



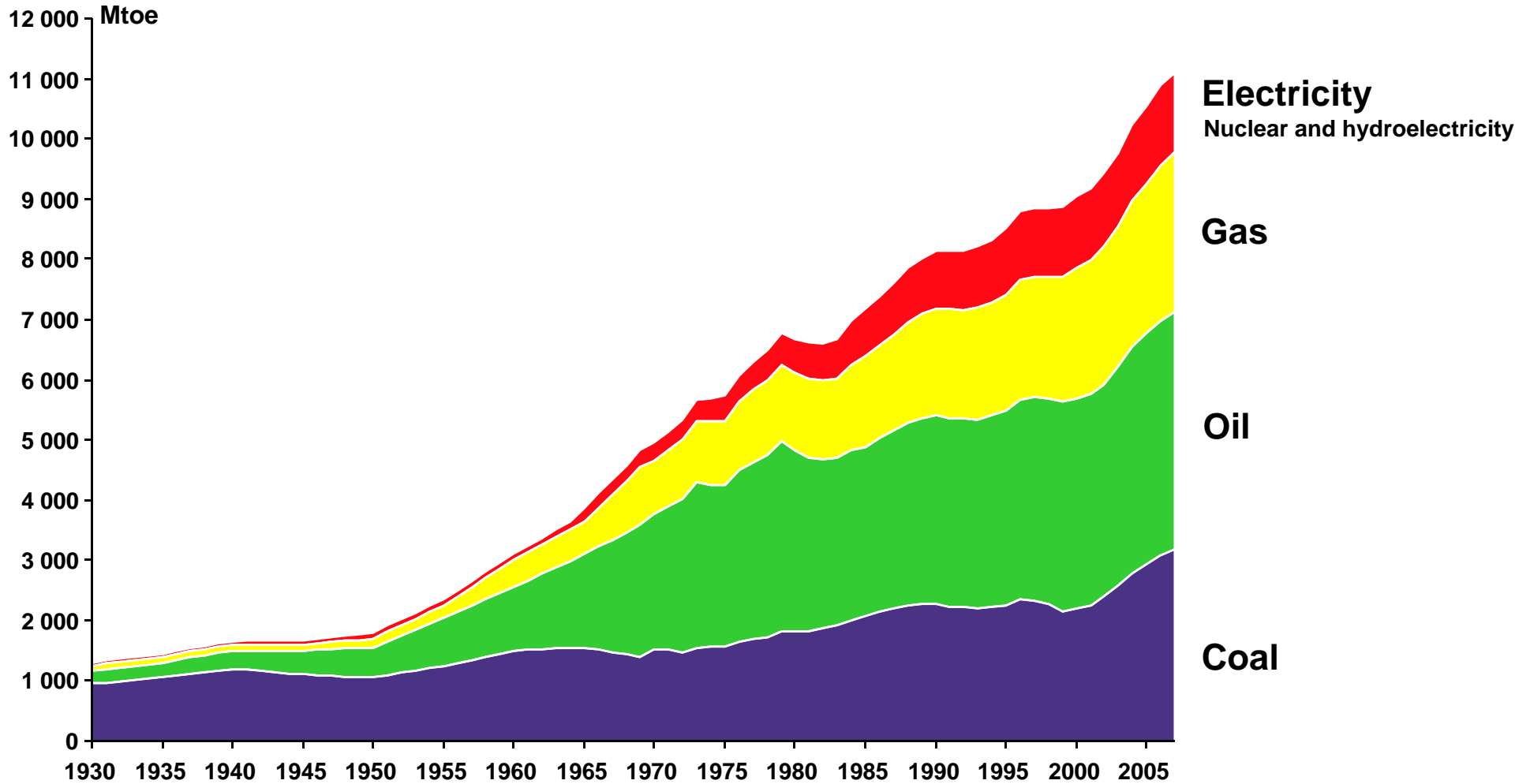
Energy in the World and in Africa

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Director, Advisor
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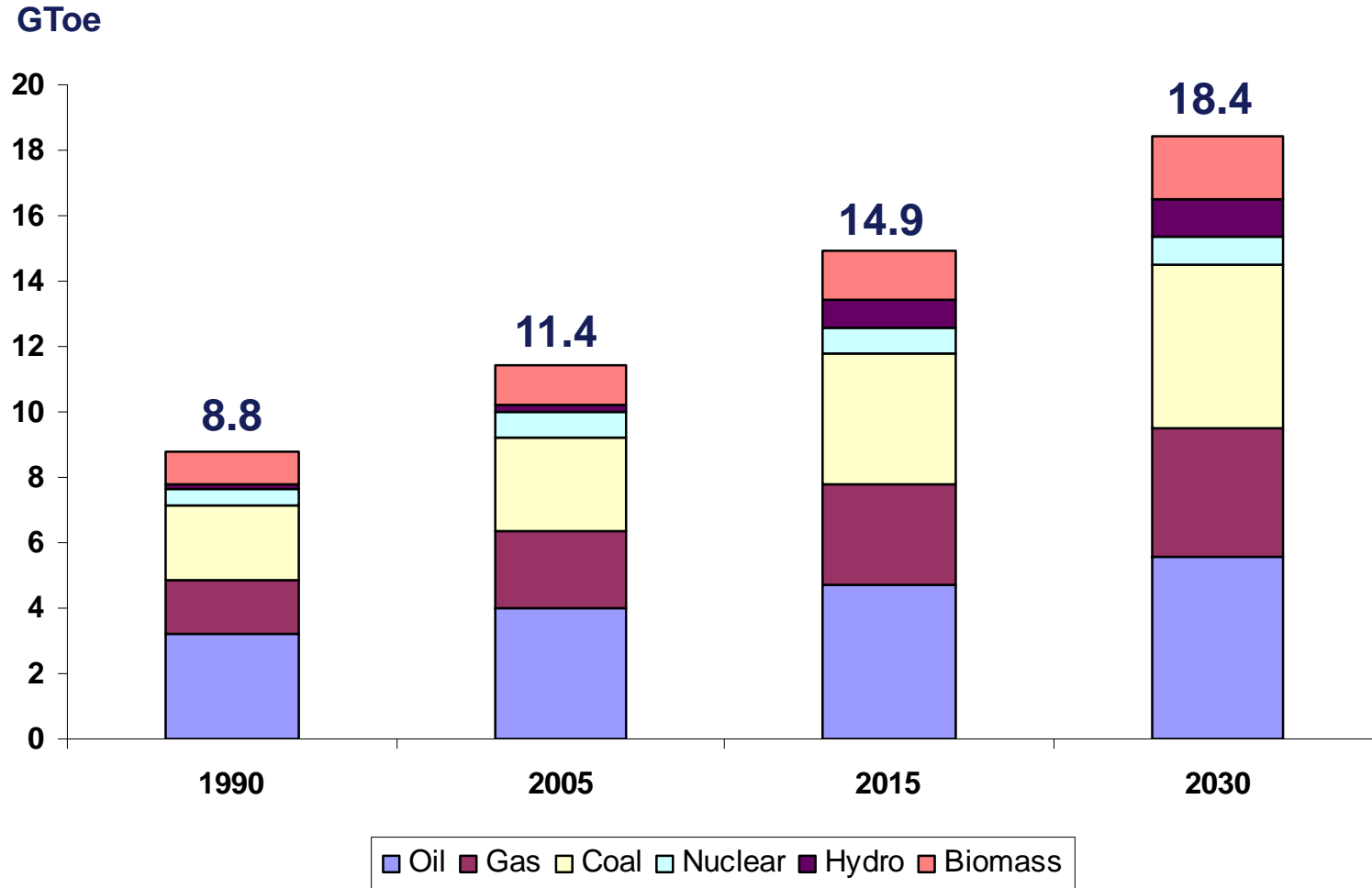
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Conference on Energy in Southern Africa
Johannesburg – November 13

