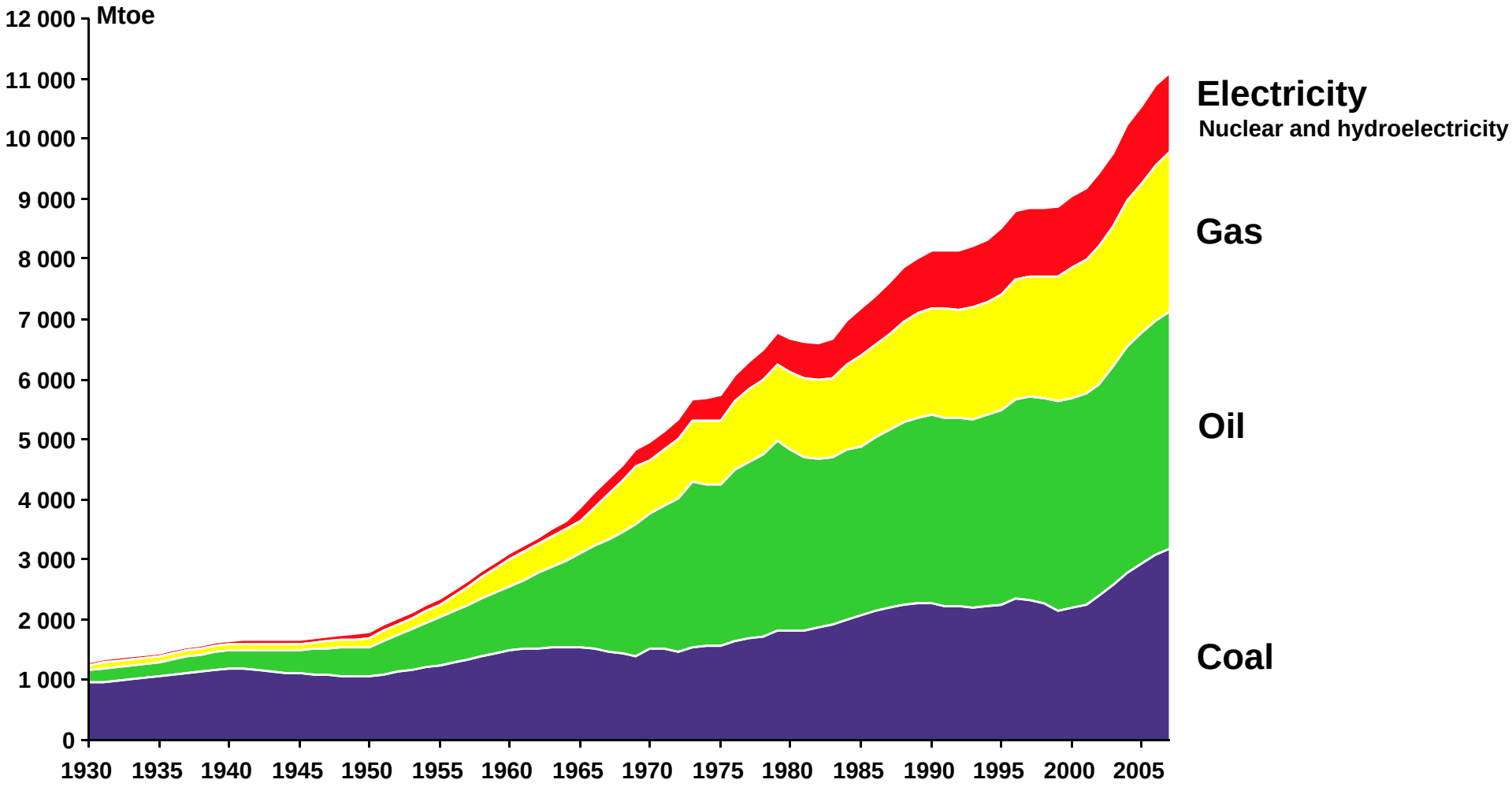
L'énergie dans le Monde et en Afrique

Jean-Pierre Favennec
Directeur, Chargé de Mission, IFP
j-pierre.favennec@ifp.fr

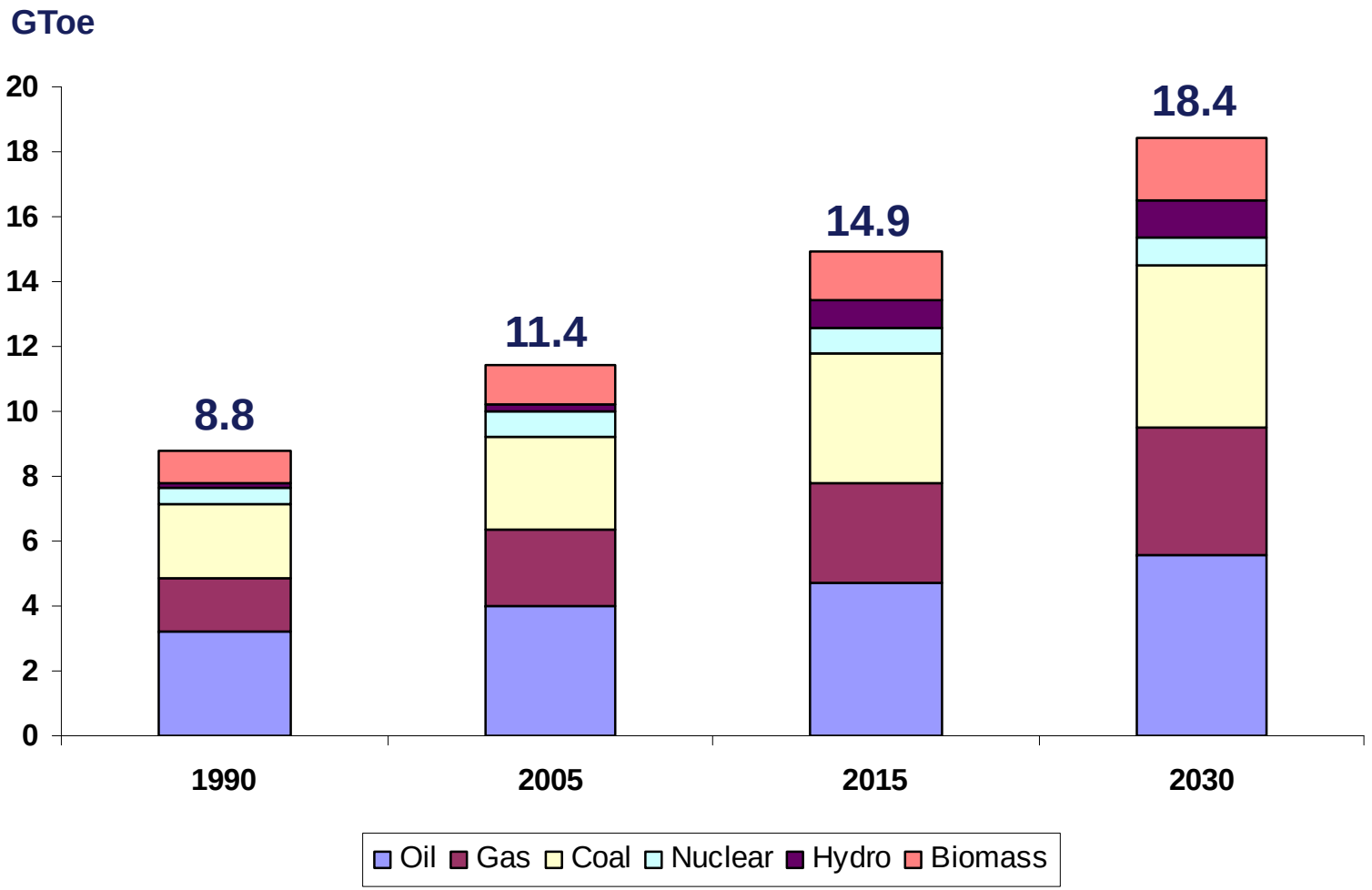
Sommet de l'énergie et du développement durable en Afrique – Dakar – 1er et 2 décembre

