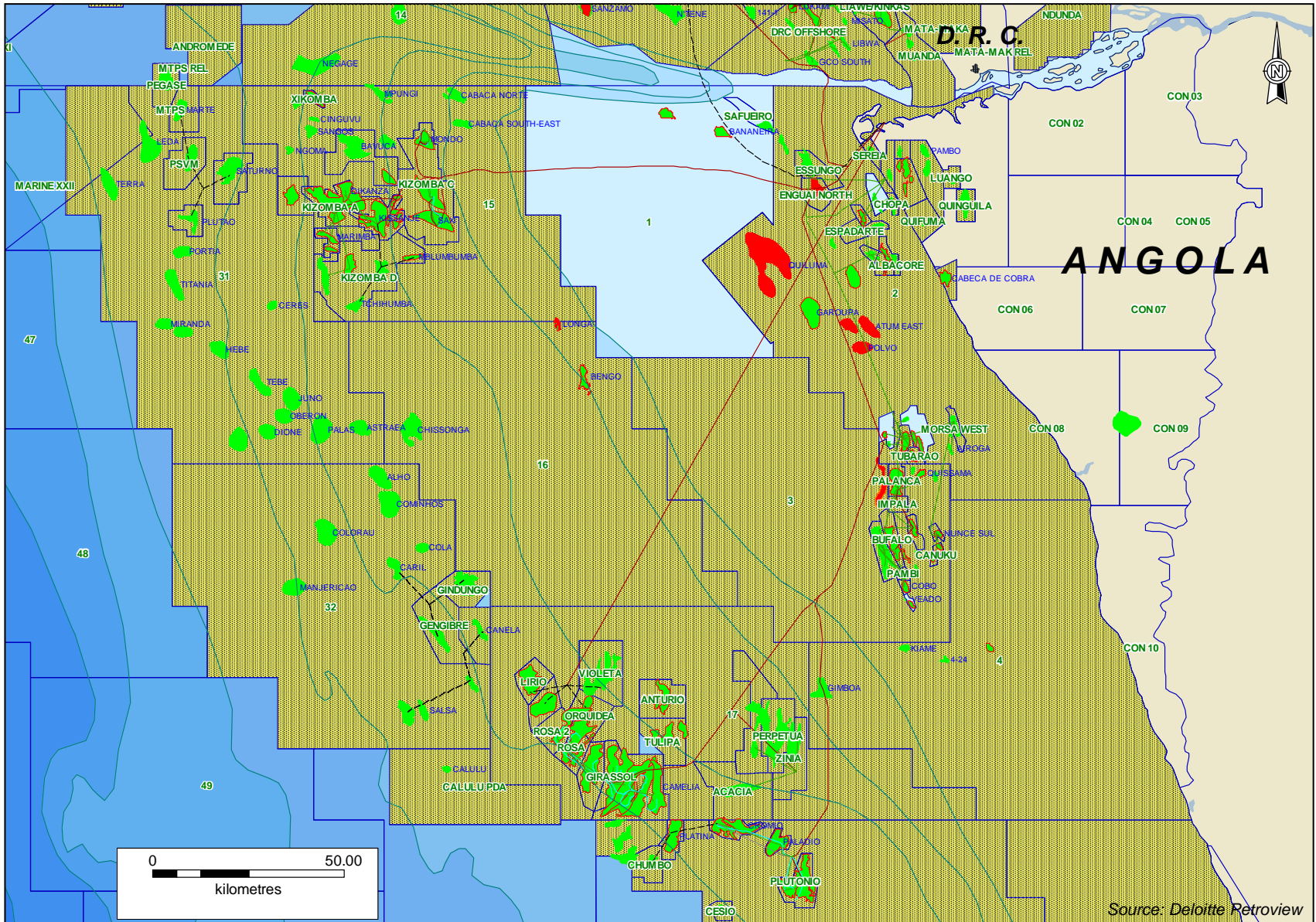
▪ TOTAL E&P	700,000 BOPD
▪ ESSO	360,000
▪ CHEVRON	350,000
▪ BP	330,000
▪ SONANGOL P&P	55,000
▪ SOMOIL	<u>5,000</u>
<b><i>TOTAL ANGOLA</i></b>	<b><i>1,800,000 BOPD</i></b>

Note: Aprox 3/4's of the oil production is from deepwater fields, 1/4 of the oil production is from shallow-water fields & onshore