World commercial primary energy consumption

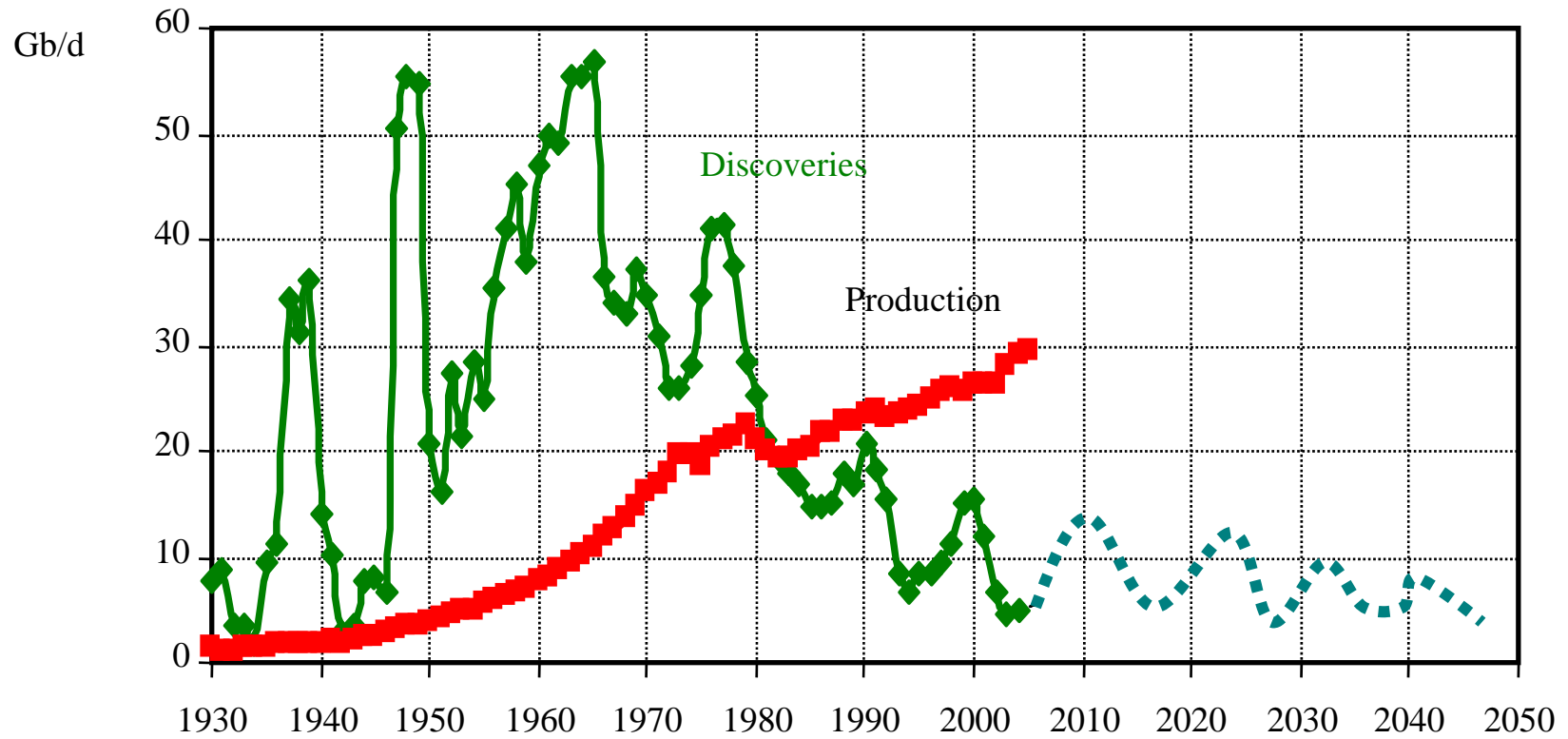


	Energy consumption (Mtoe)	Population (M)	Energy consumption (toe/ per cap)
North America	2 838	447	6,4
South & Central America	553	451	1,2
Western Europe	1 952	476	4,1
CIS + Eastern Europe	1 035	331	3,1
Africa	345	934	0,4
Middle East	574	171	3,3
OECD Asia	488	201	4,4
Non OECD Asia	3 314	3 572	0,8
WORLD TOTAL	11 099	6 584	1,7



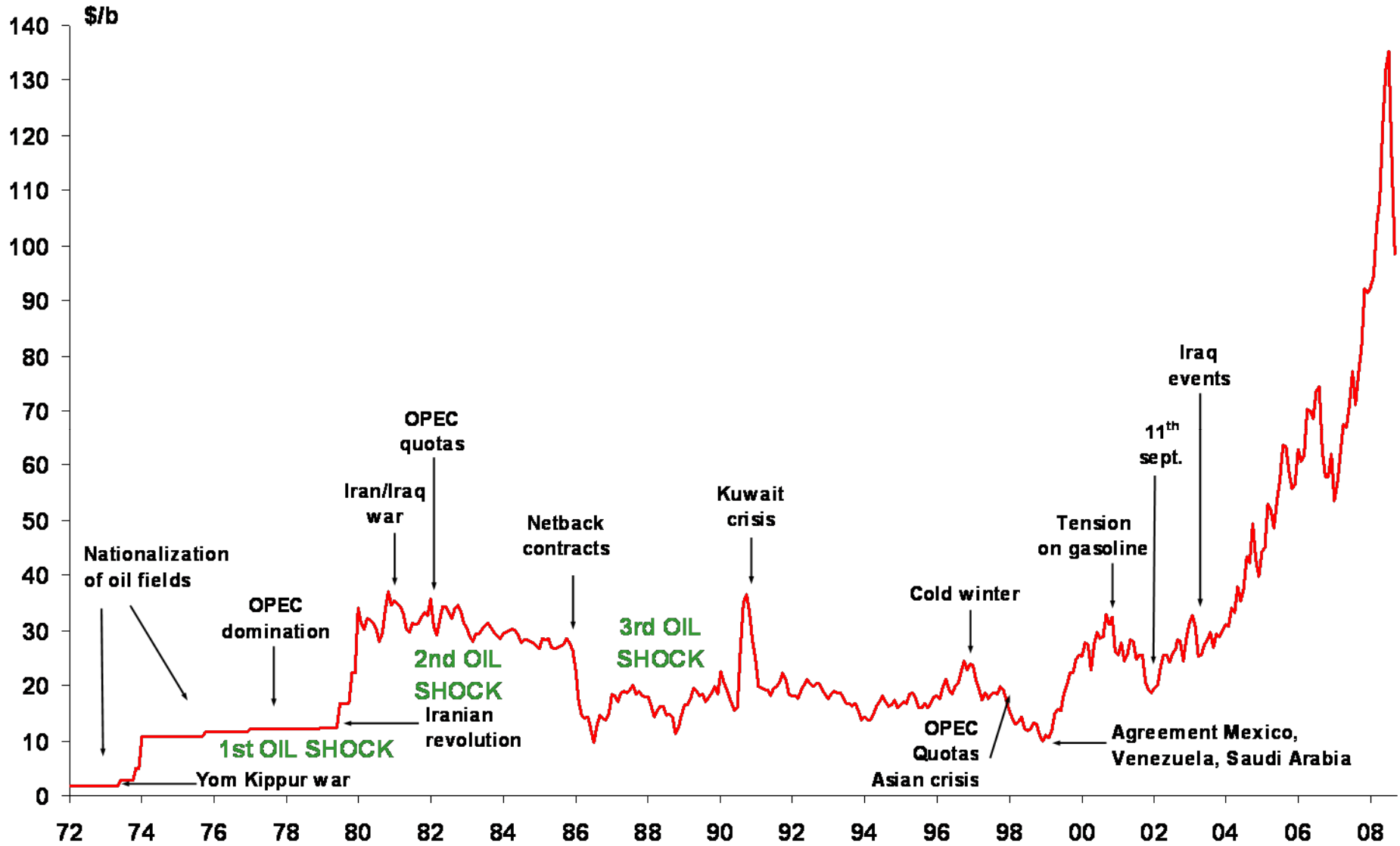
Btoe (10 ⁹ toe)			2050		
	1960	2007	A1	B	C1
Oil	1,0	4,0	7,9	4,0	2,7
Gas	0,4	2,6	4,7	4,5	3,9
Coal	1,3	3,2	3,8	4,1	1,5
Nuclear	0,0	0,6	2,9	2,7	0,5
SUB TOTAL	2,7	10,4	19,3	15,3	8,6
Renewables	0,6	2,2	5,5	4,5	5,6
TOTAL	3,3	12,6	24,8	19,8	14,2