World commercial primary energy consumption



Source : BP Statistical Review

World energy demand



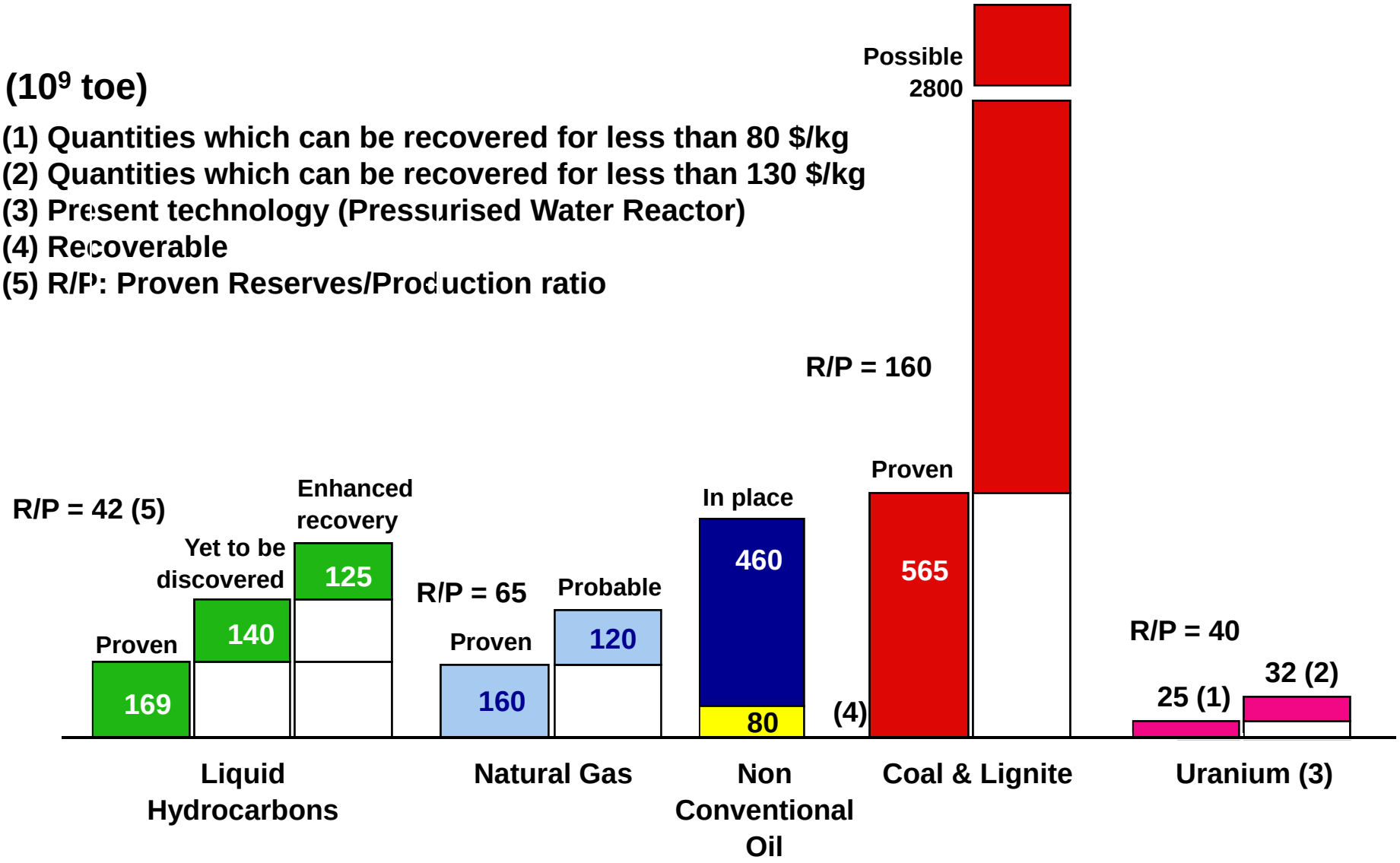
SEG - Source : AIE WEO 2007

World energy demand

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