# Stratigraphic Column

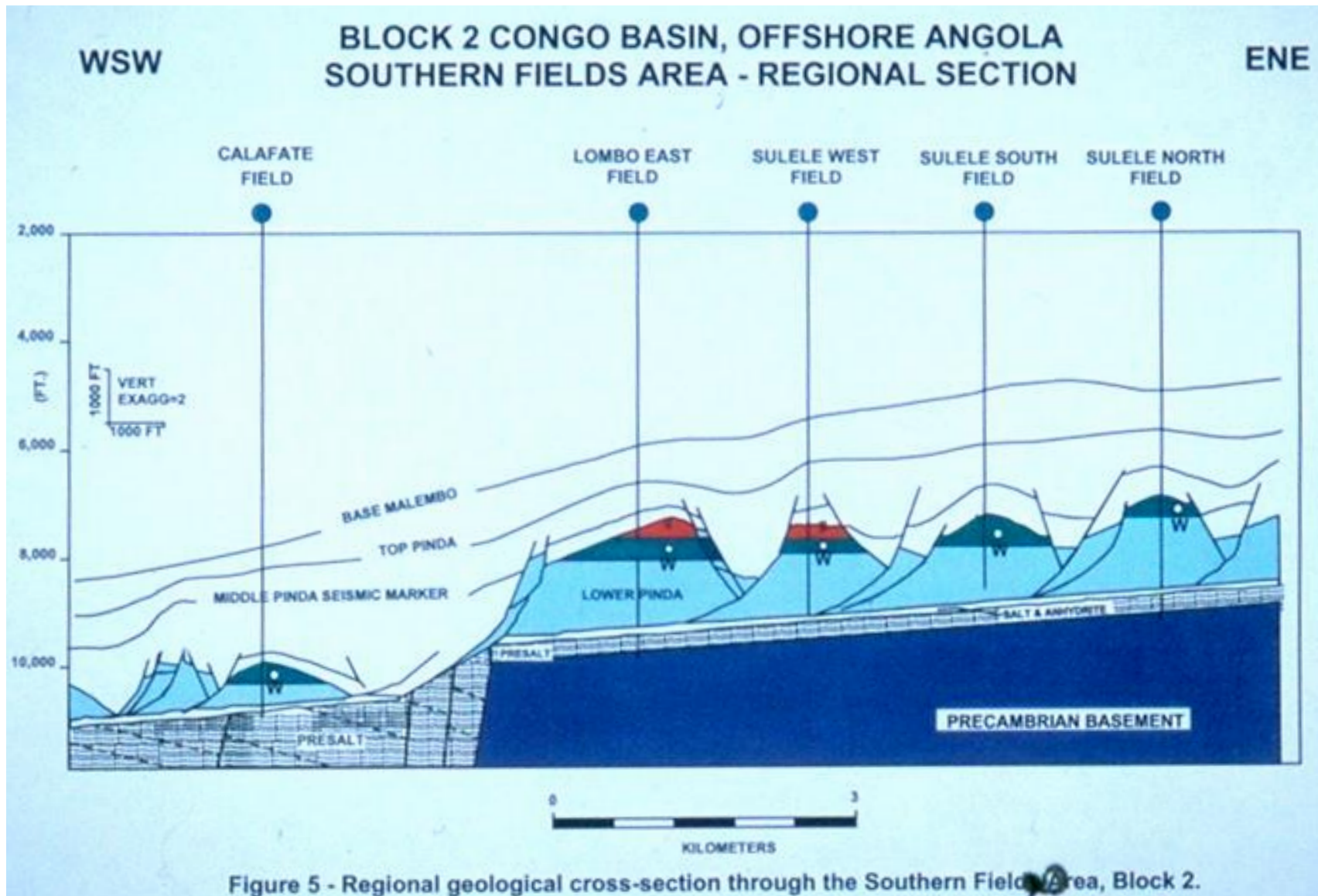


# Offshore Angola

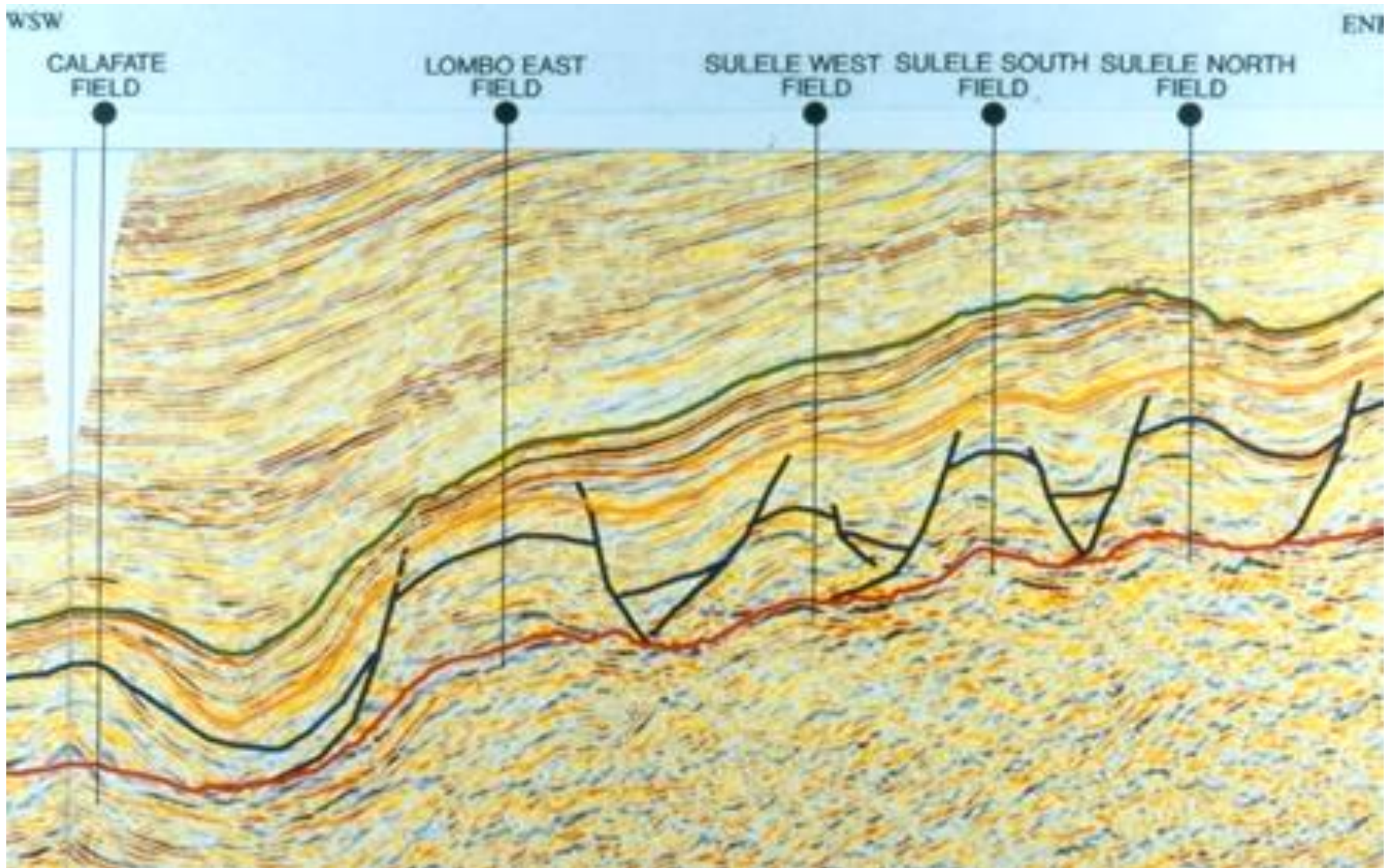


# The Lombo East Oil Field – An Example of a Typical Post-Salt Carbonate Oil Field

- **Lombo East is a Typical Pinda Carbonate (Dolomite & Limestone) Oilfield**
- **OOIP 310 MMSTB**
- **Recovery Factor 47%**
- **Cumulative Production 140 MMBLS**
- **Peak Production 33,000 BOPD from 9 wells (3,500 BOPD/ Well)**









Source: T. Koning (Texaco) & O. De Deus (Sonangol), AAPG 1997, 1998, 2000





Source: T. Koning (Texaco) & O. De Deus (Sonangol), AAPG 1997, 1998, 2000



# Review “Snapshots” of Angola’s Deepwater Oil Fields

- **Chevron Block 14**
- **Esso Block 15**
- **Total Block 17**
- **BP Block 18**

# Deepwater Discovery

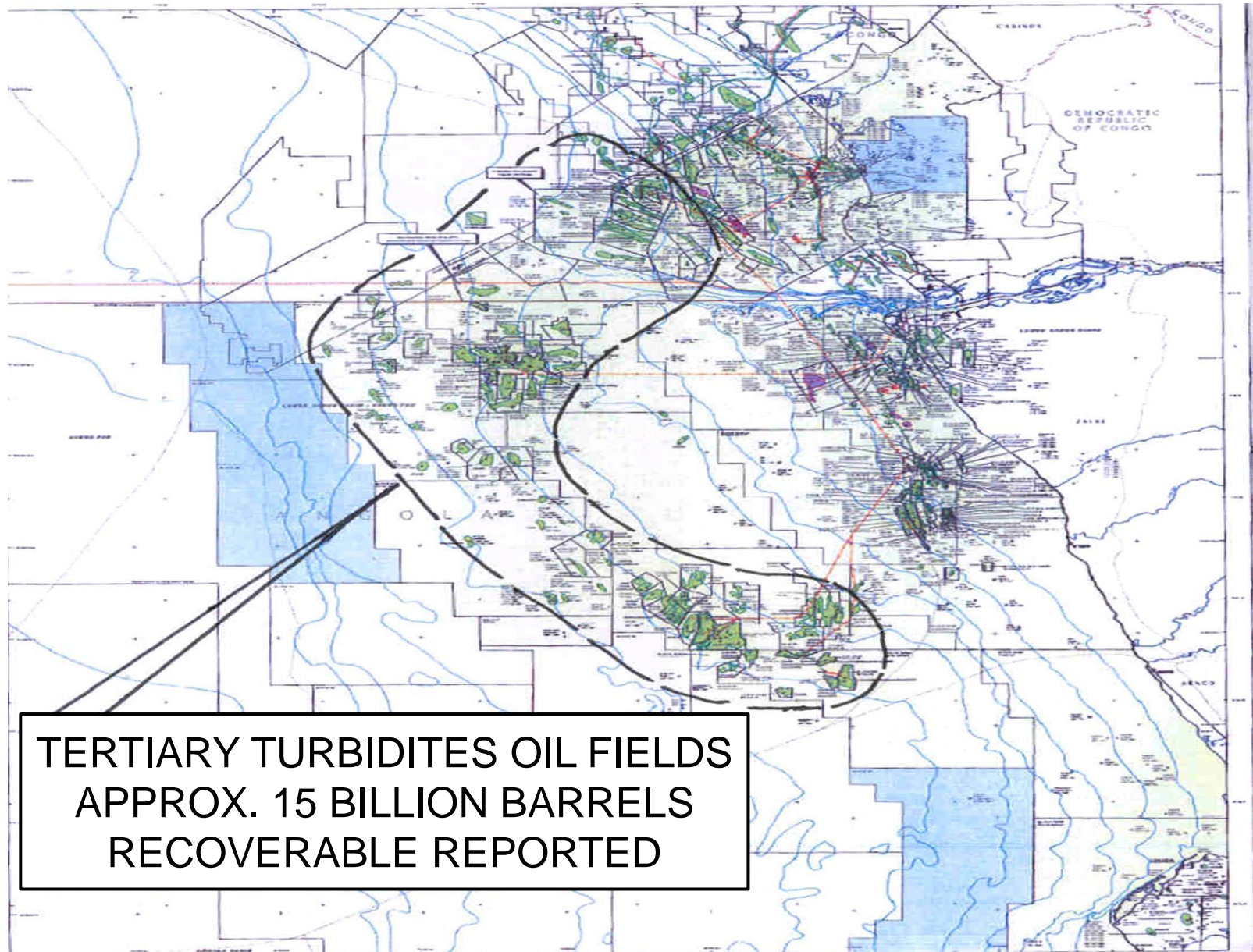


# Deepwater Turbidite Deposits

- **Geology 101: Turbidites are sands and gravels which flowed in subsea rivers from land seawards & downwards to the sea floor**
- **3/4's of Angola's oil production is now from the deepwater and comes from turbidite sand and gravel deposits**



# Tertiary Oil-bearing “Fan”



# CHEVRON Deepwater Block 14

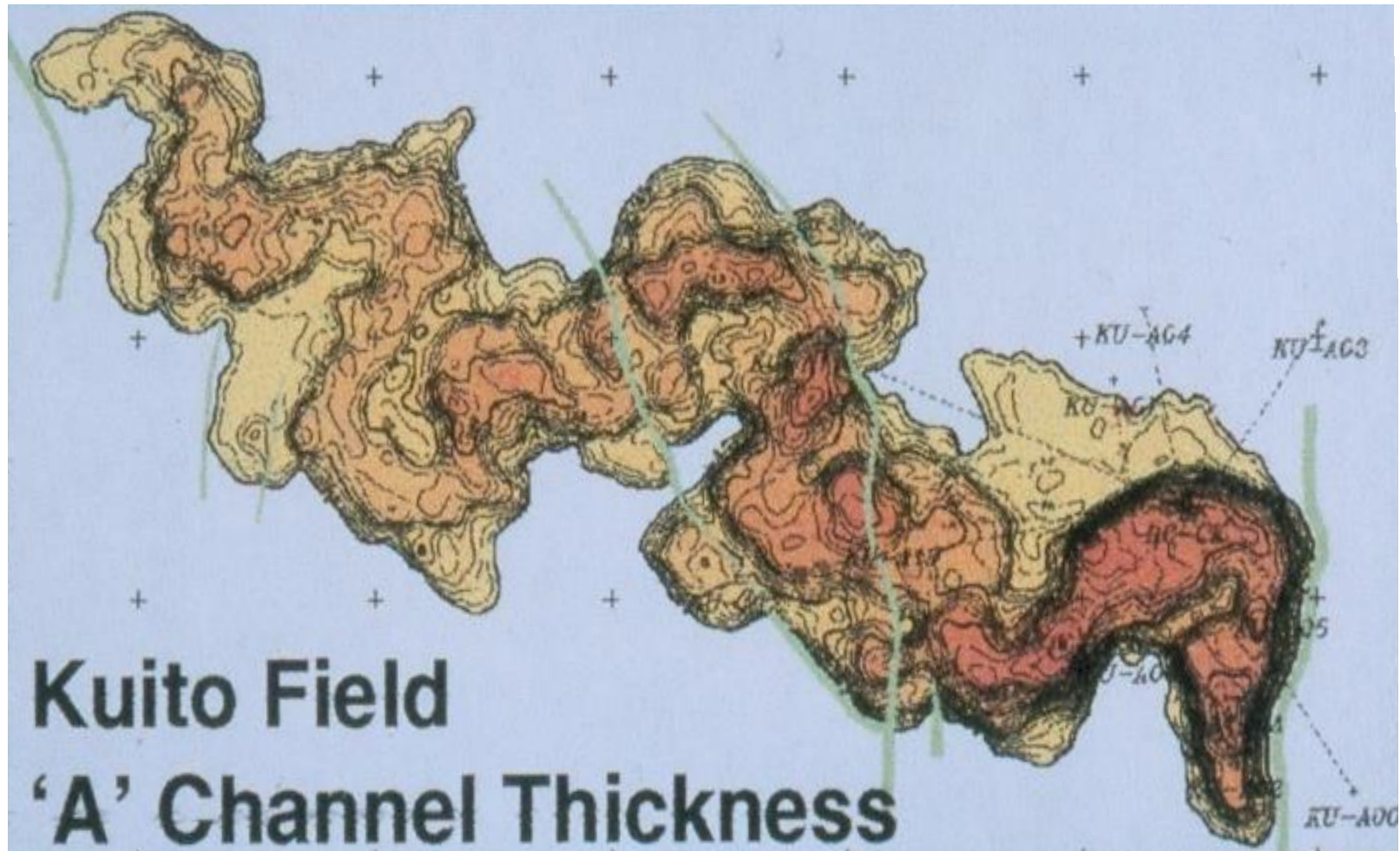
- **CHEVRON is operator with partners Sonangol, Total, Agip, Petrogal**
- **Kuito Field – First Tertiary deepwater field on production, discovered in 1997 and fast-tracked onto production in 1999**