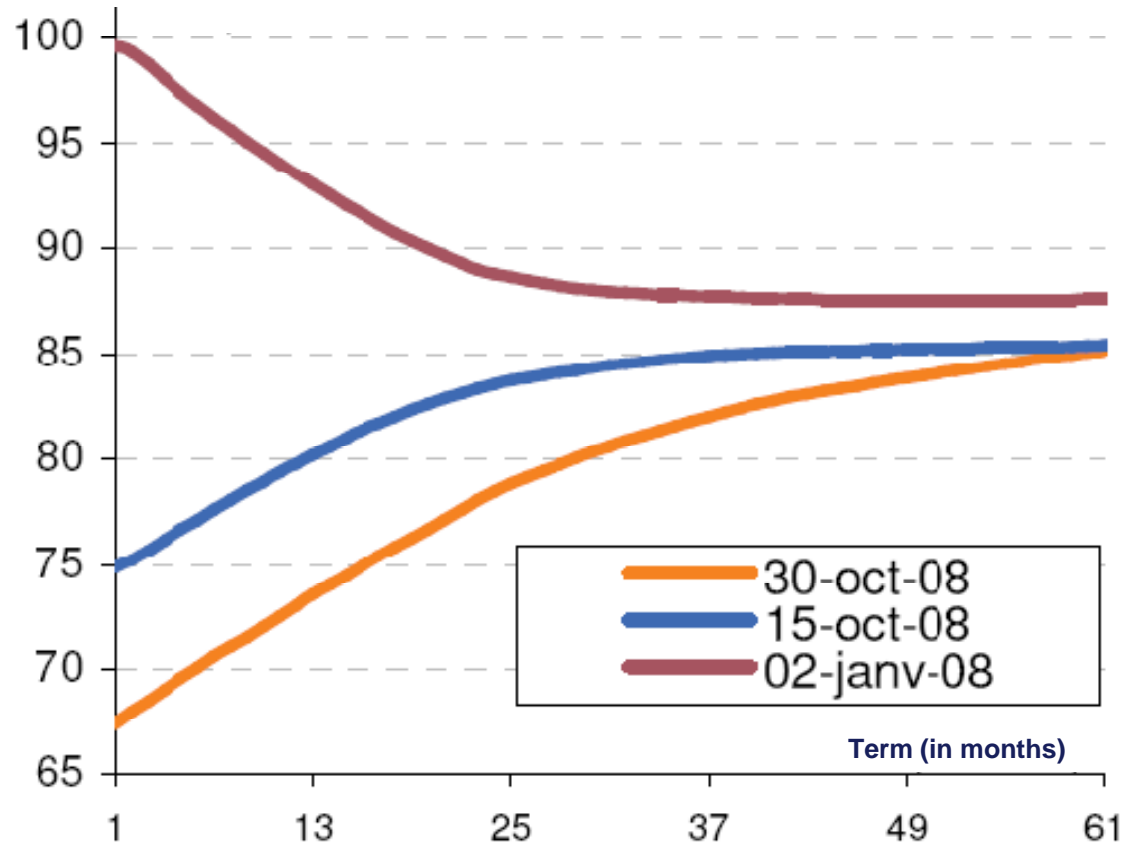
Oil discoveries and production since 1930