Source: United Nations, BP Stat. Review, WEC, EU and IFP-CEG

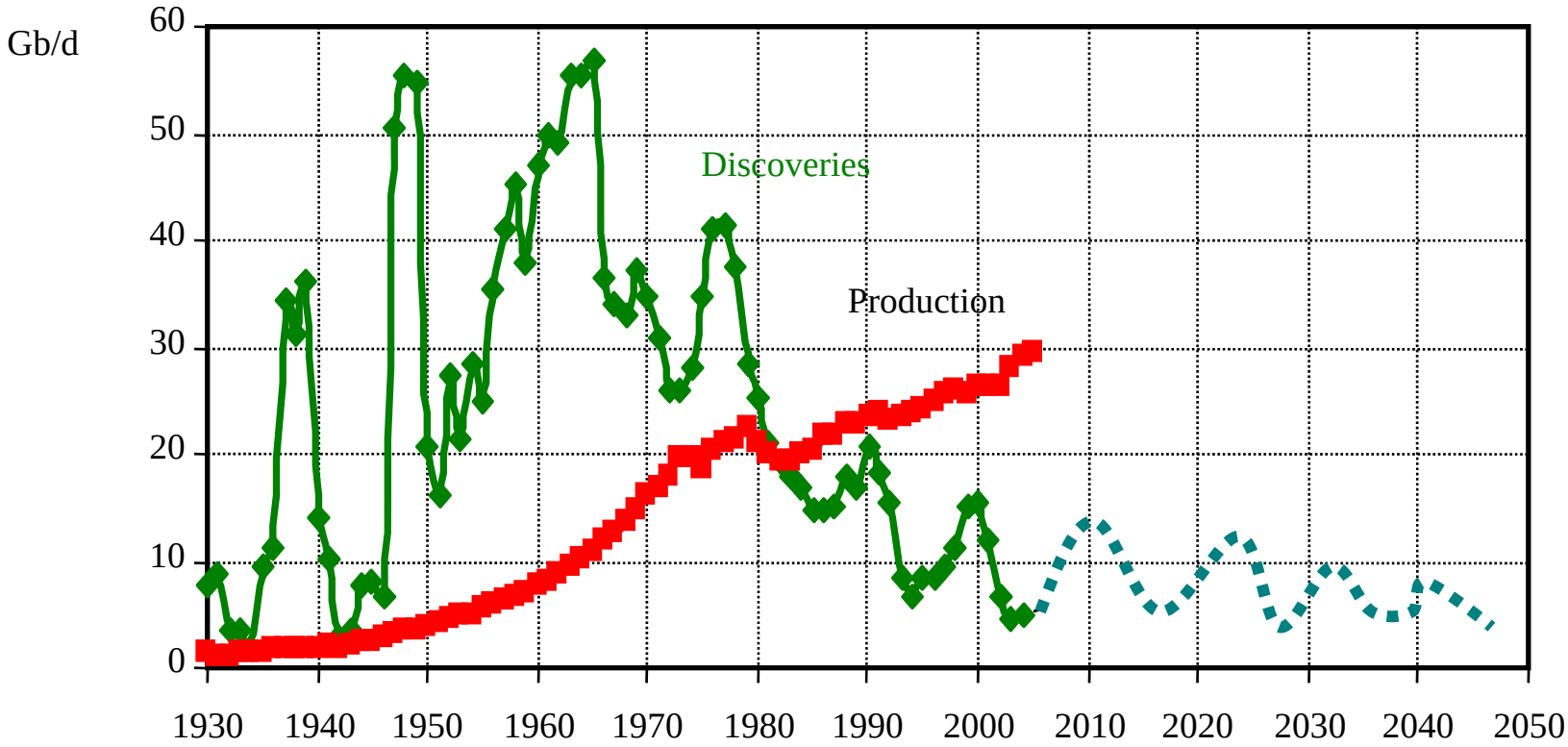
World reserves - 1.1.2008



Source : BP Statistical Review, CEA, IFP / DEE

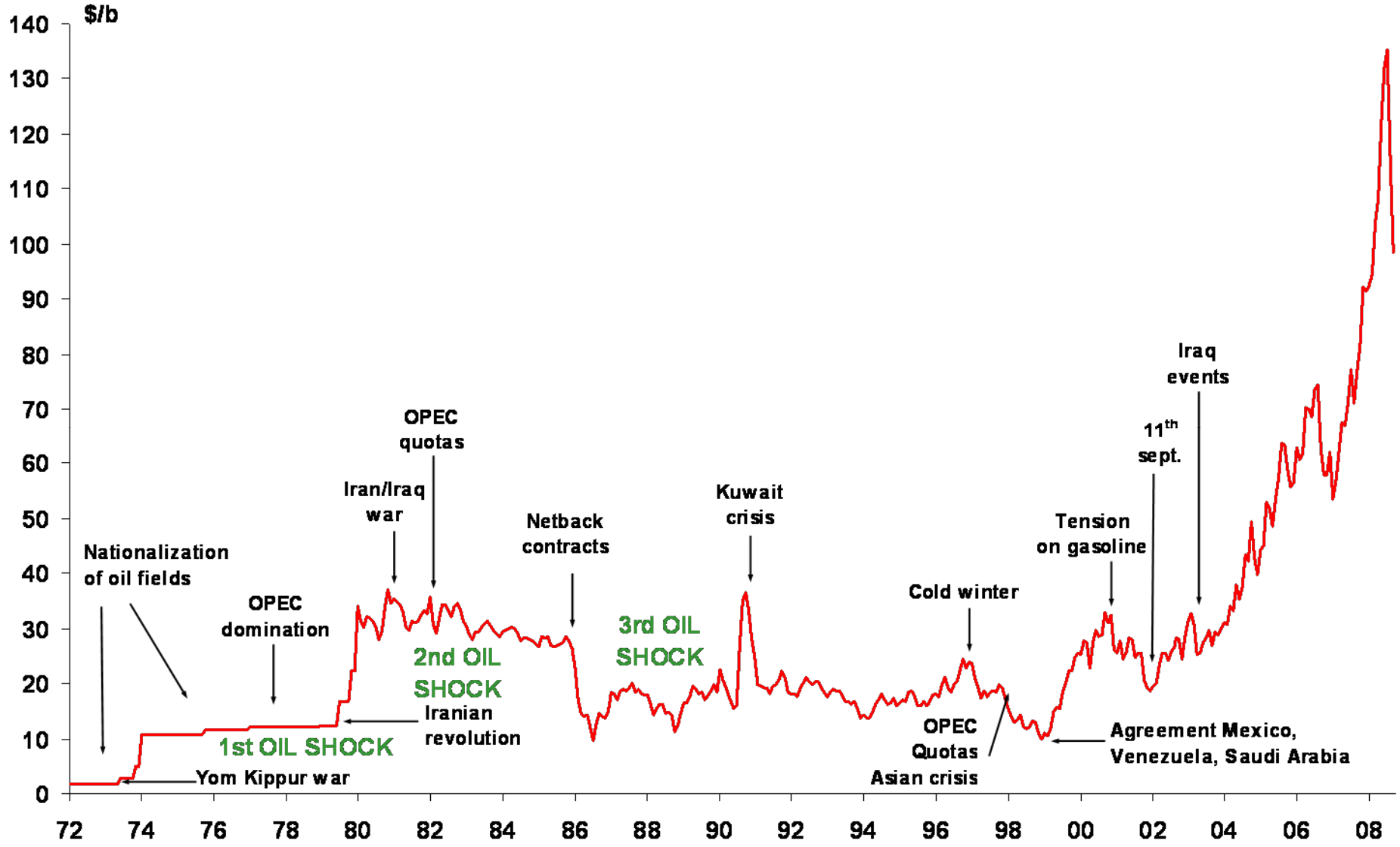