# Offshore Angola – Chevron Blocks 0 & 14





# Seismic View of the Kuito Field



Source: Chevron

# CHEVRON Deepwater Block 14 Kuito Oil Field

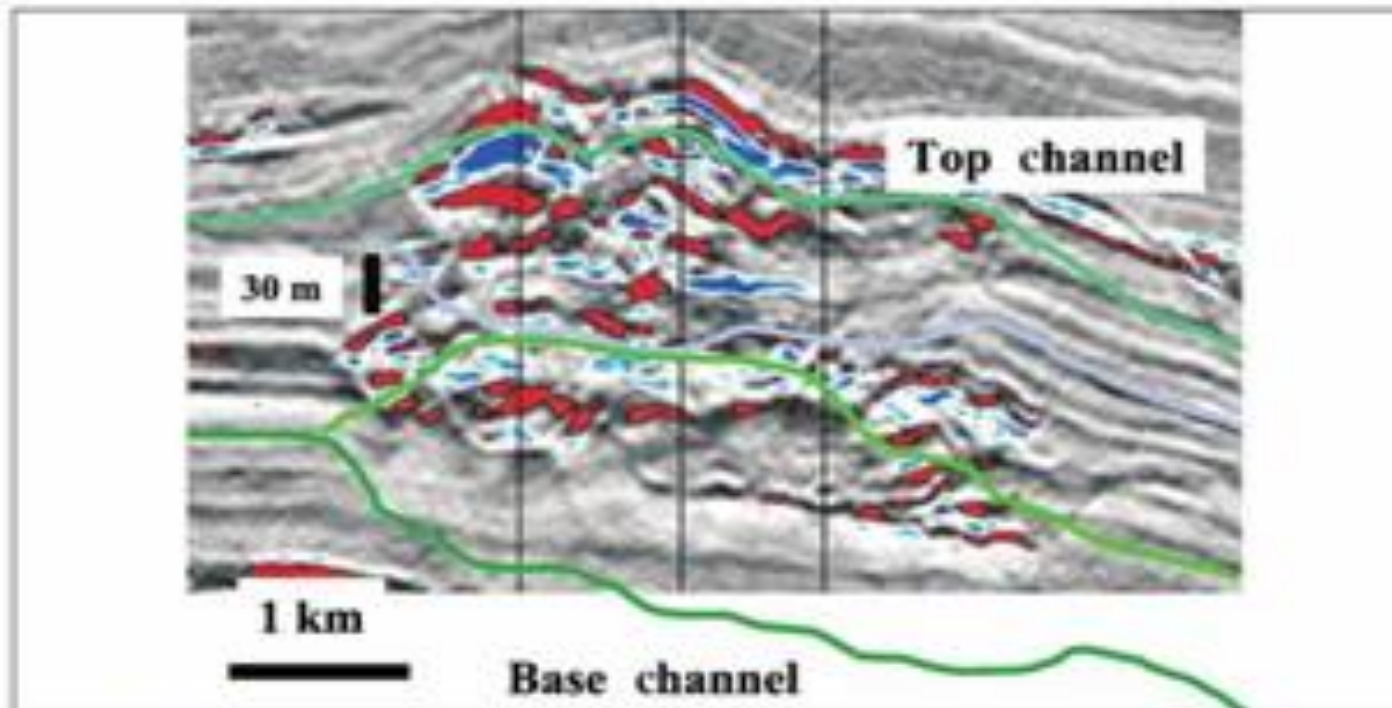
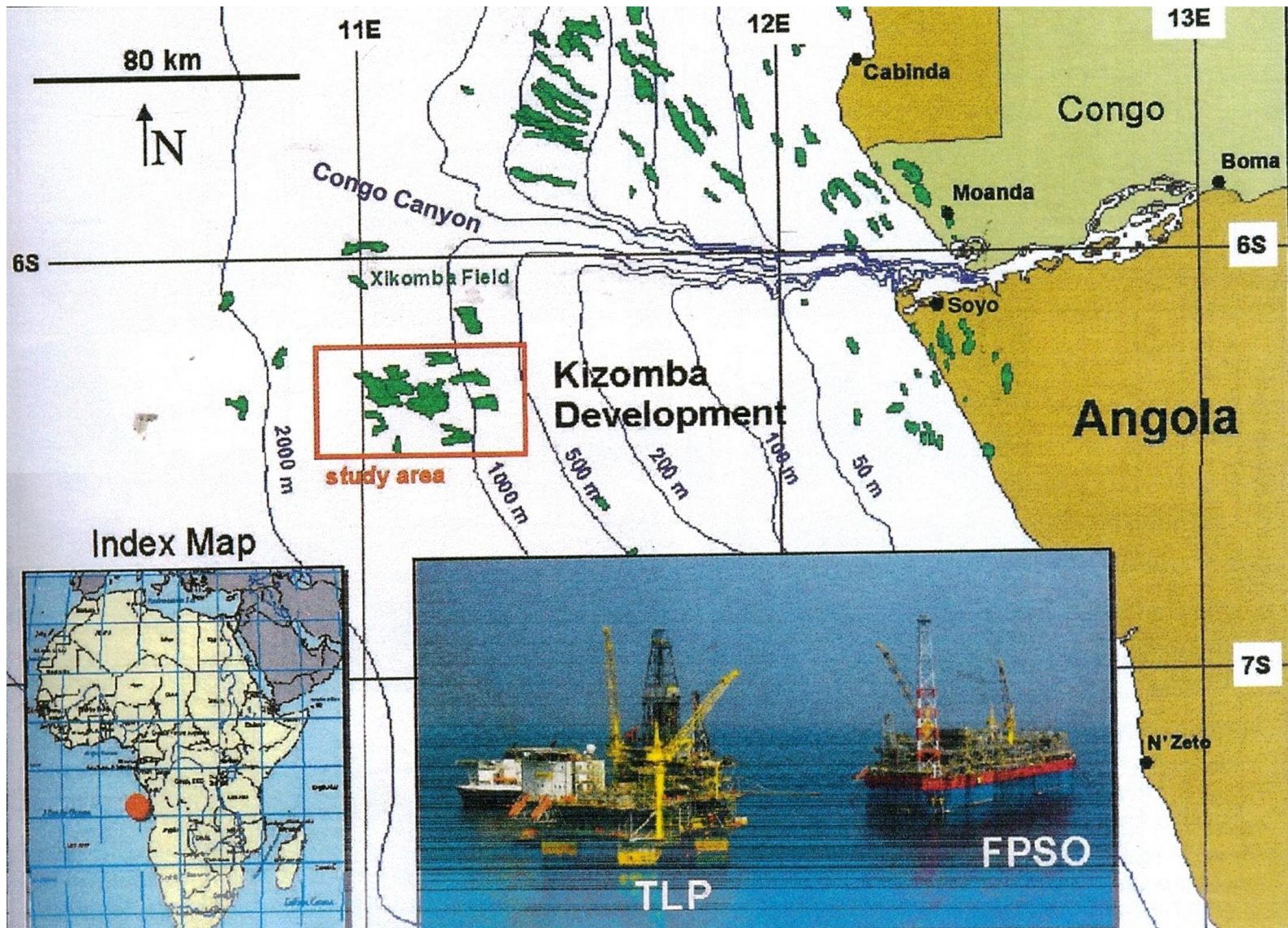


Figure 6. Seismic line through Kuito field. Line is oriented across depositional axis of channel. Note differential compaction and stacking of amplitude packages that indicate sandy turbidite channel systems.

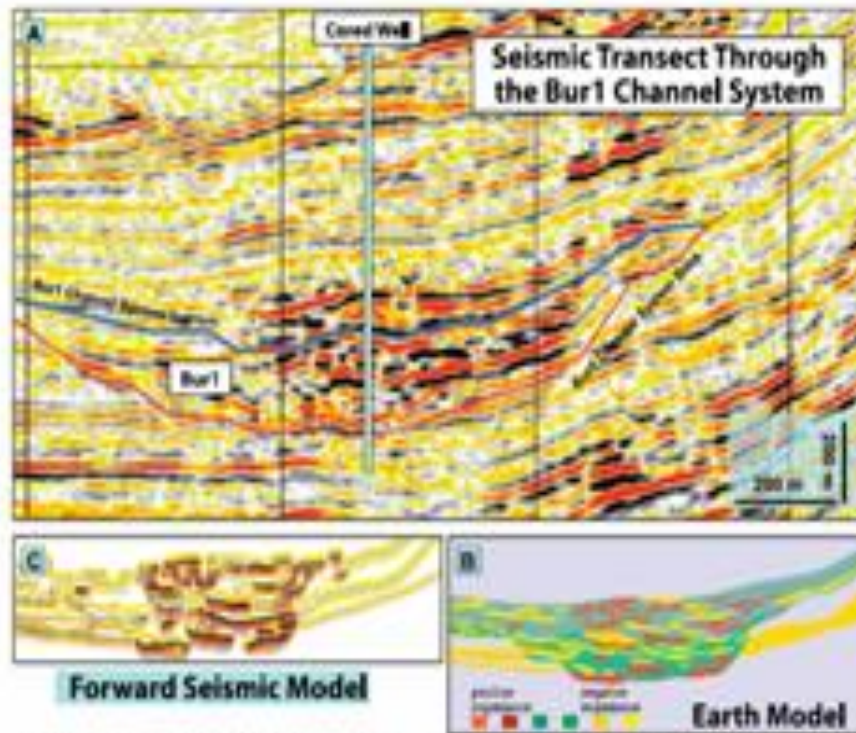
Da Costa, J. L., T. M. Schinnen, and B. B. Lawry, 2001, Lower Congo Basin, deep-water exploration province, offshore West Africa, in M. W. Dowsey, J. C. Thorne, and W. A. Morgan, eds., Petroleum provinces of the twenty-first century AAPG Memoir 74, p. 517-536.