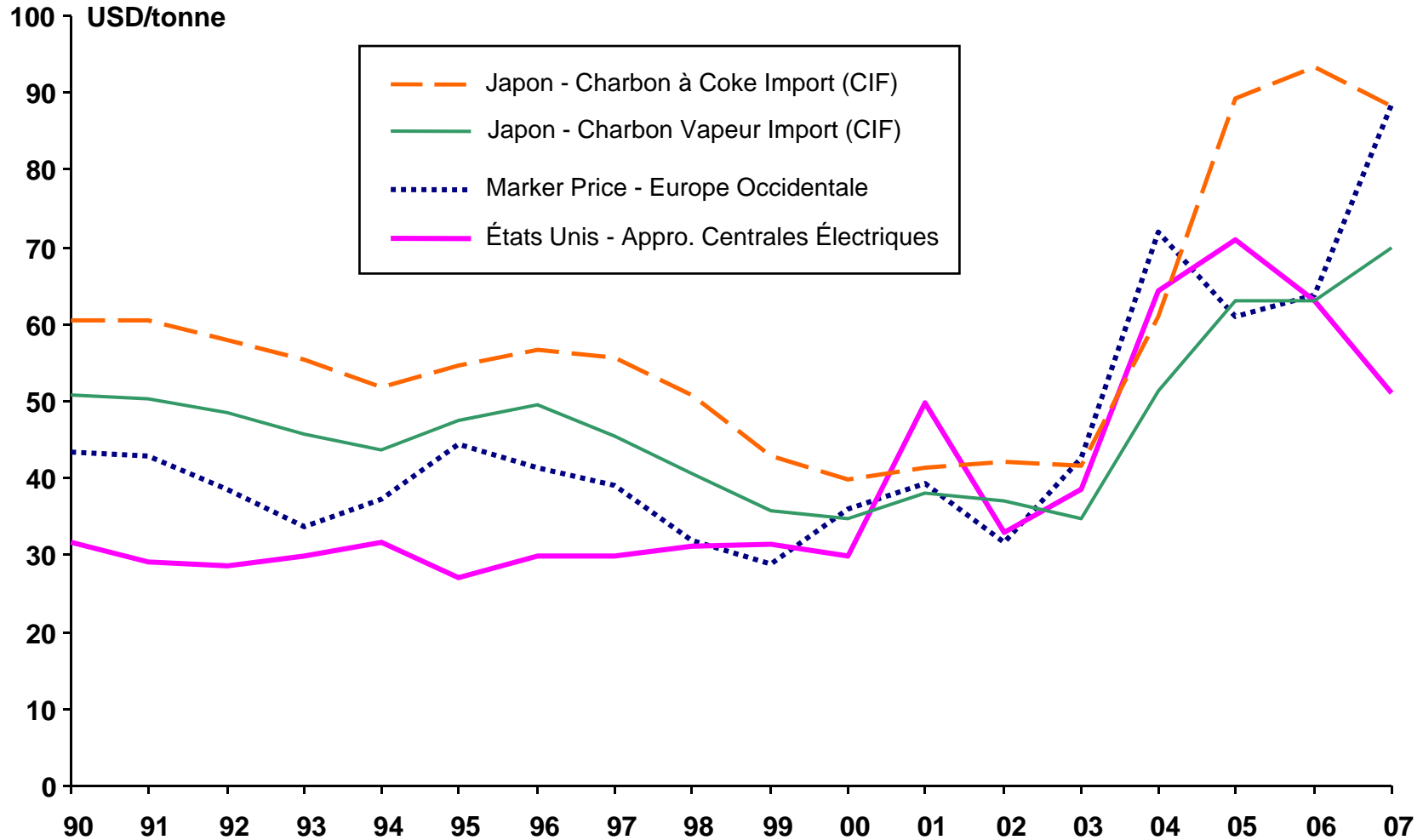




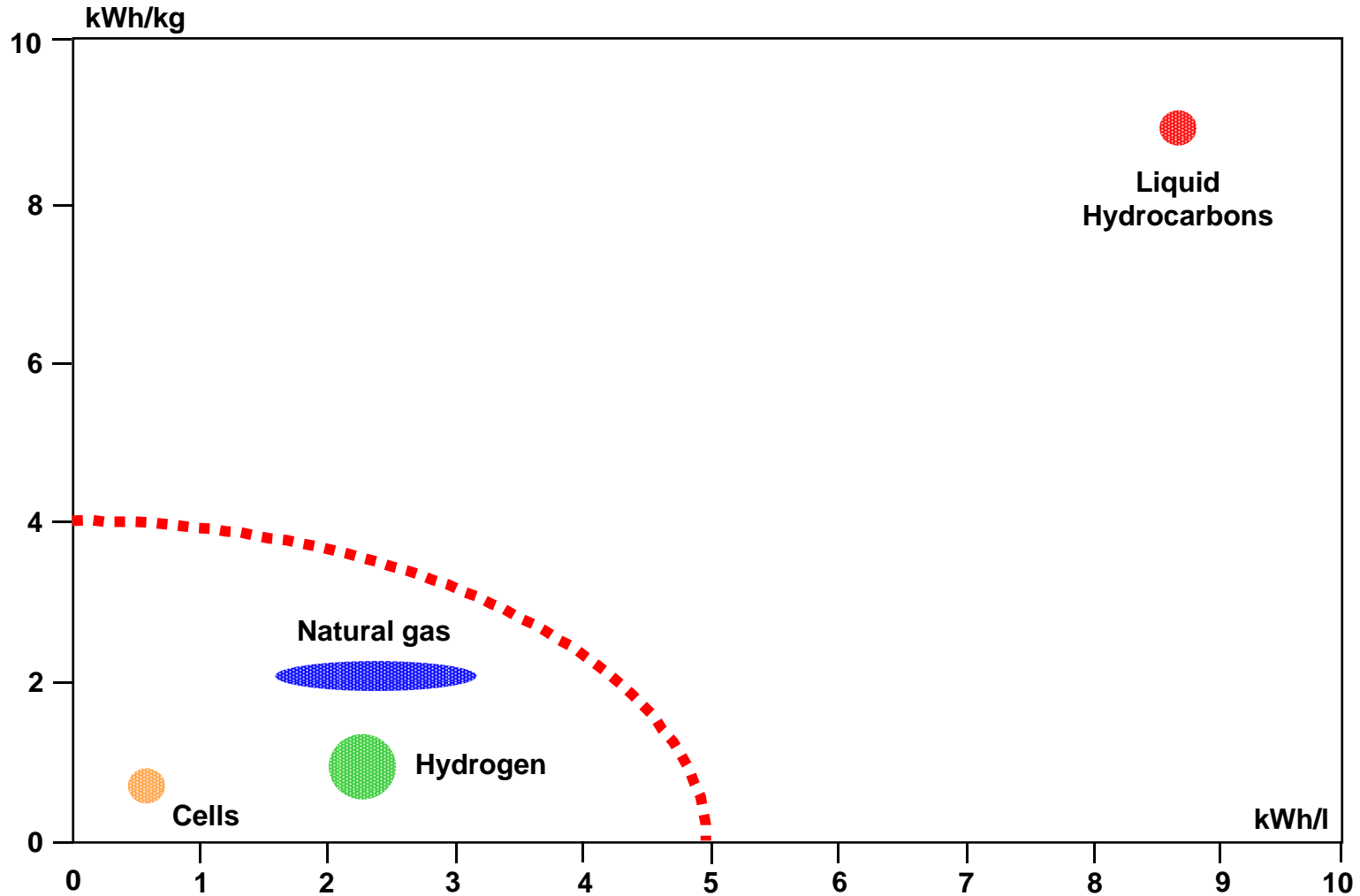
Energy price

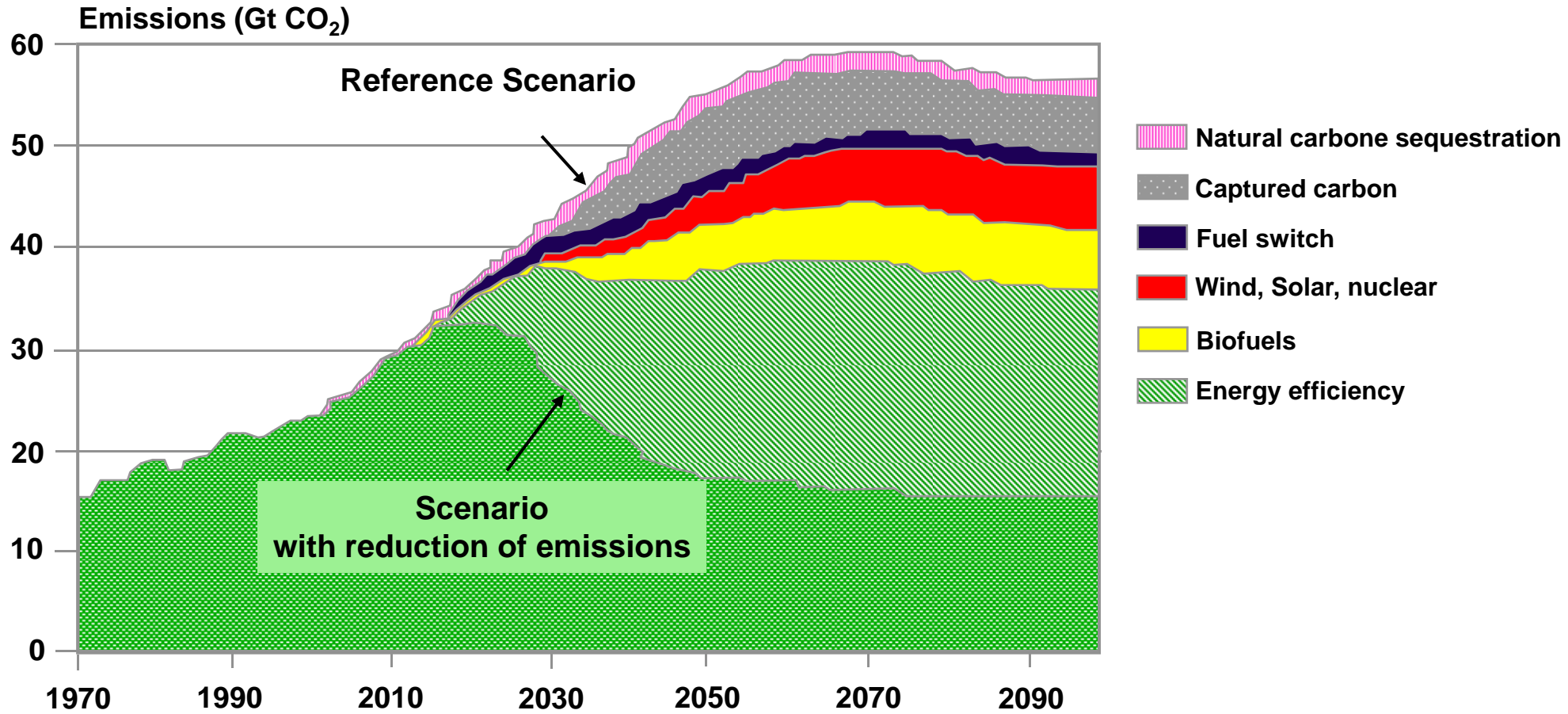






Liquid hydrocarbons : A cutting edge energetic intensity







Energy in Africa

Jean-Pierre FAVENNEC

Director