Oil reserves evolution

Oil discoveries and production since 1930



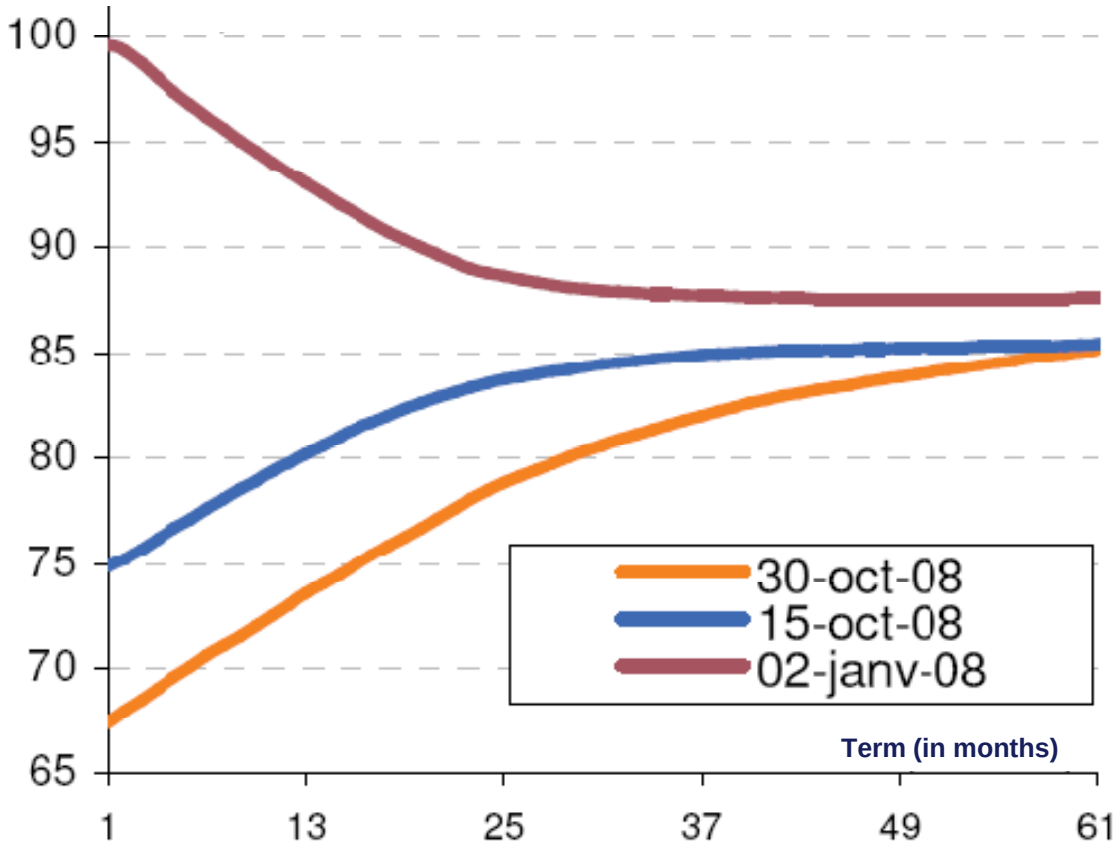
SEG - Source : IFP

Crude oil price



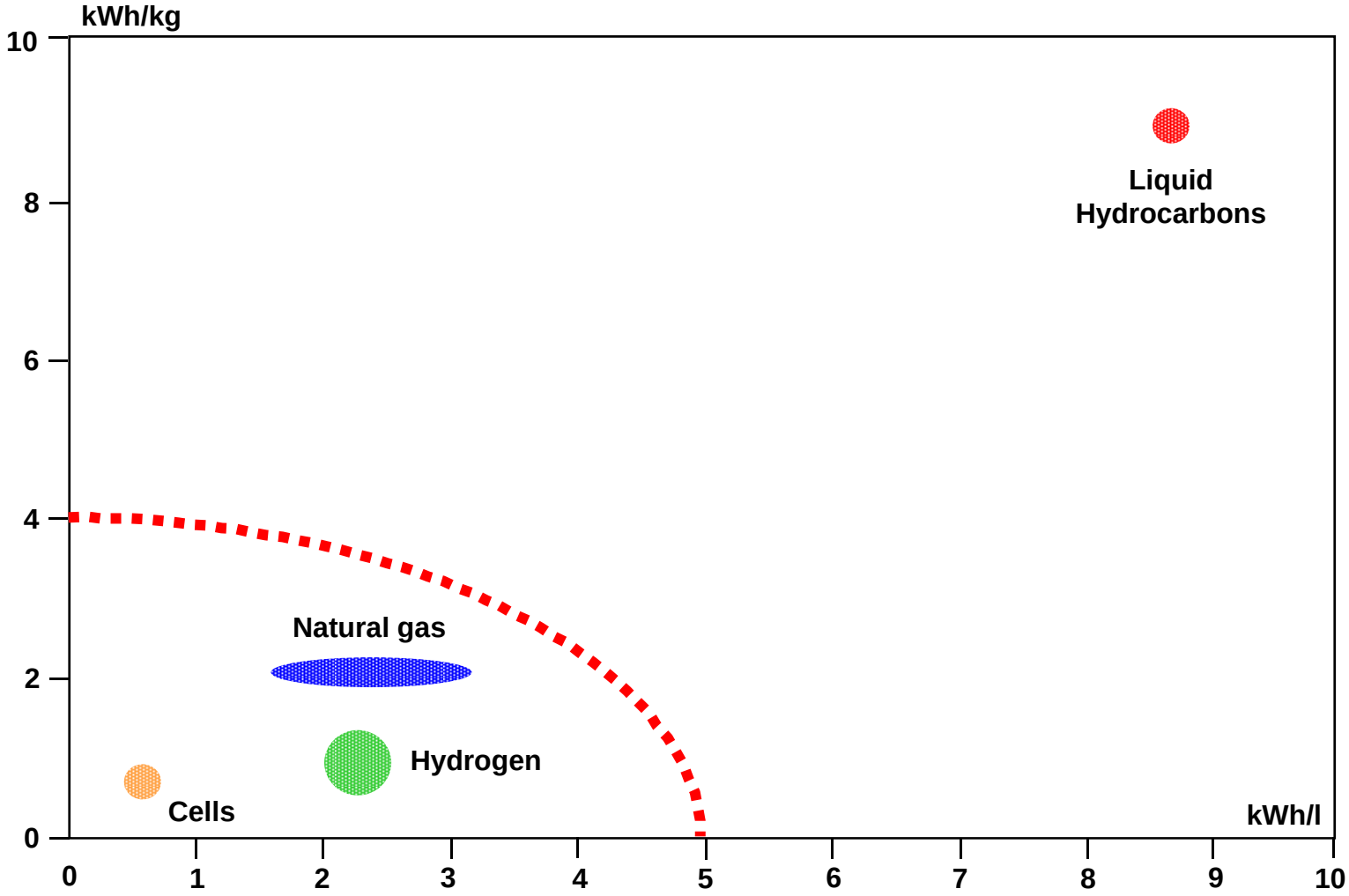
Source : Platt's

WTI ($/baril)