# ESSO Deepwater Block 15 Kizomba Field



# ESSO Deepwater Block 15, Kizomba Oil Field



**FIGURE 4.** Seismic cross section through the Bur1 slope channel system. (A) The seismic expression of the Bur1 is varied because of multiple rock types and a stratigraphy built up through multiple episodes of erosion and deposition. The solid parts of the system are seismically characterized as multicyclic, high amplitude, semi-continuous seismic facies. Off-axis and channel margin successions show moderate to low amplitude response, and these slope sets the erosional boundary of the system. An Earth model of mixed impedance channel fills and nonchanneled depositional elements (B) is convolved with a seismic source to produce a modeled seismic response (C) that is similar to the actual seismic traverse.

Porter, M. L., A. B. G. Sprague, M. D. Sullivan, D. C. Janssen, & T. Bruchmann, T. & Gashford, C. Brown, D. B. Scholten, G. D. Brown, S. J. Friedman, and D. C. McKel, 2006. Stratigraphic organization and predictability of mid- to late- and late-Permian shelf-edge successions in a lower-Miocene deep-sea slope channel system, Angola Block 15, in D. J. (Eds.) and L. J. (Eds.), eds., *Clifford: Understanding successions of the world: from rocks to resource characterization and modeling*. AAPG Memoir 94/17 (Special Publication), p. 201–215.



# ESSO Deepwater Block 15 Kizomba “A” FPSO



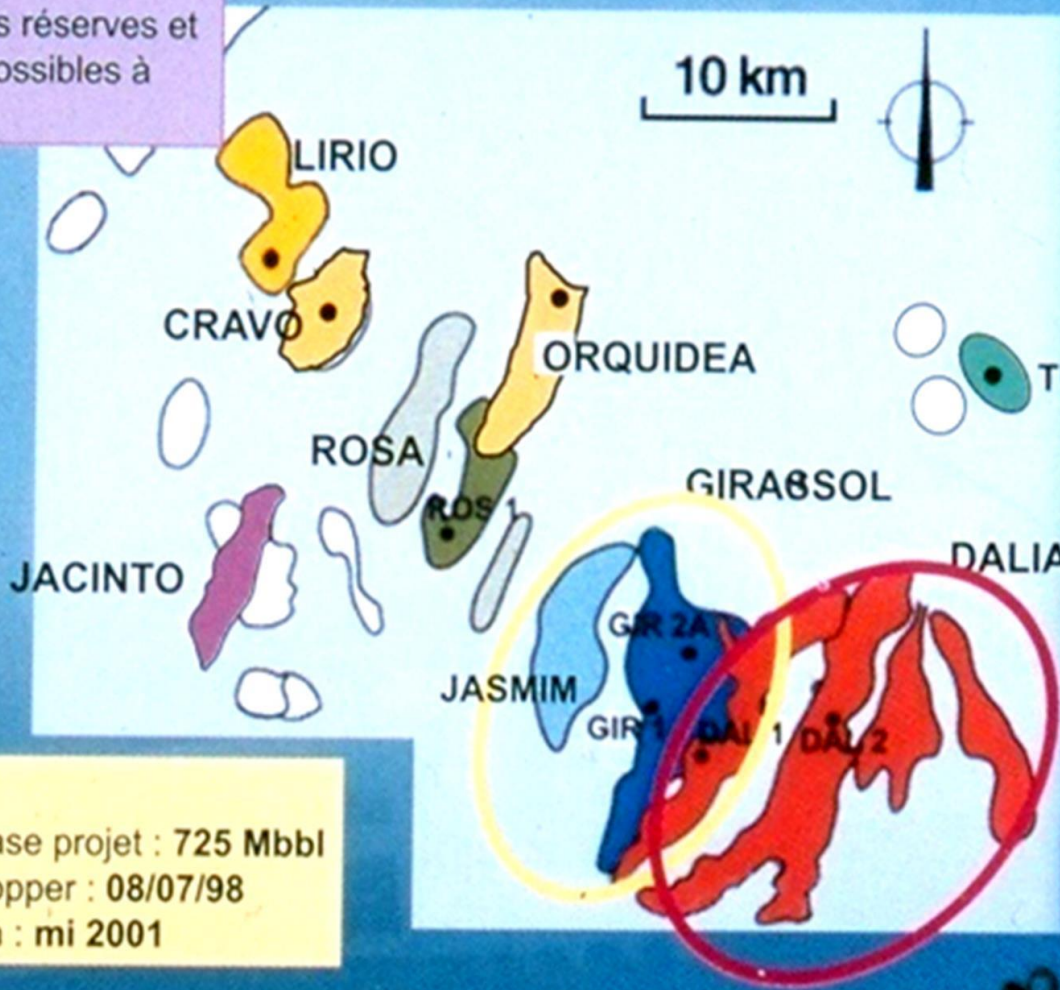




# 3 grands ensembles

## ROSA-LIRIO-CRAVO-ORQUIDEA,...

- Recensement des réserves et développements possibles à l'étude



## TULIPA

- zone prouvée à apprécier

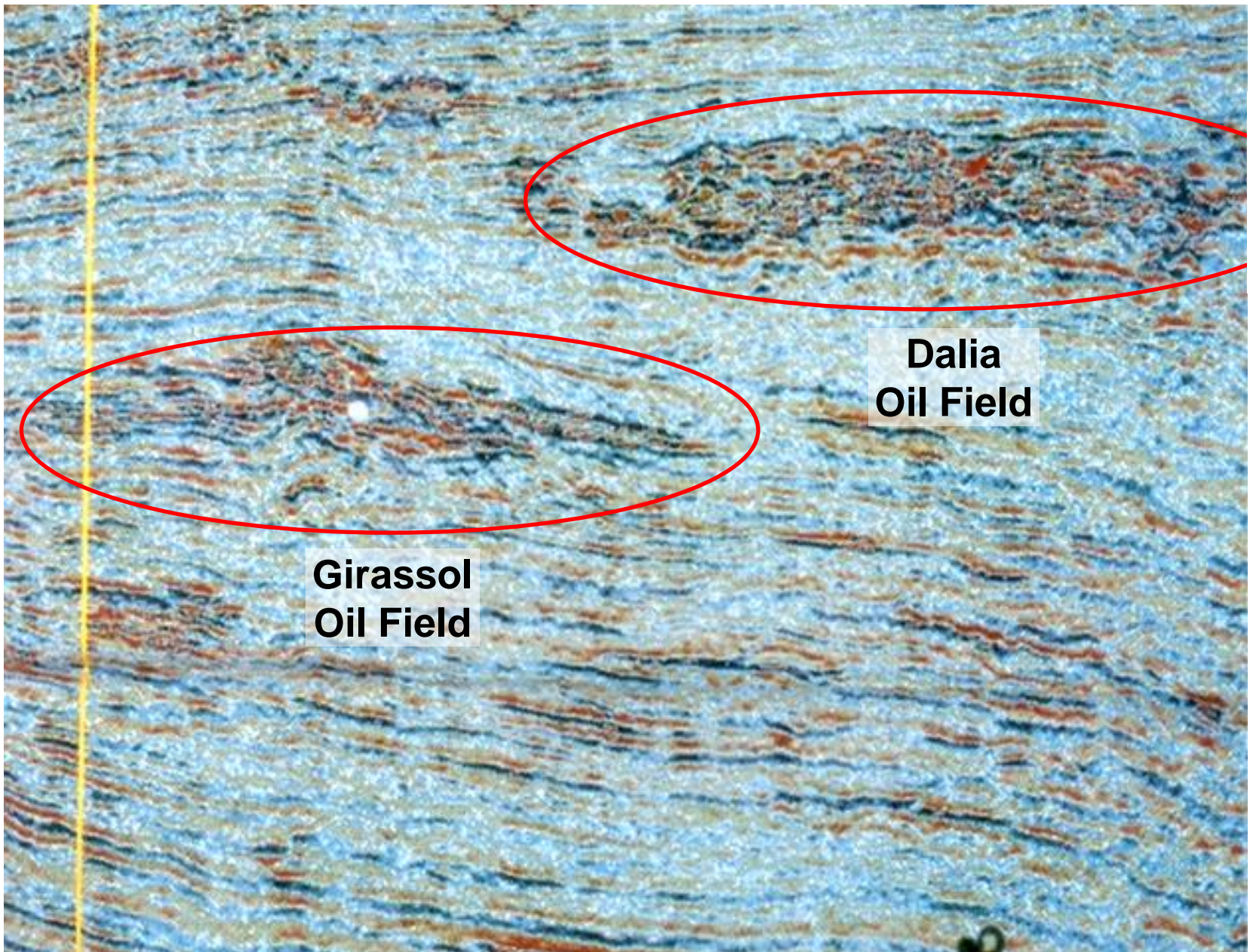
## GIRASSOL

- Réserves 1ère phase projet : 725 Mbbl
- Décision de développer : 08/07/98
- Mise en production : mi 2001

## DALIA

- Réserves 860 Mbbl
- Décision de développer : début 2001
- Mise en production : début 2004