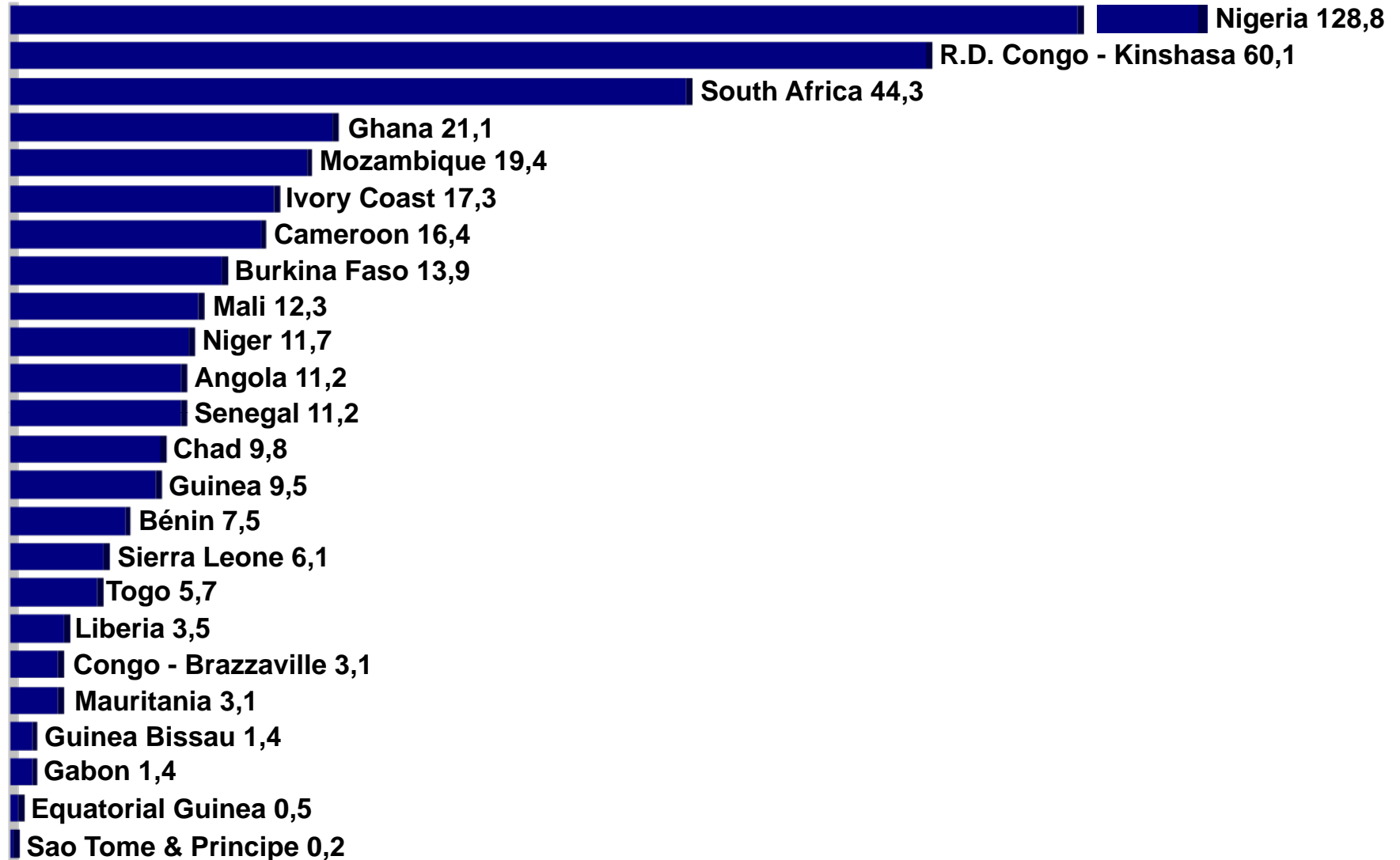
Advisor

IFP - School



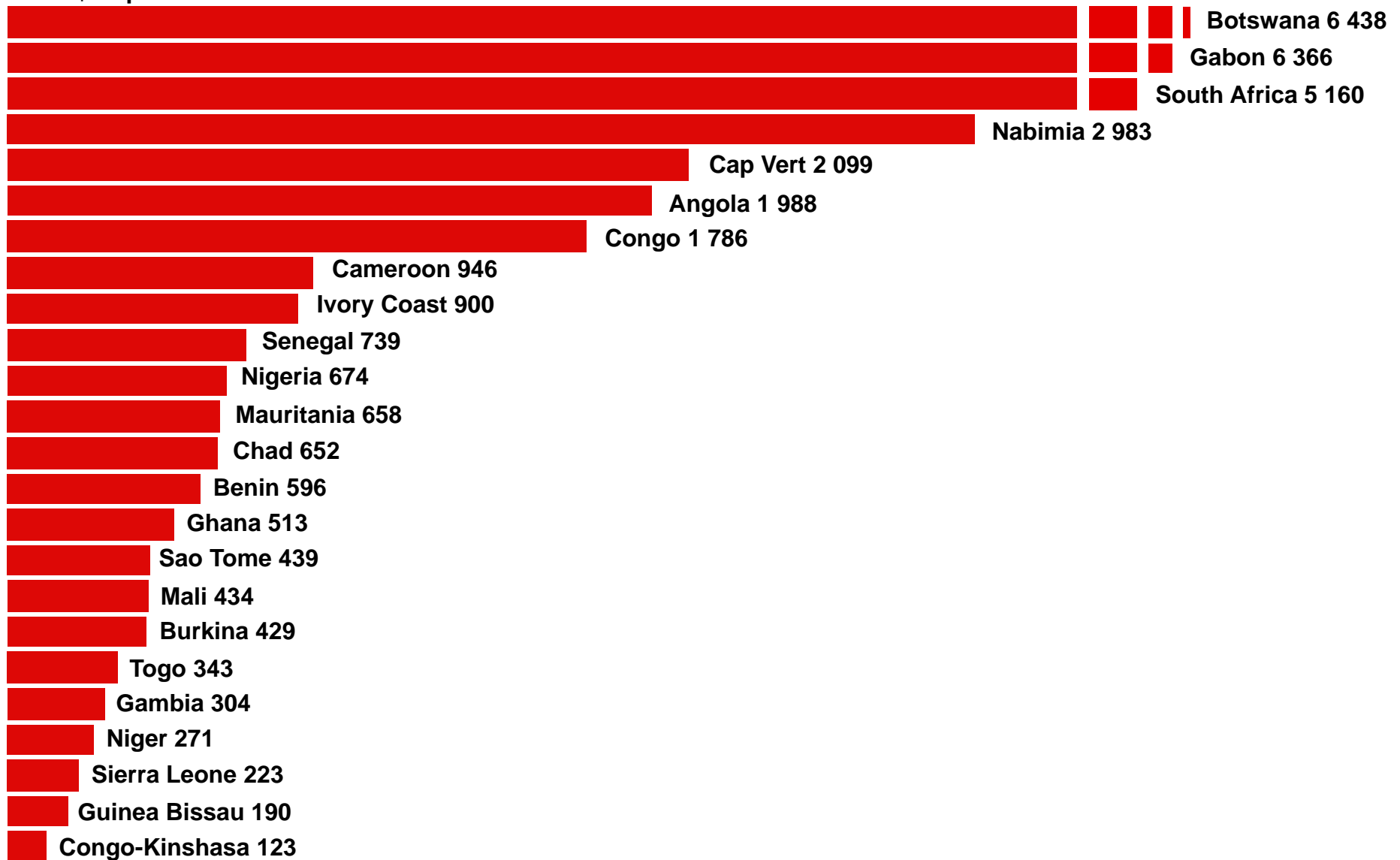
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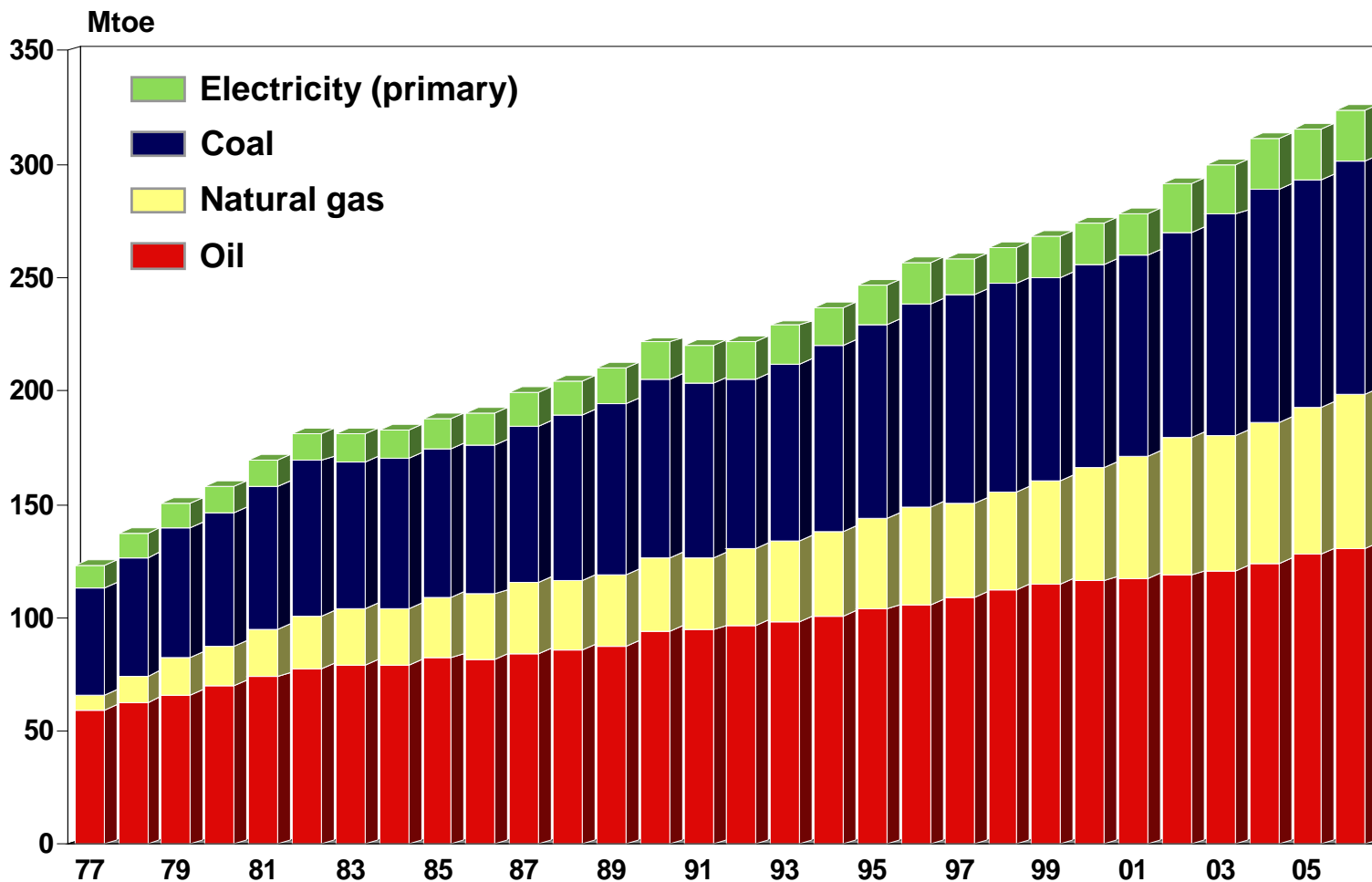
Million inhabitants in 2005



GDP per capita in some african countries in 2005

\$/Cap.



