

DEVELOPMENT OF SHALE GAS & TIGHT OIL: MIRACLE OR BUBBLE?

Nov 7-8th, Victoria Island, Canada

PECC seminar on the ENERGY TRANSITION

G. DEMEULENAERE

UNCONVENTIONAL WORLD OIL & GAS PANORAMA

HISTORY OF OIL & GAS US PRODUCTION & IMPORTS

First oil crisis



1973

Second oil crisis



1979

Oil conter shock



1986

First gulf war



1991

Twin towers

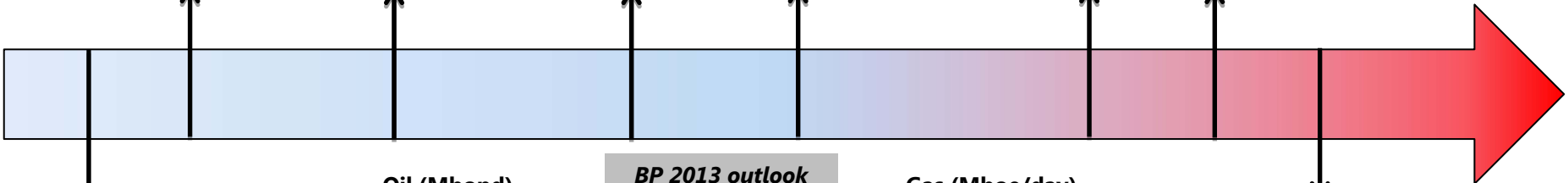


2001

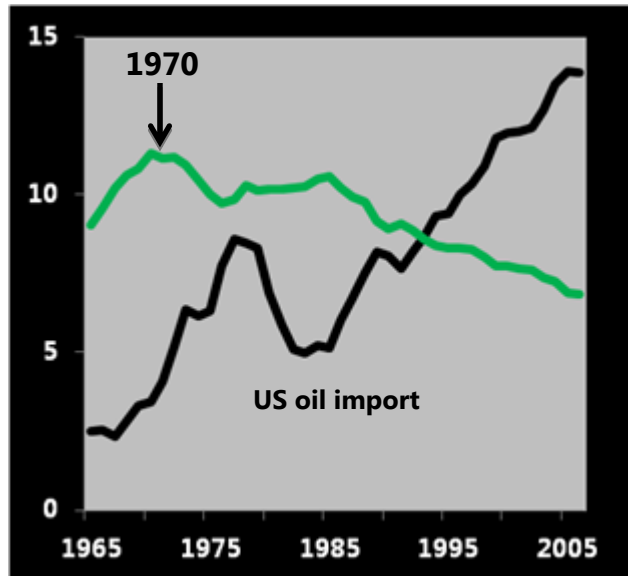
Second gulf war



2003

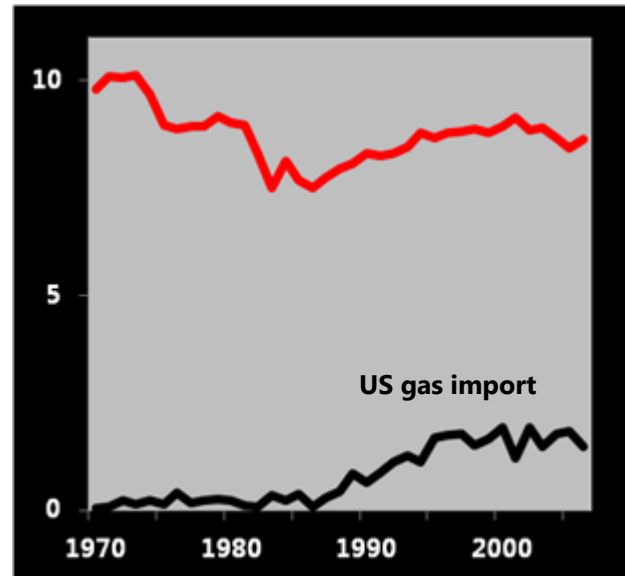


**1970
US
production
peak oil**



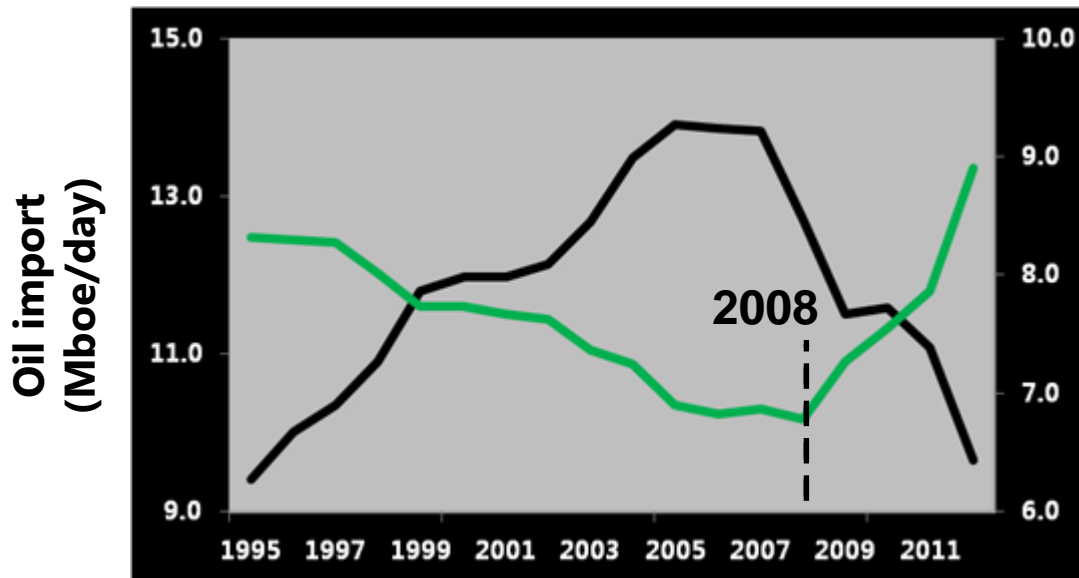
BP 2013 outlook

Gas (Mboe/day)