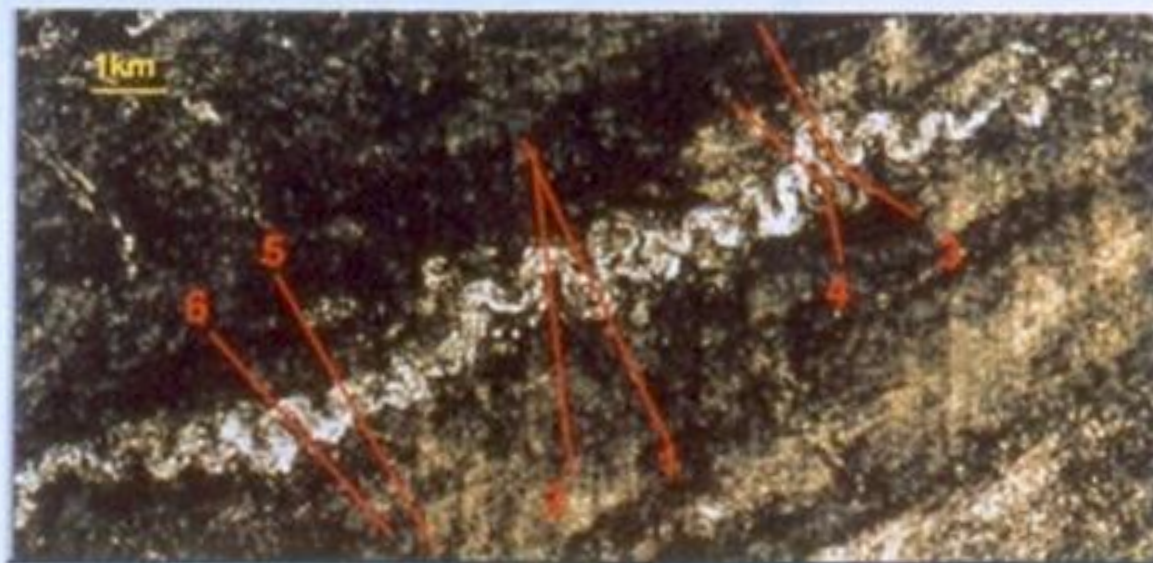
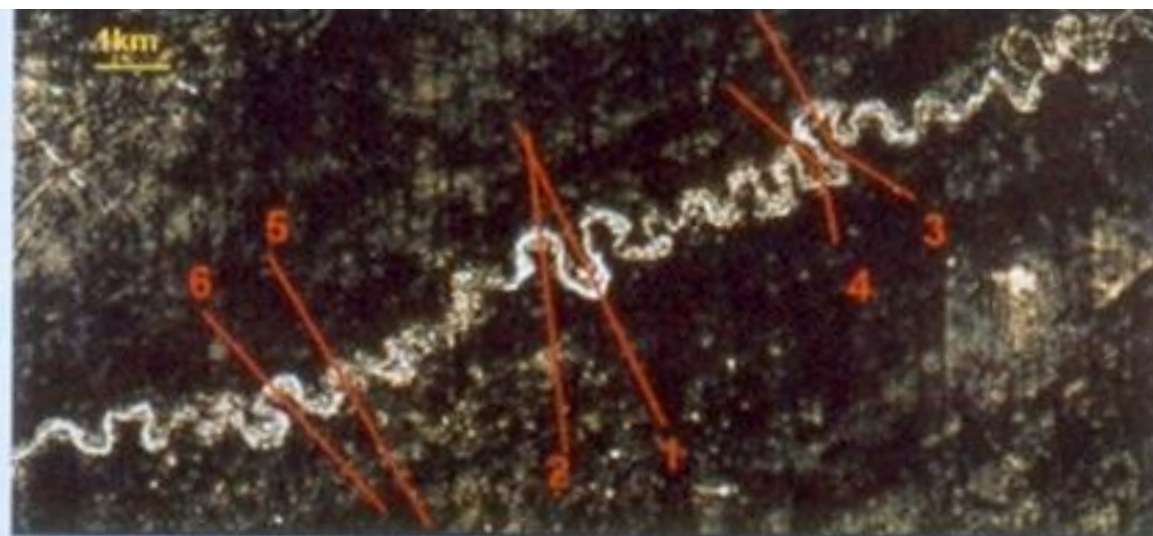
**Girassol  
Oil Field**

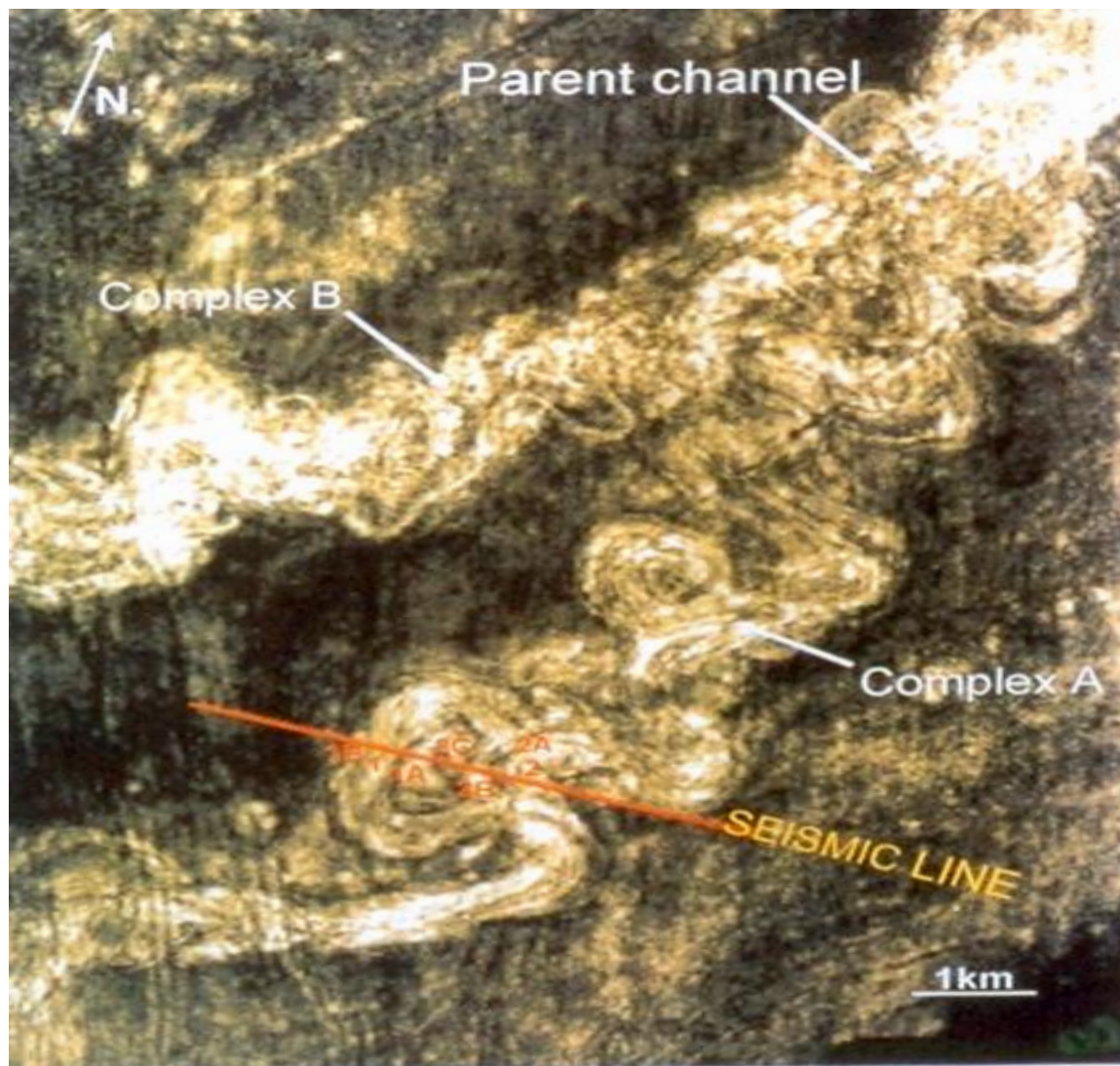
**Dalia  
Oil Field**



**Figure 5.** Average-amplitude displays in three intervals showing a simple, but highly sinuous channel form with at least one possible neck-cutoff loop.

(A) Deepest interval just below the H horizon, that is, 0 to +20 ms. (B) The first interval just above horizon H, that is, 0 to -20 ms. (C) The second interval above horizon H, that is, -20 to -40 ms. The width of the high-amplitude facies increases from the lower to upper intervals. Lines 1, 2, 3, 4, 5, and 6 are seismic sections shown in Figures 8-15.





© TFE Staff, AAPG 2001

**Figure 17.** Amplitude display of a composite interval (combining all four intervals shown in Figure 3) of complex sinuous-channel systems. Two sinuous channel complexes—complex A and complex B—both originating from a single parent channel, are shown. The parent channel first took the course of complex A and then avulsed to complex B. Features that resemble cutoffs are present in complex A. The sinuous loop that shows the seismic line (Figure 3) location is the focus of our article and is our complex sinuous channel example I in the text. The sinuous loop consists of crescent-shaped high-amplitude seismic facies 2, 2A, 2B, 2C, and 1 (1A, 1B), interpreted to be migratory channel courses (see Figure 18A).