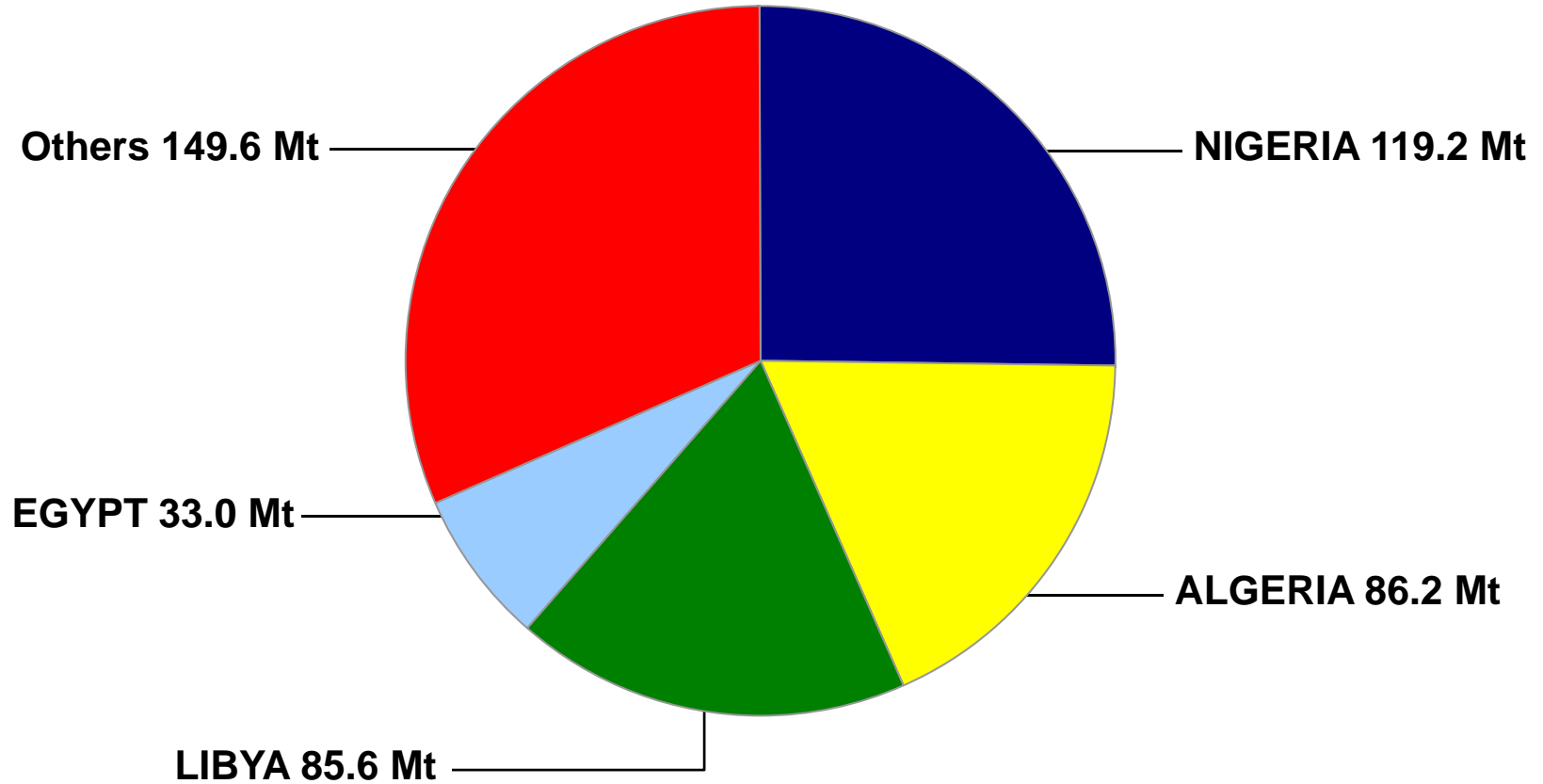


Oil proven reserves in Africa 1st January 2008 (Mbbbl)

Libya	41 646
Nigeria	36 220
Congo Brazzaville	16 000
Algeria	12 200
Angola	9 035
Sudan	5 000
Egypt	3 700
Gabon	2 000
Chad	1 500
Equatorial Guinea	1 100
Tunisia	400
Cameroon	200
Congo Kinshasa	180
Ivory Coast	100
Mauritania	100
Ghana	15
South Africa	15
Benin	8
Morocco	1

Nigeria	108,4
Libya	85,0
Angola	84,8
Algeria	66,8
Egypt	31,9
Sudan	23,6
Equatorial Guinea	16,0
Congo Kinshasa	12,0
Gabon	11,5
Chad	7,5
Tunisia	4,6
Cameroon	4,2
Ivory Coast	1,5
Mauritania	1,3
Congo Brazzaville	1,0
South Africa	1,0
Ghana	0,3

473.7 Mt in 2006



Share of hydrocarbons in the economy of african countries 2006

Country	% of GDP	% of exports	% of revenues
ANGOLA	56	94	83
CAMEROON	8	47	20
CONGO	64	85	82
GABON	51	80	63
NIGERIA	39	90	82
EQUAT. GUINEA	92	97	88
ALGERIA	30	97	60
LIBYA	50	95	60
EGYPT	4	40	10

- **Countries in (long term) decline**
 - Cameroon, Congo (formerly Zaire), Gabon

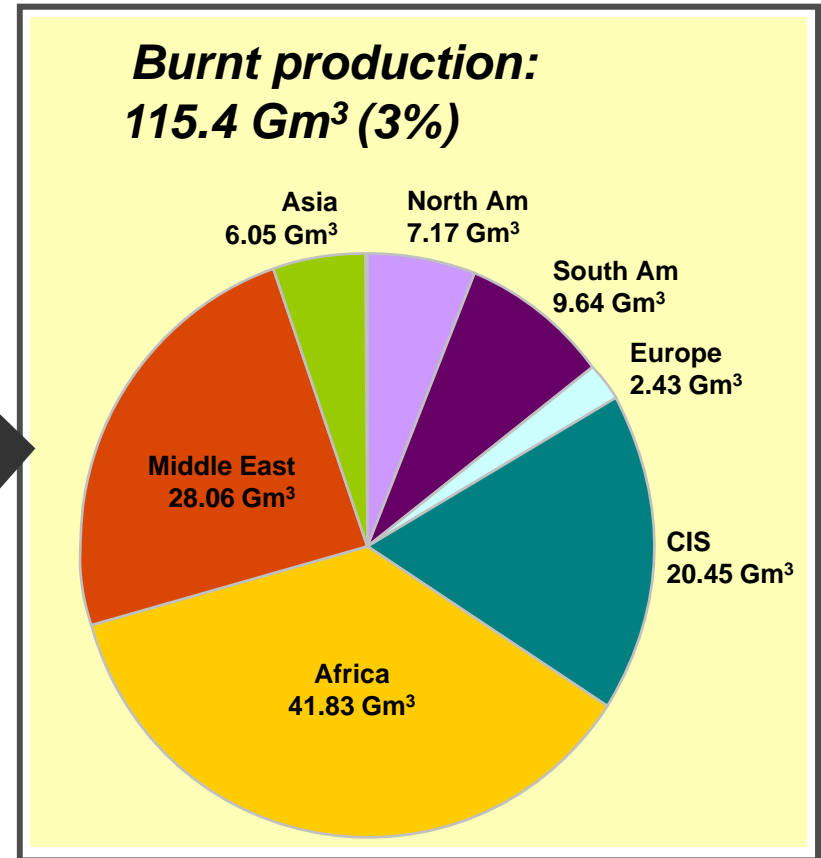
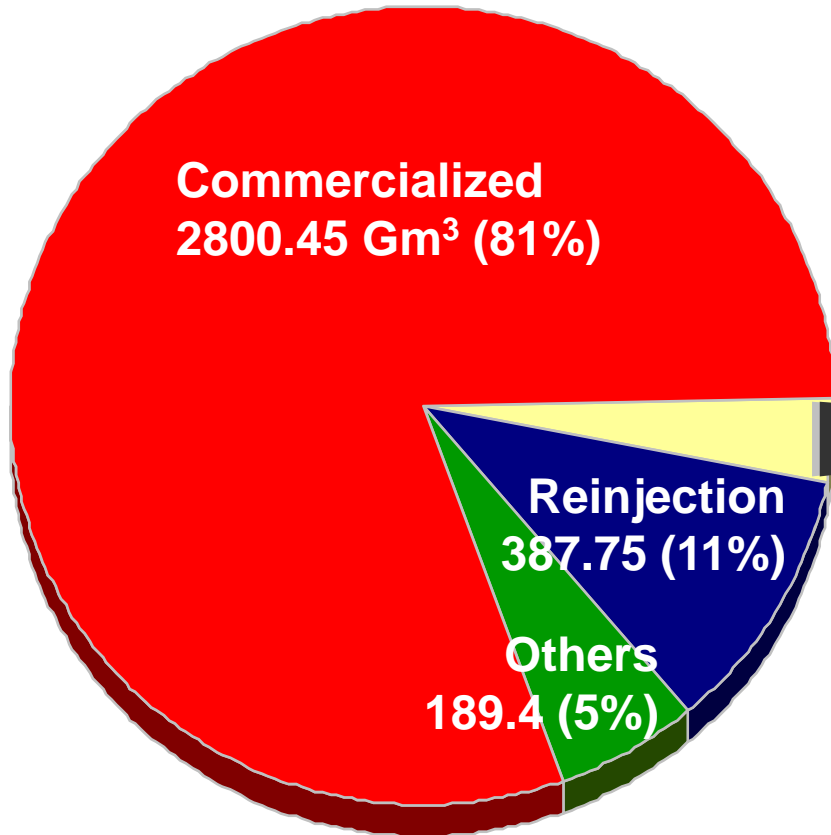
- **Countries that have reversed their decline**
 - Congo-Brazzaville