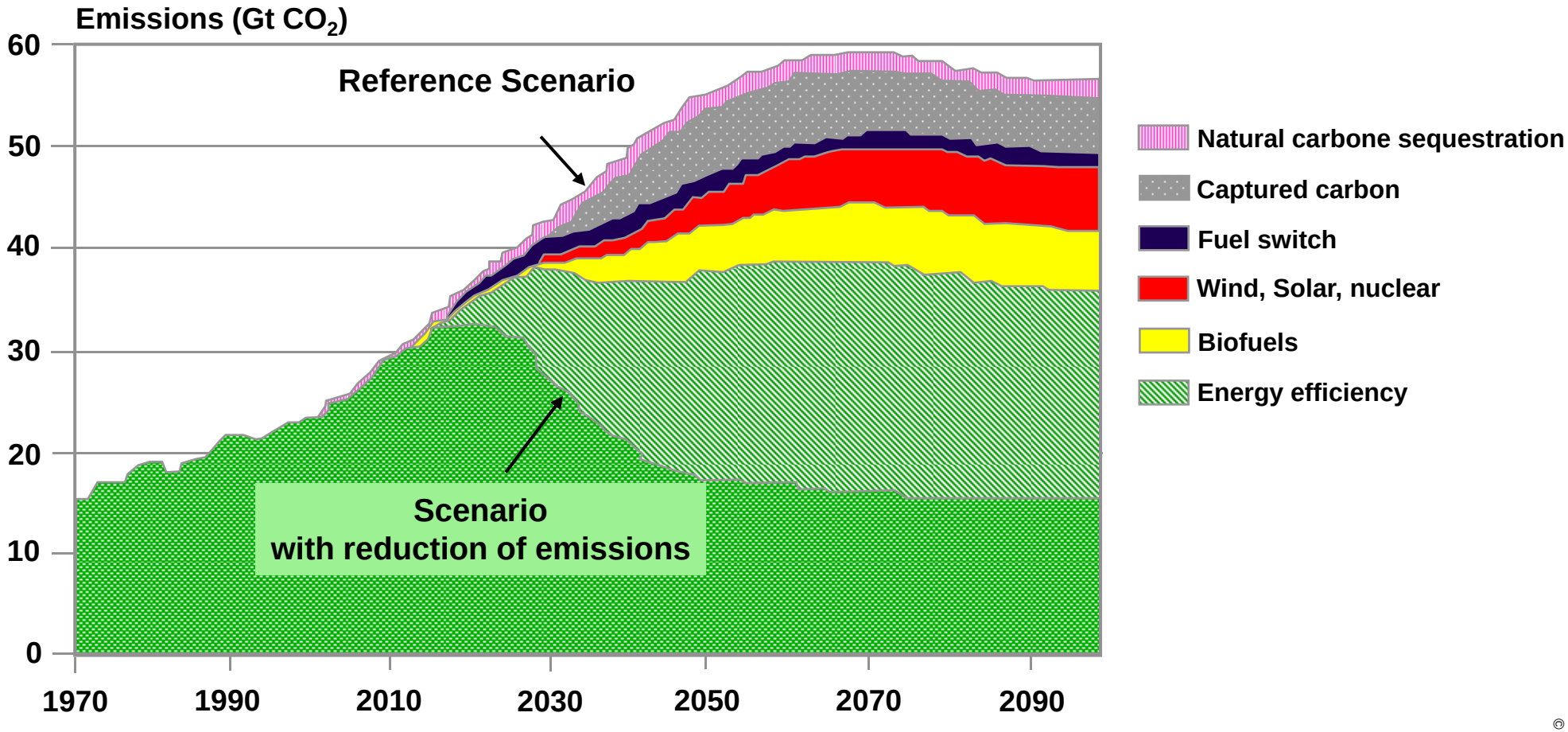
SEG - Source : IDP - DEE

Liquid hydrocarbons : A cutting edge energetic intensity



SEG Source : PR Bauquis – Revue de l'énergie - 2004

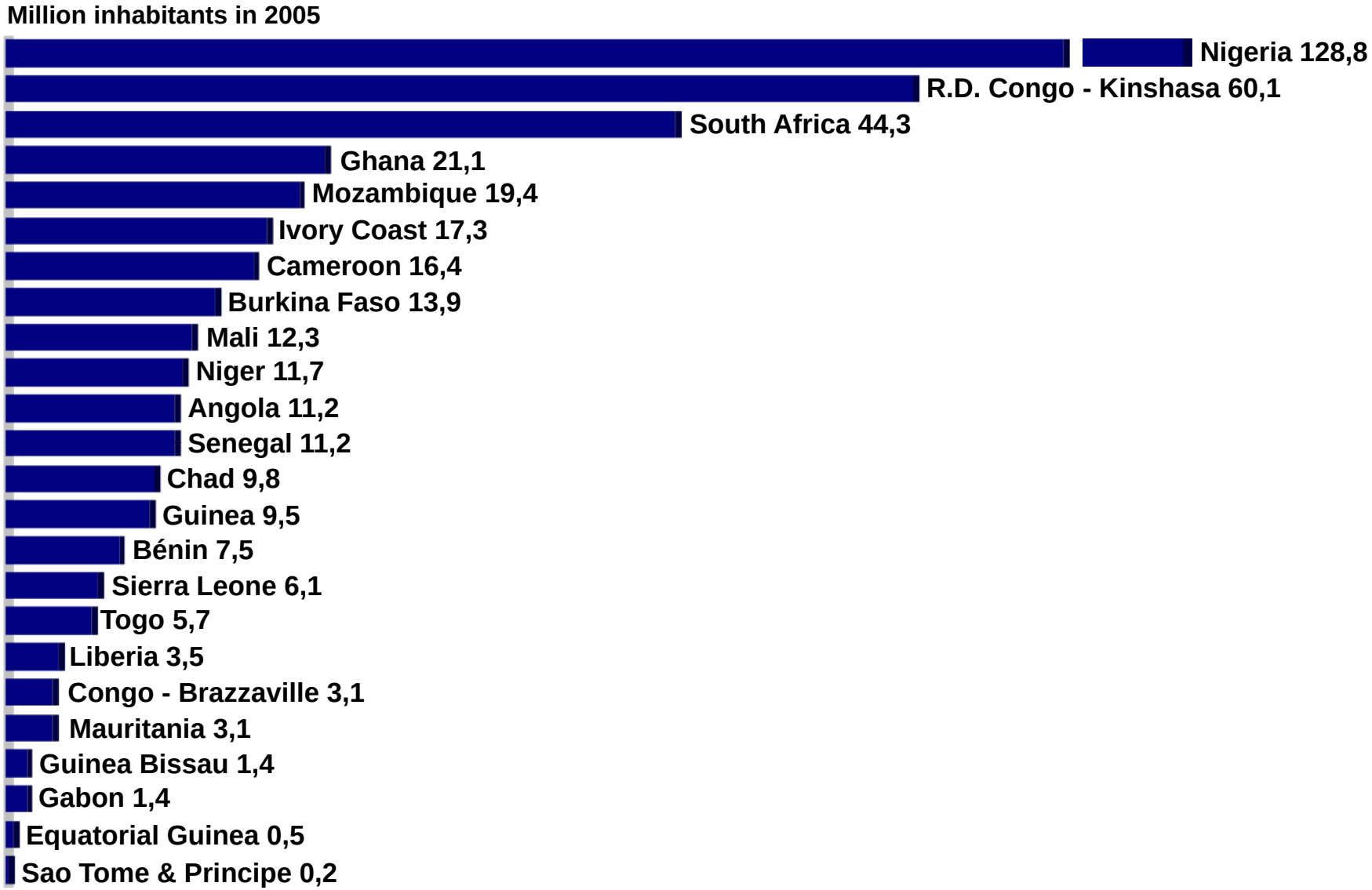