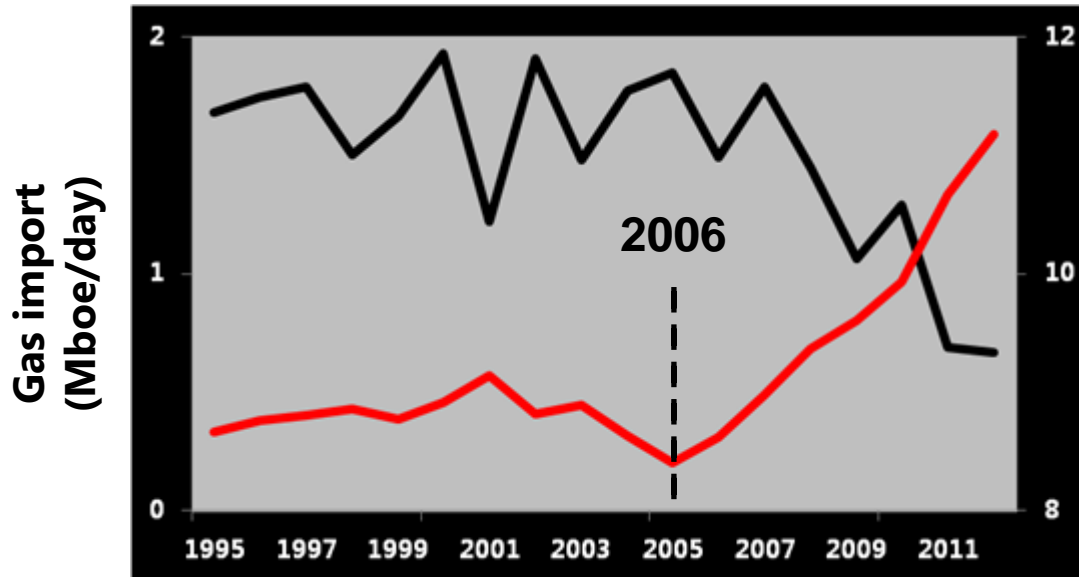
**2006
US
import
peak oil**

2006 & 2008 : THE START OF AN OIL & GAS REVOLUTION



Date	Oil (Mbopd)		Gas (Mboepd)	
	Prod	Import	Prod	Import
2000	7,7	12	8,9	1,9
2006	6,8	14	8,6	1,5
2012	8,9	9,6	11,2	0,7

- Oil production increases by 14,5%
- Oil import decreases by 22 %
- Gas production increases by 23%
- Gas imports decrease by 92 %



Shale oil

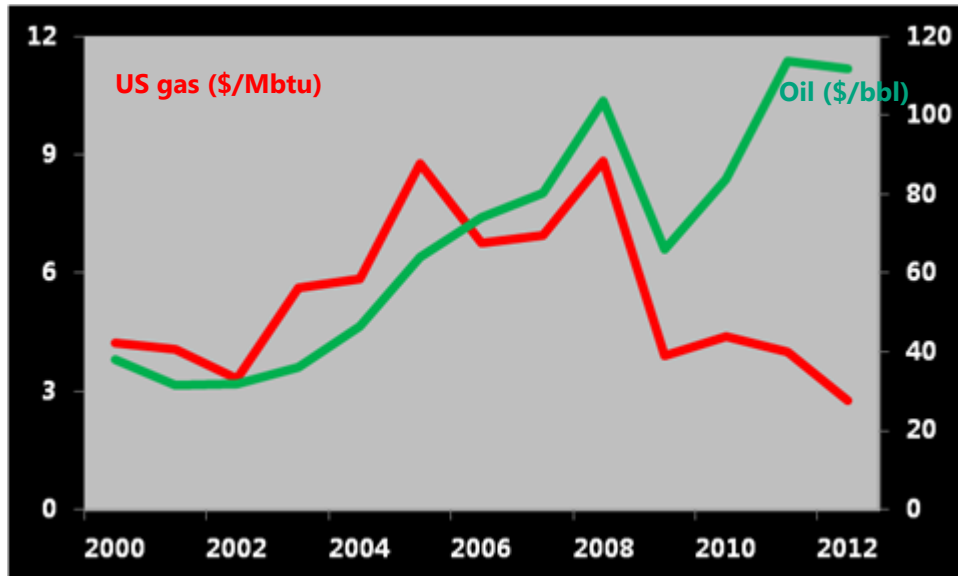


?