- **Countries where output is increasing**
 - Angola , Equatorial Guinea , Ivory Coast, Nigeria, Algeria, Libya

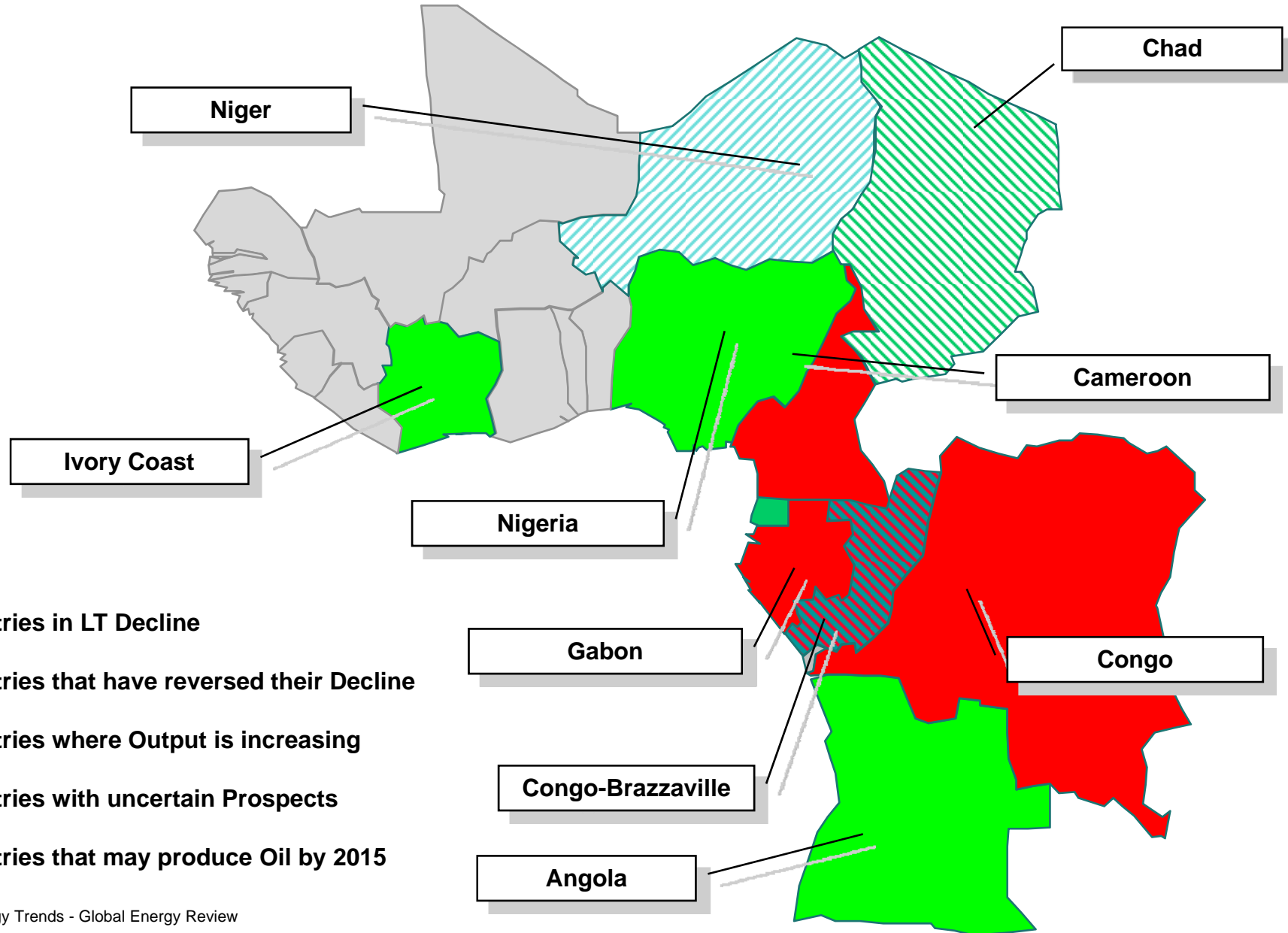
- **Countries with uncertain prospects**
 - Chad

- **Countries that may produce oil by 2015**
 - non-producing countries that are attracting attention from IOCs :
Niger & Sao Tome e Principe