CO_2 emissions



SEG -Source : Commission Européenne

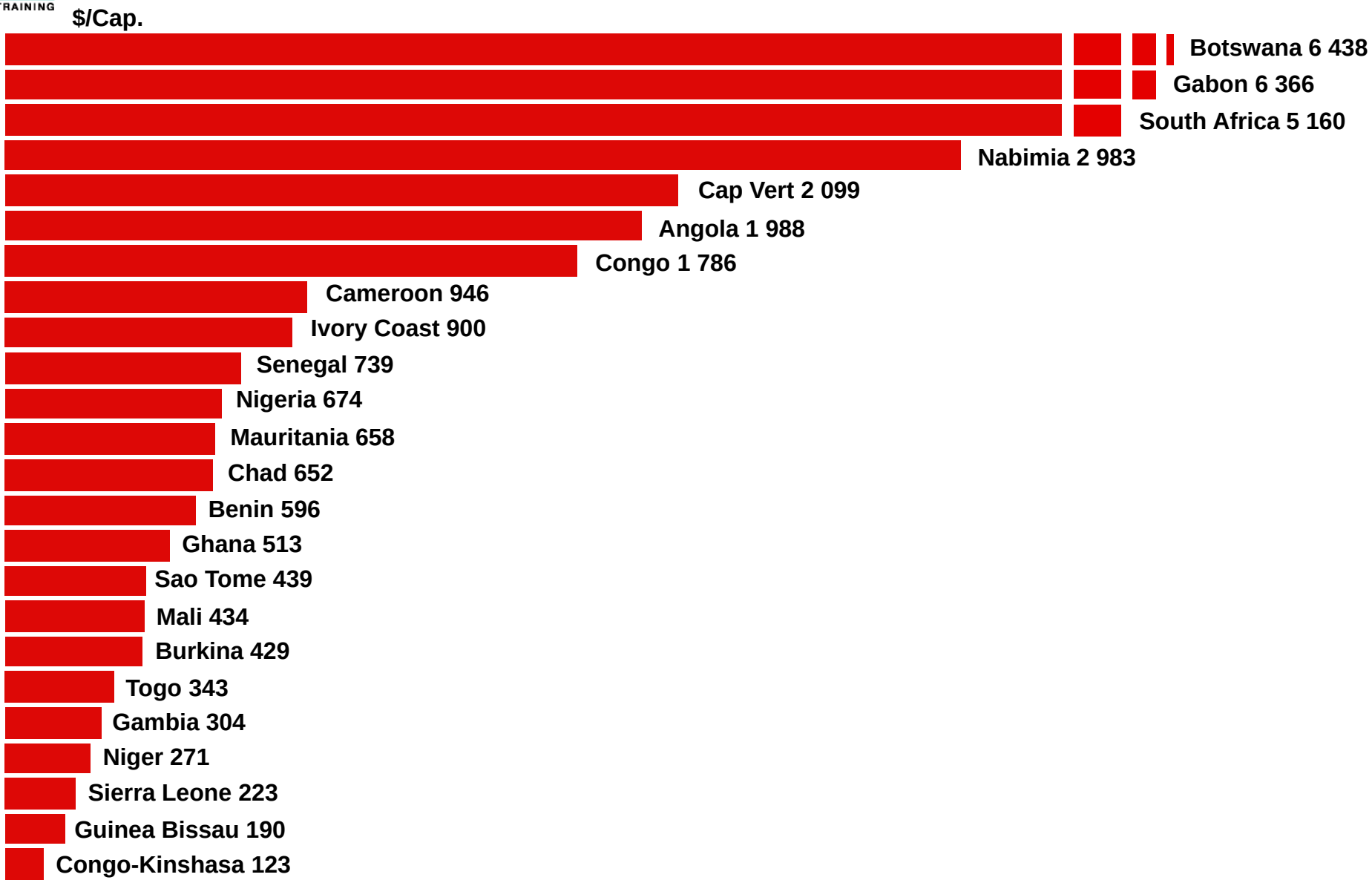
L'énergie en Afrique

Population in some african countries



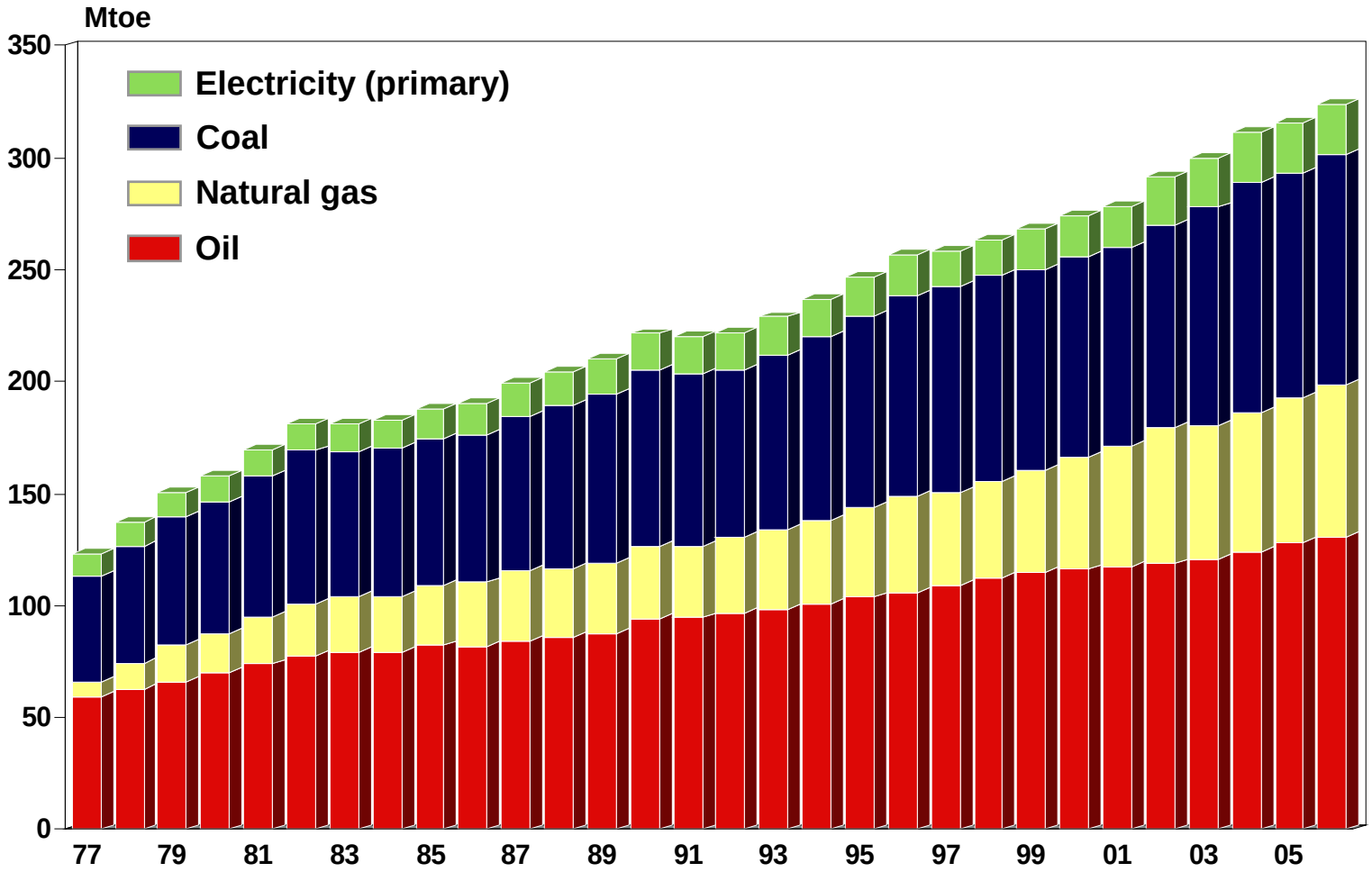
Source : CIA World Fact Book