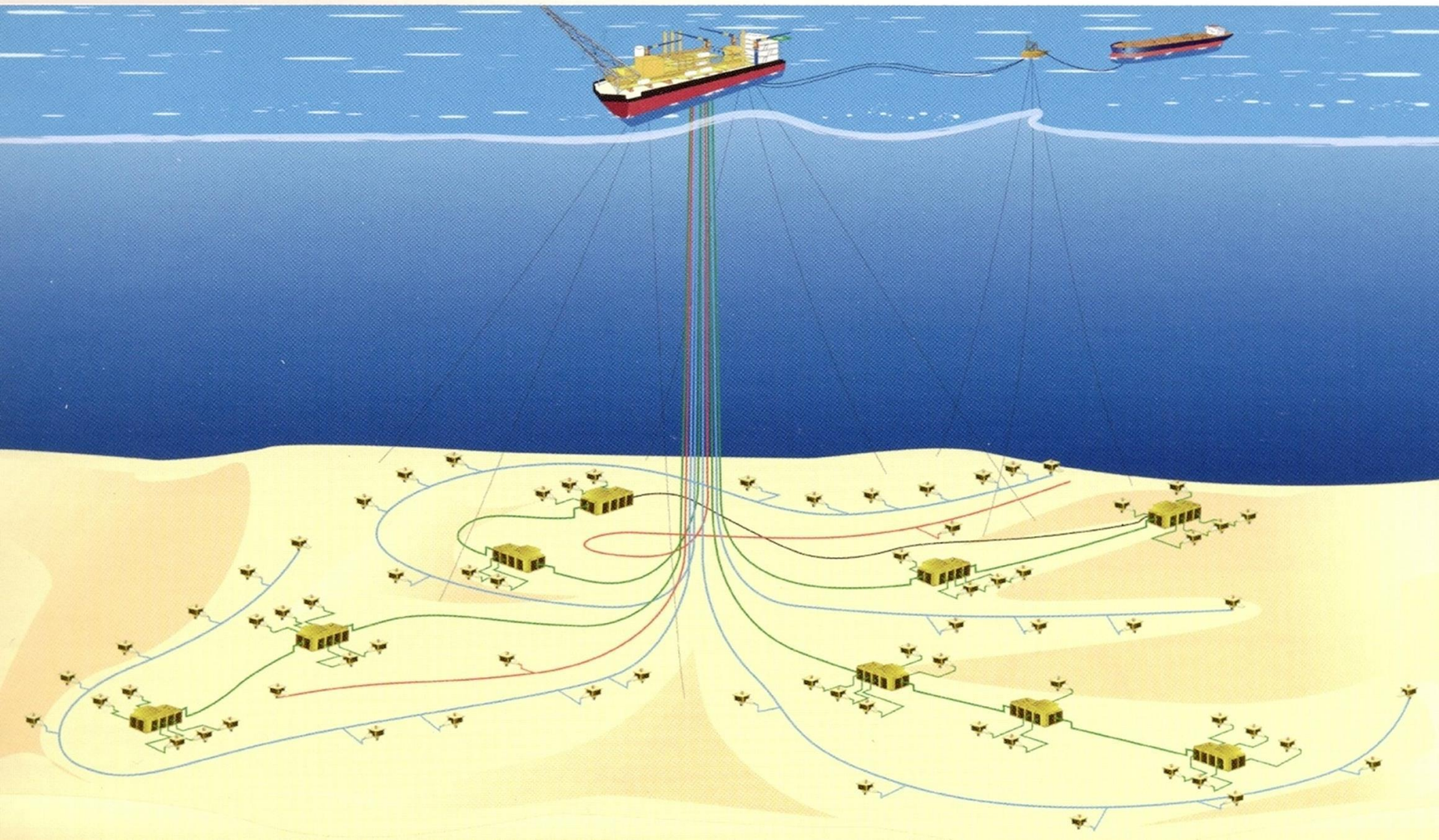


# Girassol Moves West





# TOTAL Deepwater Block 17, Girassol Oil Field





# TOTAL Deepwater Block 17, Dalia Oil Field

## OFFLOADING BUOY

Moored 2,100 metres from the FPSO  
Buoy Turret Loading system

## FPSO

Hull dimensions: 300 m x 60 m x 32 m  
Oil storage capacity: 2 million barrels  
Oil processing capacity: 240,000 barrels/day  
Water injection capacity: 405,000 barrels/day  
Water treatment capacity: 265,000 barrels/day  
Gas compression capacity: 8 million standard cubic m  
Total installed power capacity: 66 MW  
Weight of topsides: 29,400 tonnes (including 1-tub  
Living quarters capacity: 120 people and up to 19  
shut-downs  
Design working life: 20 years

## WORLD REFERENCE OFFSHORE DEVELOPMENT

scheme, designed to produce 240,000 barrels per day,  
ological as well as an economic challenge, requiring  
push a number of technologies to their very limits.

NEARLY  
**2,500 DAYS**  
INVOLVING 67 WELLS  
(21 WELLS REQUIRED BY FIRST)

**2 DRILLING  
RIGS**

## **BP Block 18 Deepwater Block:**

- **Block operator is BP (50%); partner is Sonangol Sinopec (50%)**
- **Area of block is 4900 sq km**
- **On production in 2008, has produced up to 220,000 BOPD**

Information source: GeoLuanda Conference, 2000 & SEG & other publications



## Stratigraphic View Spectral Decomposition RGB Overlay

reflects the 10 to 15 Hz amplitude  
sum at 50ms above the pick

green is the 15 to 25 Hz amplitude  
sum at 50ms above the pick

blue is the 25 to 45 Hz amplitude  
sum at 40ms above the pick



Images, data courtesy of Greg Partyka, BP Upstream Technology Group

A 3-D perspective view of a subsurface structure map, undeveloped offshore West Africa reservoir, draped with a 2-D spectral decomposition image. The reservoir is a sandy turbidite filling an erosional valley at a depth of about 3,100 meters. The draped image also conveys a 3-D perspective by showing three different slices through the reservoir section with different color bars (red, green and blue). Understanding the vertical stacking patterns of flow units is important for determining optimum drainage.



# BP Blk 18, Greater Plutonio





# BP Block 31 PSVM

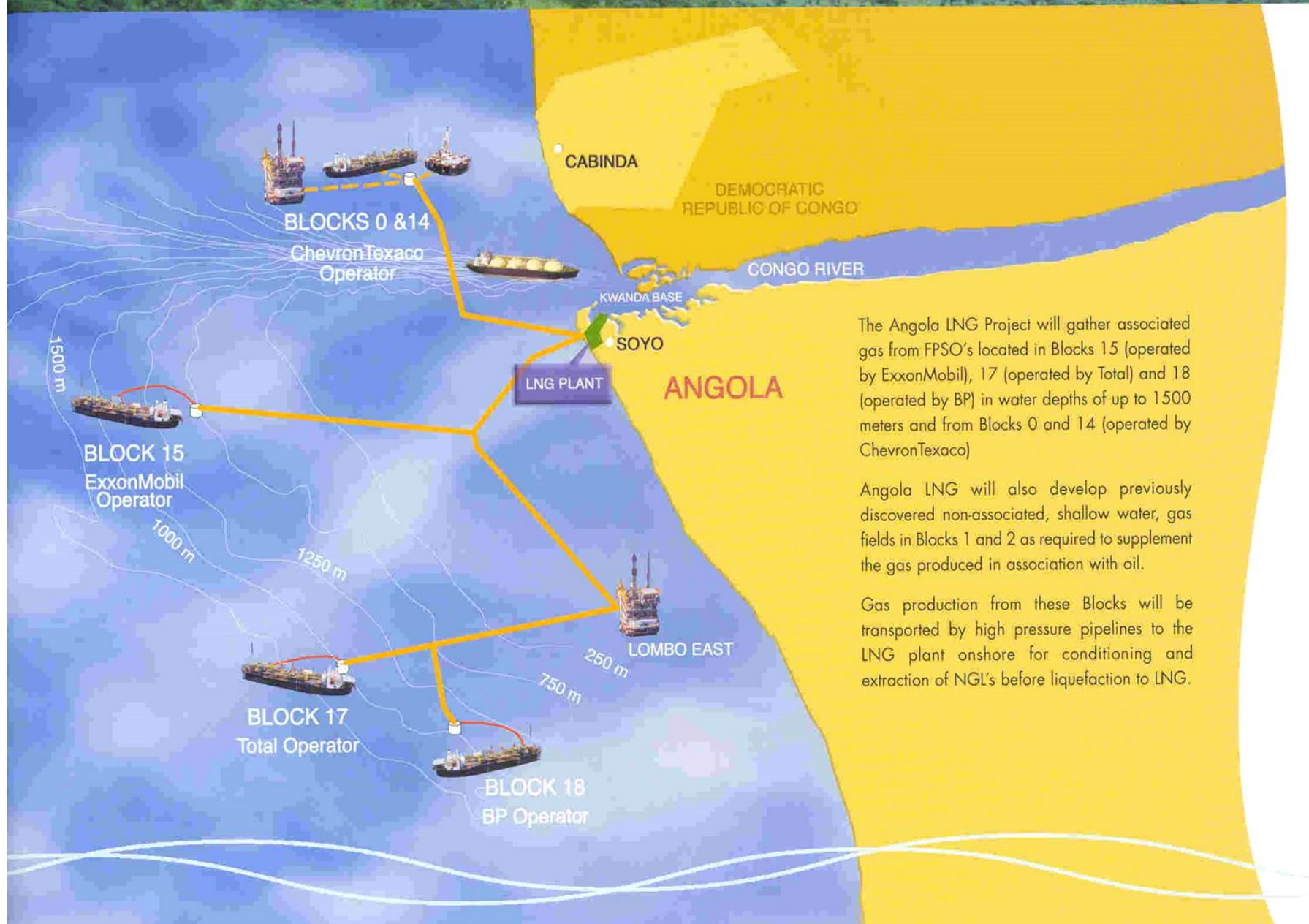


# Angola LNG Project

- **\$10.0 billion project constructed at Soyo, northern Angola**
- **Purpose is to monetize gas currently being flared**
- **Partners are Sonangol, Chevron, BP, Total and ENI**
- **Started production in July, 2013, goal is 5.2 million tons per year LNG mainly for USA markets, also 125 MMSCFG/D for industrial development in Soyo**



# OFFSHORE DEVELOPMENT





# Angola LNG Project





# Angola LNG Project





# Angola LNG Project

- **SIGNIFICANT ECONOMIC IMPACT!**
- **5.2 MMTonnes/year LNG is energy equivalent to 200,000 barrels of oil per day**
- **Angola currently producing 1,800,000 barrels of oil per day but with LNG it will be total of about 2,000,000 barrels of oil equivalent per day (BOEPD)**