Total production: 3493 Gm³

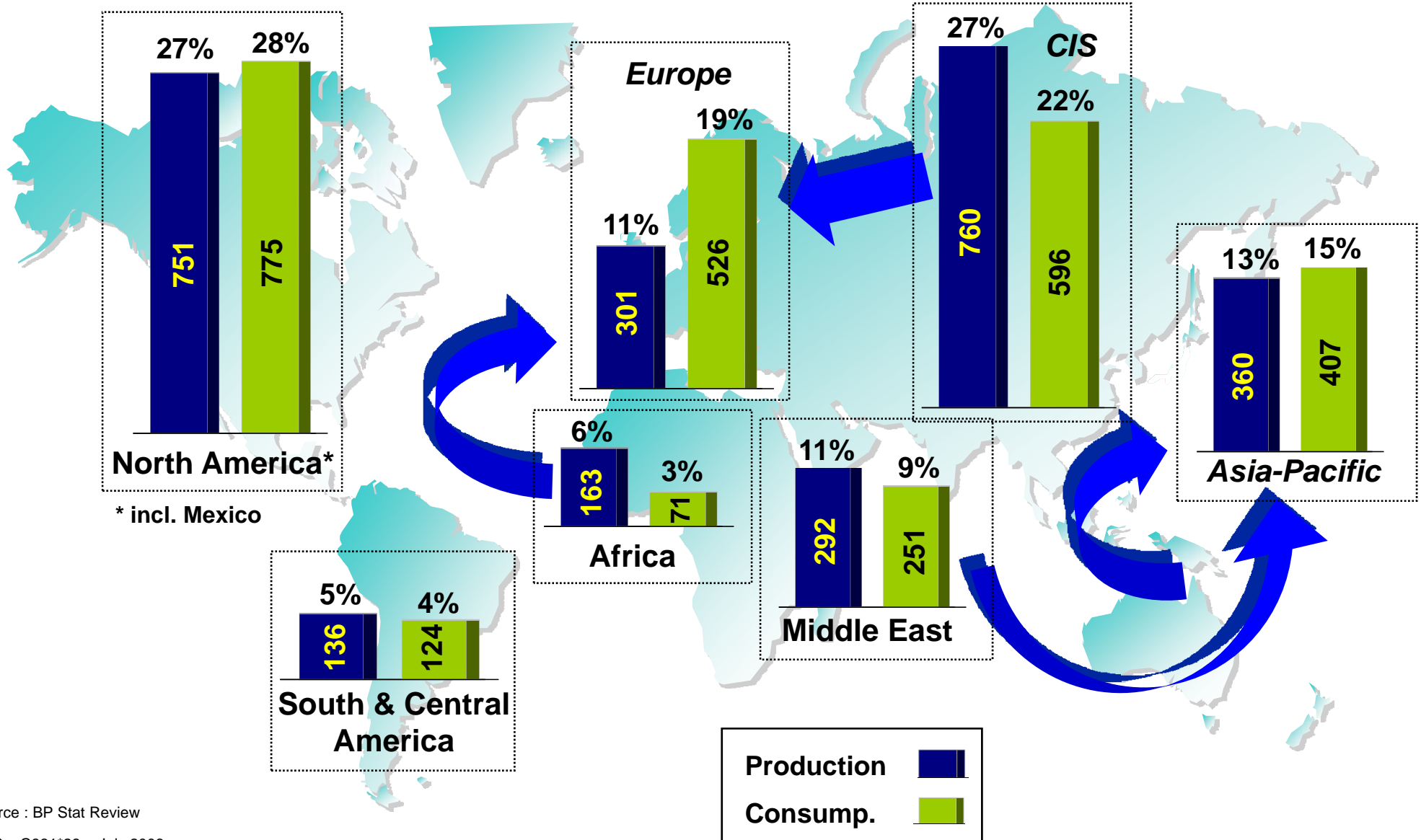


Prospects for Oil in West Africa : a proposed classification



Nigeria	5152
Algeria	4452
Egypt	1638
Libya	1403
Angola	267
Cameroon	134
Mozambique	126
Congo Kinshasa	90
Sudan	84
Tunisia	64
Namibia	62
Rwanda	56
Equatorial Guinea	36
Gabon	28
Ivory Coast	28
Mauritania	28
Ethiopia	25
Ghana	22
Tanzania	6
Somalia	6
Morocco	2
Benin	1
Congo Brazzaville	1

World Demand : 2 763 Bcm = 2.5 Gtep



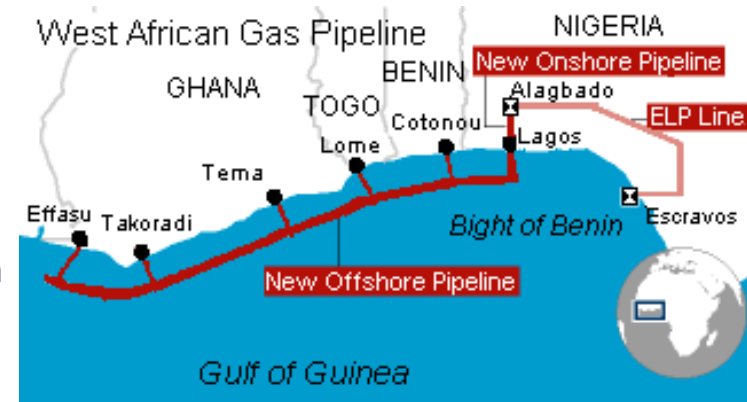
	Reserves (Bcm)	%	R/P ratio
<i>North America</i>	7 450	4	10
United States	5 450	3	10
Canada	1 590	1	9
<i>S. & Cent. America</i>	7 020	4	52
<i>Europe</i>	5 690	3	19
<i>FSU</i>	58 320	32	77
Russia	47 820	27	80
Turkmenistan	2 900	2	49
<i>Africa</i>	14 390	8	88
Algeria	4 580	3	52
Nigeria	5 230	3	>100
Egypt	1 890	1	54
Libya	1 490	0.8	>100
<i>Middle East</i>	72 130	41	>100
Iran	26 740	15	>100
Qatar	25 780	14	>100
<i>Asia-Pacific</i>	14 840	8	41
Indonesia	2 760	1	36
Australia	2 520	1	68
TOTAL WORLD	179 840	100	65

R/P =
Reserves (1.1.2006) /
Production (2005)
(gross - re-injected)

■ Large local projects are now considered:

– The West African Gas Pipeline (WAGP)

- a solution to energy shortage in Benin, Togo and Ghana
- a key infrastructure that will
 - enhance energy cooperation and integration
 - bring new industrial investments



– Power production

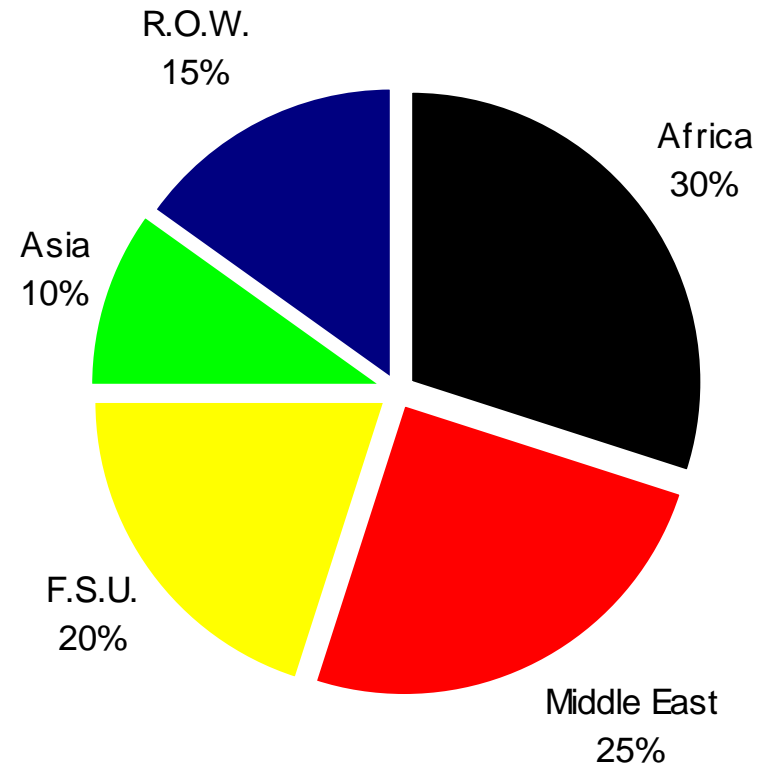
- **The development of local electricity generation using natural gas**
 - **Ghana - expansion of the Aboadze thermal power plant**
 - The upgrade would convert the plant from burning oil to natural gas, which it would receive from Nigeria through the WAGP.
 - The cost of the expansion project is estimated at \$215 million. World Bank had given approval for negotiations on financing the project.
 - **Mauritania**
 - Building a thermal power plant could improve the economics of LNG exports.

- Around 150 Bcm/y of natural gas are flared every year.

- The “Global Gas Flaring reduction”: a global initiative led by the World Bank with the aim to reduce significantly the CO₂ emissions of due to flaring.
 - there is a strong commitment of many actors to improve the impact of E&P activities in this area.

- As a consequence, significant quantities of natural gas should be available for new projects.

Natural gas flaring in the World



Source : World Bank

- **Many future plans include converting flared natural gas to LNG. Possible project list includes:**
 - **Nigeria**
 - **In 2005, Nigerian gas production reached 21.8 Bcm, only 12 Bcm were exported**
 - Current capacity : 18 MTPA. With upcoming train 6 and possible train 7, capacity could be lifted to over 30 MTPA by 2011.
 - **Equatorial Guinea**
 - **The Bioko Island project to export LNG from Alba field**
 - May 2007: Train 1 delivered its first First LNG Cargo. This train has a nameplate capacity of 3.7 MTPA.
 - A possible second 4.4 MTPA train is currently undergoing feasibility studies.
 - **Angola**
 - **ANGOLA LNG**
 - a single 4.0 - 5.0 MTPA train with the option for additional trains is currently under study. However, the facility is not expected to come online before 2010.

- The **South African** example...
 - **Two firms supply approximately 40% of the local fuels market.**
 - **Sasol and CTL**
 - a **160,000 bbl/d** capacity
 - the world's only manufacturer of oil from coal (Sasol has produced more than 700 million boe since the early 1980s)
 - **PetroSA :**
 - the Mossel Bay plant: a capacity of **45,000 bbl/d** from gas to liquids (GTL)
- **New African GTL projects are also considered:**
 - **NIGERIA :**
 - **The Escravos project (EGTL)**
 - Partners: Chevron, Sasol and NNPC
 - a **34,000 bbl/d** plant that will benefit from the infrastructure already in place for nearby oil and gas production and export facilities.
 - **The Syntroleum's project:**
 - a GTL barge concept with a **20,000 bbl/d** nominal capacity
 - a useful way of monetizing small and isolated gas deposits in the absence of any gas transmission network.