GDP per capita in some african countries in 2005



Source : IMF

Energy consumption in Africa



Source : BP Statistical Review

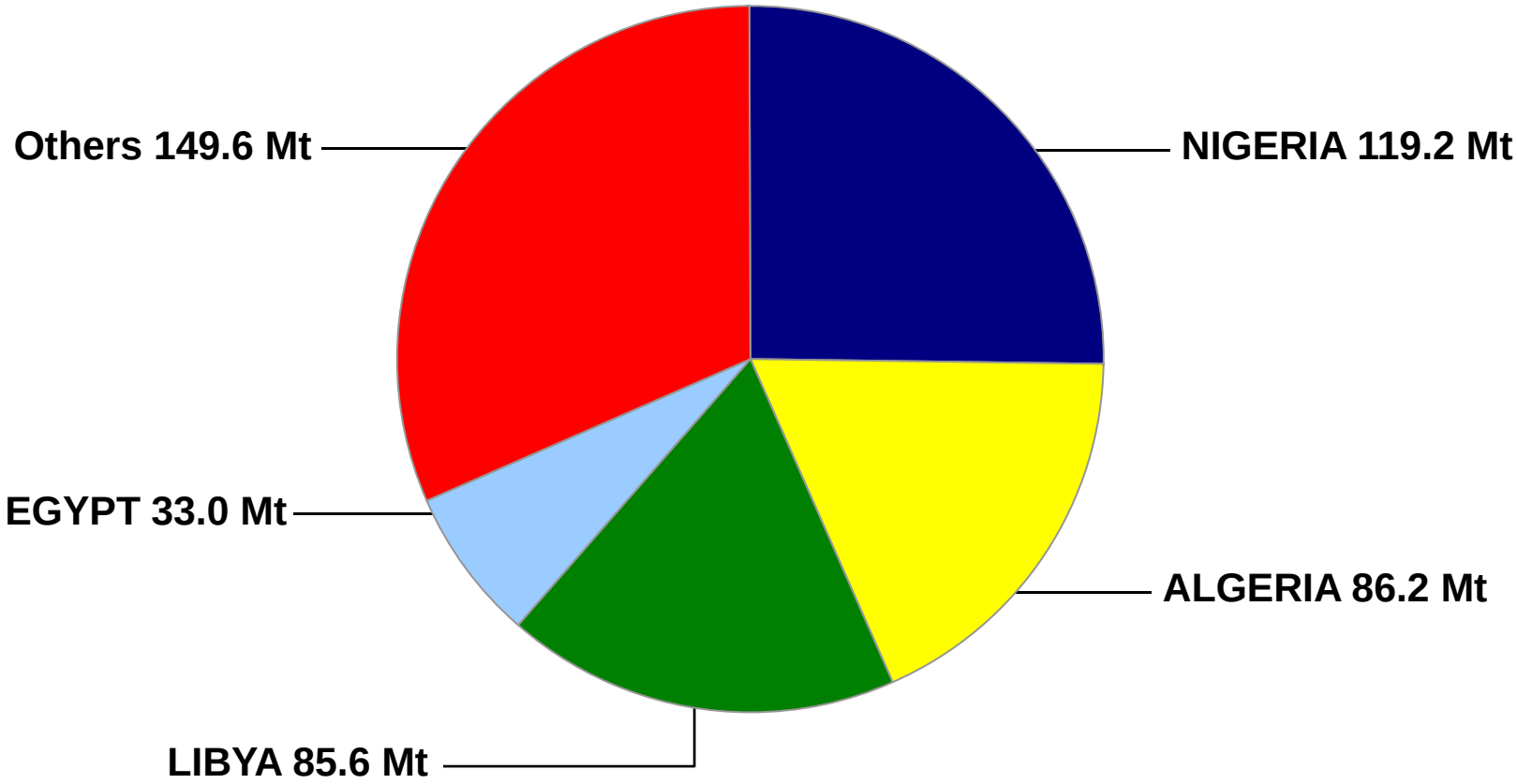
Oil proven reserves in Africa 1st January 2008 (Mbbl)