# Angola LNG Project

- **A “win-win” mega-project**
- **Commercializes natural gas which previously was flared off**
- **Creates significant job opportunities for Angolans**
- **Creates secondary industries in the Soyo area, such as possible fertilizer plants, petrochemicals**

# PRE-SALT!!!

- BRAZIL

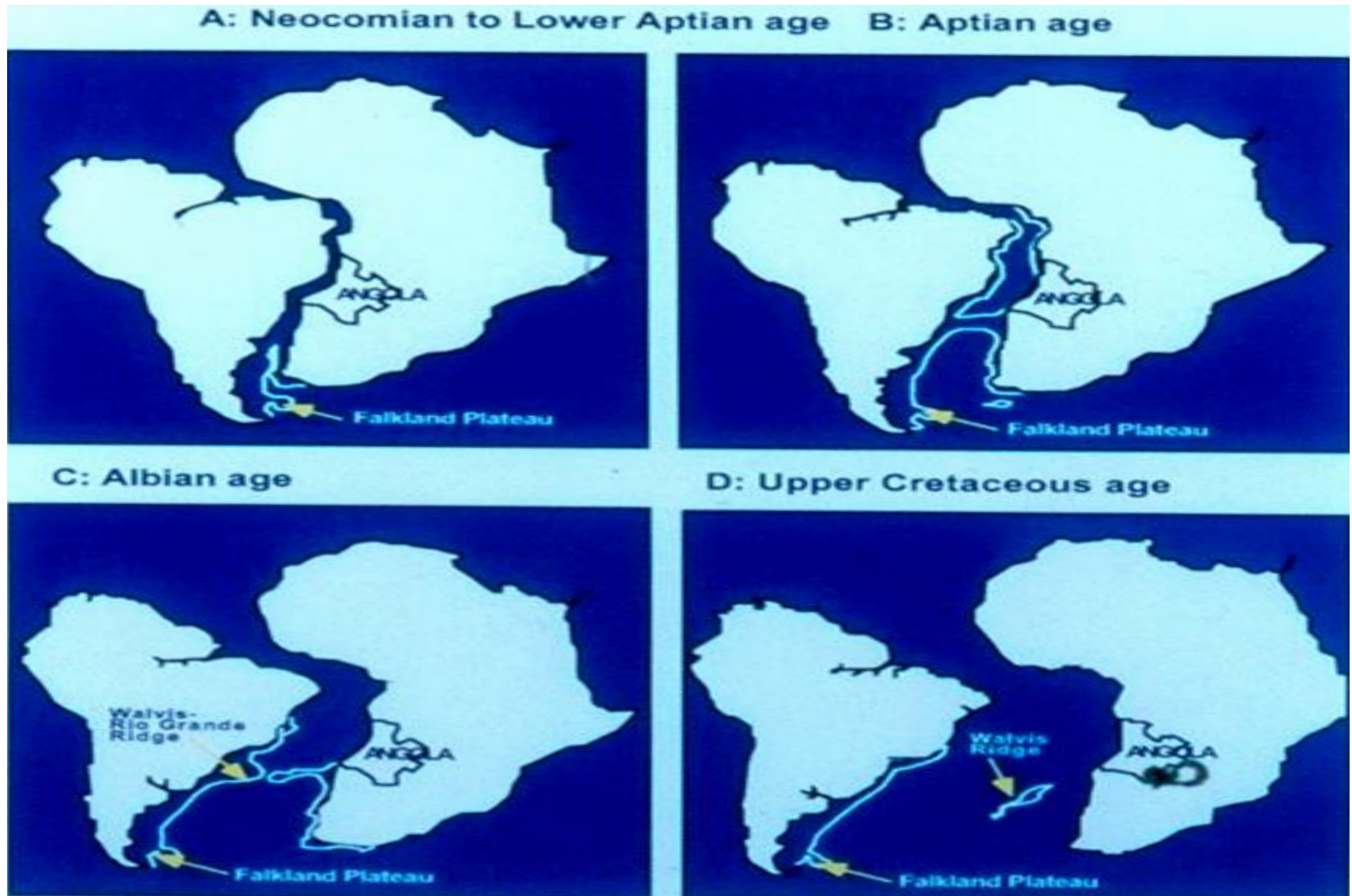
- ANGOLA



# Impact of Brazil's Recent Pre-Salt Mega- Oil Discoveries on Angola's Oil & Gas Potential

- Major world class pre-salt (sub-salt) oil and gas discoveries have been made since 2007 in the deepwater of Brazil
- Petrobras believe the pre-salt fields could be producing 2.0 MM BOPD by 2020, thereby doubling Brazil's oil production to about 4 MM BOPD; *already Brazil is producing 800,000 BOPD from the pre-salt*
- Brazil and Angola were contiguous (joined up) in Cretaceous time
- This play has been partially evaluated in the deepwater of Angola but needs more drilling