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

Source : Oil and Gas Journal

Oil production in Africa

473.7 Mt in 2006



Source : BP Stat Review

Share of hydrocarbons in the economy of african countries 2006

Country	% of GDP	% of exports	% of revenus
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

Source : CRS, World Bank, IMF, CIA World Factbook, EIA, OECD

Prospects for Oil in Africa : a proposed classification

- **Countries in (long term) decline**
  - Cameroon, Congo (formerly Zaire), Gabon
- **Countries that have reversed their decline**
  - Congo-Brazzaville ; Egypt
- **Countries where output is increasing**
  - Angola , Equatorial Guinea , Ivory Coast, Nigeria, Sudan, Algeria, Libya
- **Countries with uncertain prospects**
  - Mauritania; Chad
- **Countries that will produce oil by 2015**
  - Ghana; Ouganda; Niger ? Sao Tome e Principe ?

Source : Oil and Energy Trends - Global Energy Review

Proven natural gas reserves

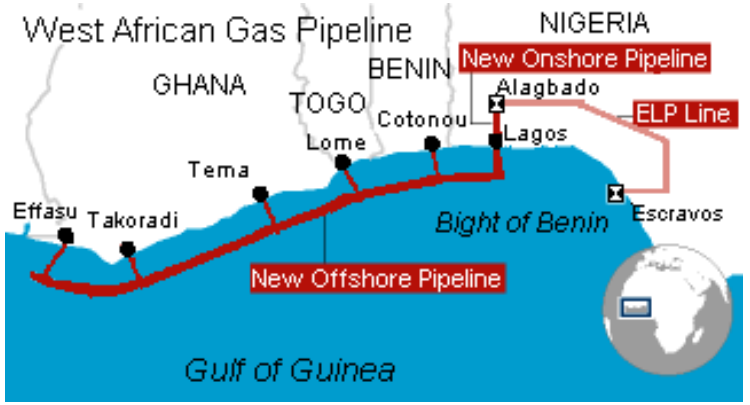
	Reserves (Bcm)	%	R/P ratio
North America	*7 450*	*4*	*10*
United States	**5 450**	**3**	**10**
Canada	**1 590**	**1**	**9**
S. & Cent. America	*7 020*	*4*	*52*
Europe	*5 690*	*3*	*19*
FSU	*58 320*	*32*	*77*
Russia	**47 820**	**27**	**80**
Turkmenistan	**2 900**	**2**	**49**
Africa	*14 390*	*8*	*88*
Algeria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

Source : BP Stat. Review

New projects are transforming Africa's industry

- **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.

Source : DOE, Nigeria LNG, SasolChevron

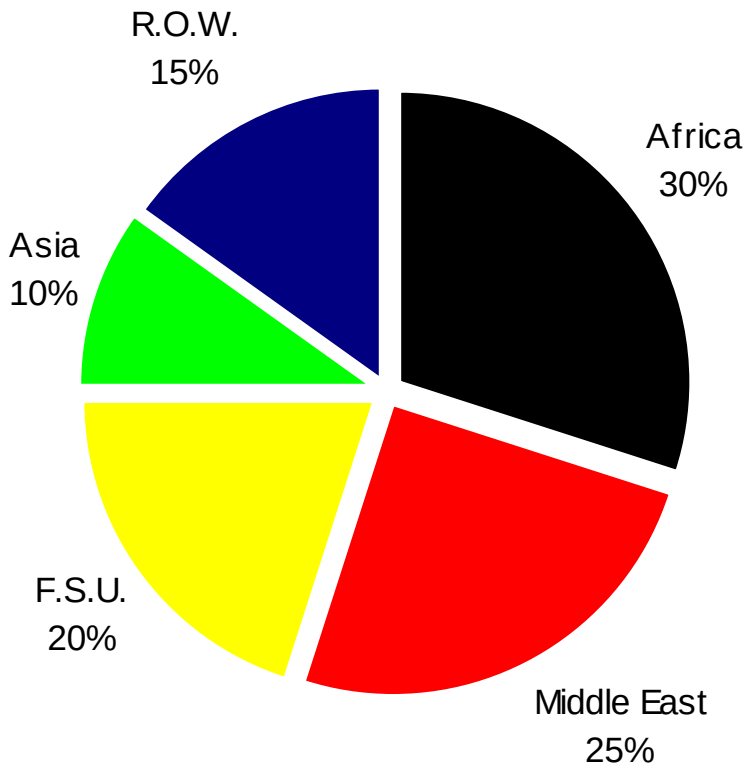
The “Global Gas Flaring reduction” initiative

- **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 CO_2 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

Expanding exports with LNG?

- **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.
  - **Gabon**
    - **Various projects under study**

X-To-Liquids : an African technology

- 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.

Source : DOE, Nigeria LNG, SasolChevron

Prospects for energy in Africa

- **Africa produces large quantities of oil, gas and coal but consumes limited quantities**
- **Africa still largely dependant on biomass : but desertification and health problems have to be adressed**
- **Africa is the "smallest" producer of CO2 but could suffer most of climate chande**
- **Collapse of oil prices is a "windfall benefit" for most african countries which are "non oil producing countries". But this is a temporary situation and Africa should prepare to higher prices by 2010**
- **All alternative energies should be developped**

Source : Oil and Energy Trends - Global Energy Review