# Reconstruction of the South Atlantic Ocean Evolution



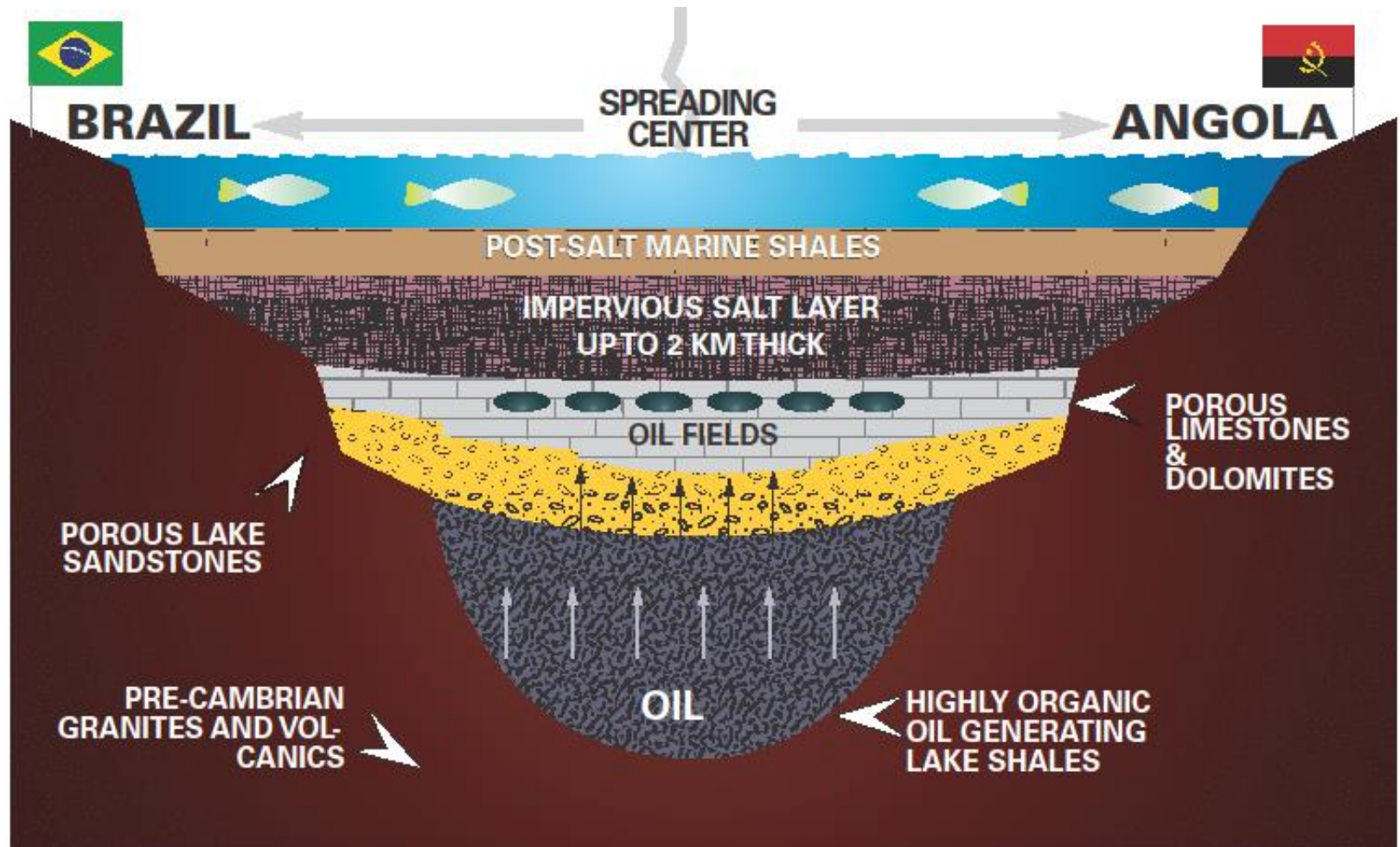




# Pre-Drift Reconstruction of S. America-Africa (124 MYBP)



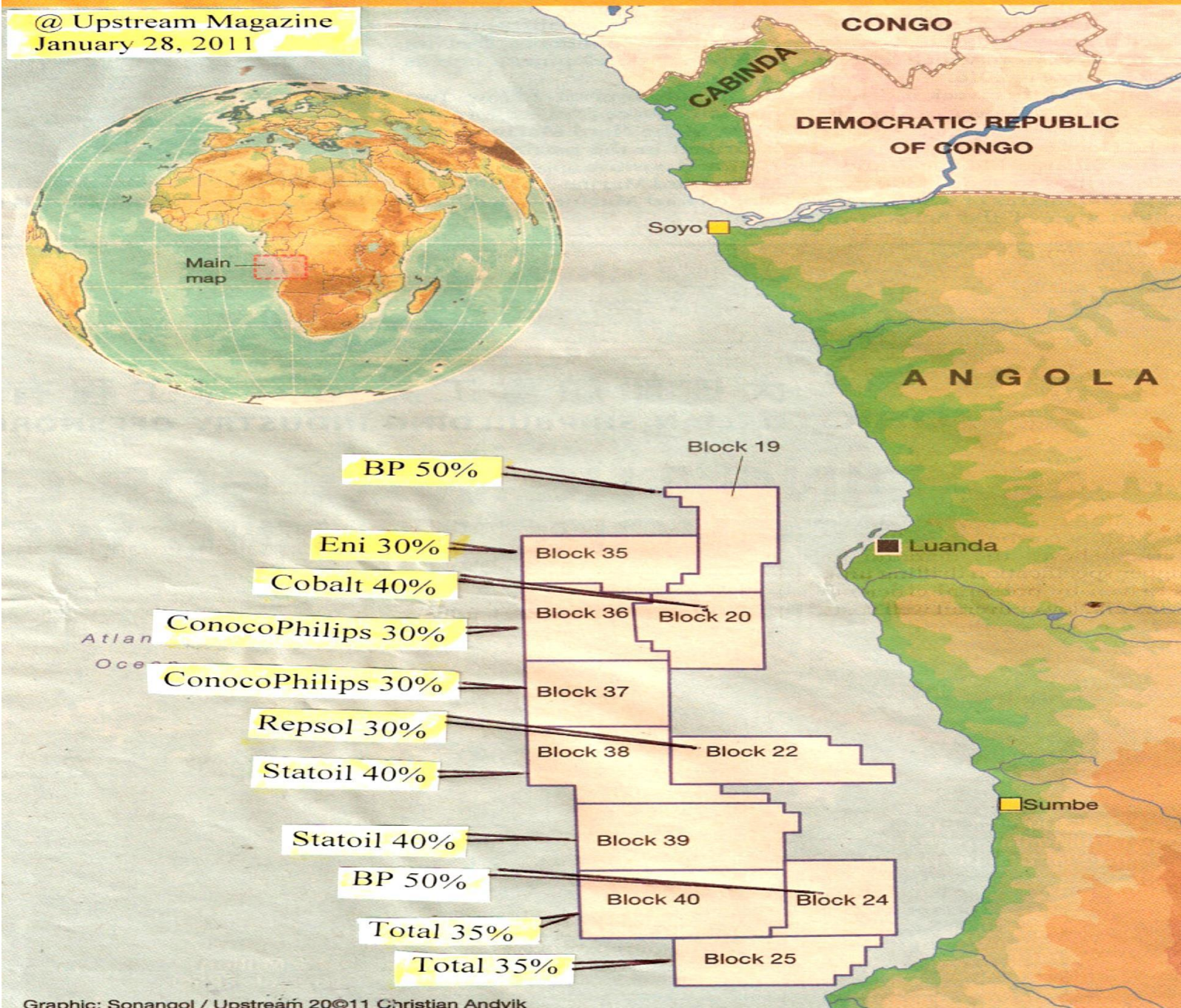
# Geology – Brazil vis-à-vis Angola





# ANGOLA PRE-SALT LICENCE AWARDS

@ Upstream Magazine  
January 28, 2011

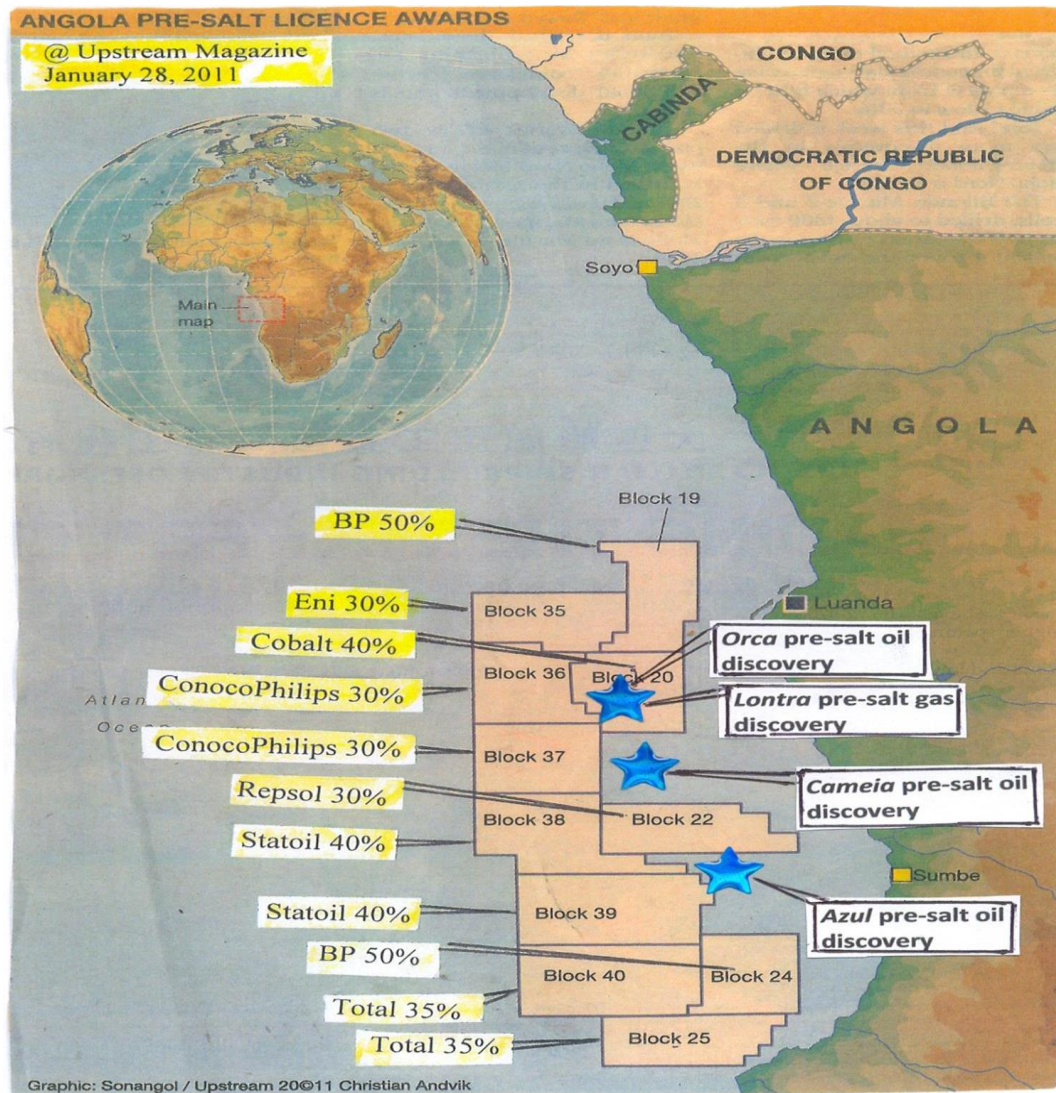




## Angola 2011 Bid Round – Award of Pre-salt Blocks

- All blocks are located in the deepwater Kwanza Basin
- Bid round was described as “*a historic event in Angola’s oil industry*”
- Operators include BP, ENI, ConocoPhillips, Cobalt, Repsol, Total, Statoil
- Blocks were officially awarded in December, 2011

# Kwanza Basin – Deepwater Drilling Results – Wells which Flowed Oil & Gas from the Pre-Salt



## **Publically Announced Info on Pre-salt Drilling – Maersk – Azul-1**

- January 14, 2012, MAERSK OIL announced that their first well on deepwater Block 23, AZUL-1 was “mini-tested” indicating a flow capacity of greater than 3000 BOPD; Maersk viewed the results as “encouraging”**
- Azul-1 was the first ever deepwater well targeting pre-salt reservoirs in the Kwanza Basin**
- Drilled in 920 meters water to a depth of 5330 meters**



## **Publically Announced Info on Pre-salt Drilling – Cobalt – Cameia-1**

- **February 9, 2012, COBALT announced that CAMEIA-1 drilled on Block 21 in 1680 meters (5500 feet) of water tested at 5010 barrels of oil per day from pre-salt carbonates**
- **360 meters (1180 feet) of gross pay of which 75% is net pay**
- **No gas/oil or oil/water contacts encountered**
- **Well has potential to produce at excess of 20,000 barrels of oil per day**

## **Publically Announced Info on Pre-salt Drilling – Cobalt – Lontra-1**

- **December 1, 2013, COBALT announced that LONTRA-1 was drilled on Block 20 to a depth of 4195 meters**
- **75 meters of net pay “in a very high quality reservoir section”**
- **Lontra-1 tested at 2500 barrels per day of condensate and 39 MMcfgpd; flow rates were restricted by the surface test facilities on the rig**
- **Press reports: 2.2 – 3.8 TCF gas or 900 MMBOE**

## **Publically Announced Info on Pre-salt Drilling – Cobalt – Orca-1**

- May 9, 2014, COBALT announced that ORCA-1 was drilled on Block 20 to a depth of 3872 meters**
- 76 meters of net pay “in excellent reservoir quality section”**
- Orca-1 tested at 3700 barrels pol per day of and 16.3 MMcfgpd; flow rates were restricted by the surface test facilities on the rig**
- Cobalt reports a resource range of 400 to 700 million barrels of oil**



## **Publically Announced Info on Pre-salt Drilling – ConocoPhillips**

- **April 23, 2015, CONOCOPHILLIPS announced that the OMOSI-1 deepwater exploration well in Block 37 was drilled to a total depth of 20,666 feet (6298 m).**
- **A gas column of approximately 525 feet (160 m) was encountered in the primary objective reservoir.**
- **No further activity is planned.**
- **The well has been plugged and abandoned.**

# The “Angola Advantage” – Oil & Gas Industry

- *One of the world’s most exciting countries for oil & gas activities, huge progress in past century*
- **World class geology**
- **Benign operating environment (no icebergs, hurricanes, high seas)**
- **Subsurface drilling is not difficult, e.g., no major overpressuring problems, etc**
- **Contractual stability due to political stability (government has been led by MPLA since independence in 1975)**

# CONCLUSIONS

- **After a century of exploration and production, significant undiscovered oil and gas resources remain to be found in Angola in the extension westwards of the Tertiary turbidites deepwater play**
- **The deepwater pre-salt Kwanza Basin play is not as big as Brazil's, but more drilling is needed**
- **Many opportunities are available for companies willing to invest and be active for the *long term***



# Angola

Obrigado!

Thank You!

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