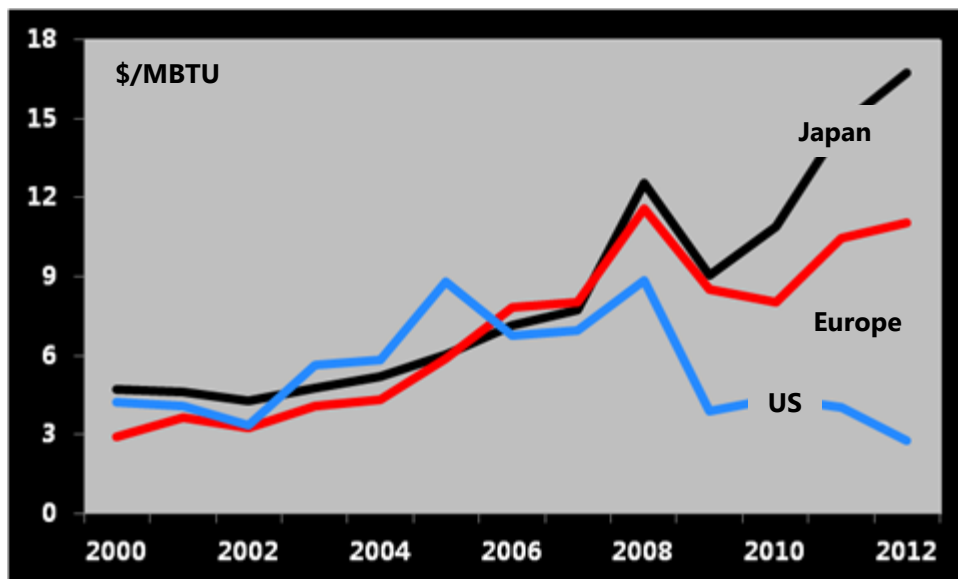
Shale gas

BP 2013 outlook

HUGE IMPACT ON GAS PRICES IN THE US



From 2008 US gas prices disconnect from oil prices



From 2008 US gas prices disconnect from Europe and Japan (Fukushima) gas prices :

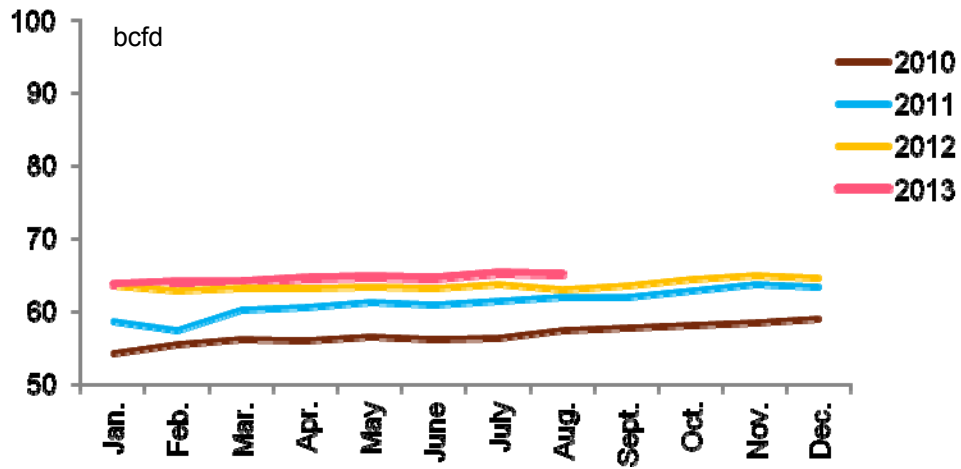
- **US# 3\$/MBTU**
- **Europe 10\$/MBTU**
- **Japan > 15\$/MBTU**

BP 2013 outlook

...WHERE GAS PRODUCTION REMAINS REMARKABLY HIGH DESPITE LOW GAS PRICE

EXAMPLE OF THE US

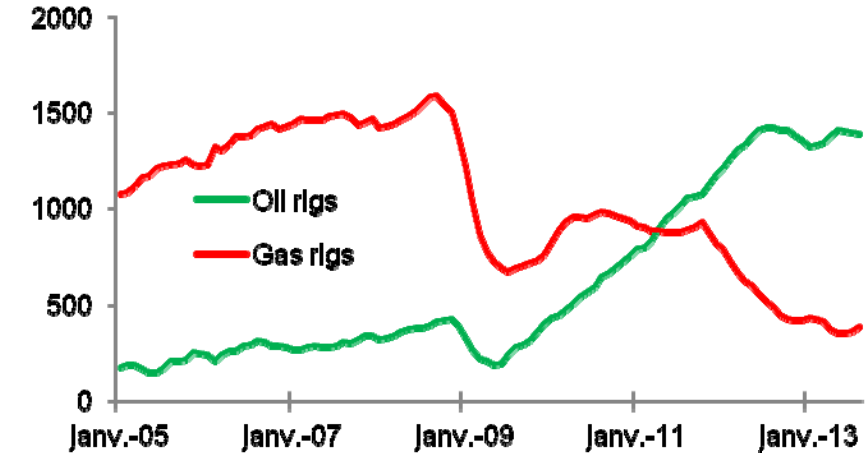
Gas production*



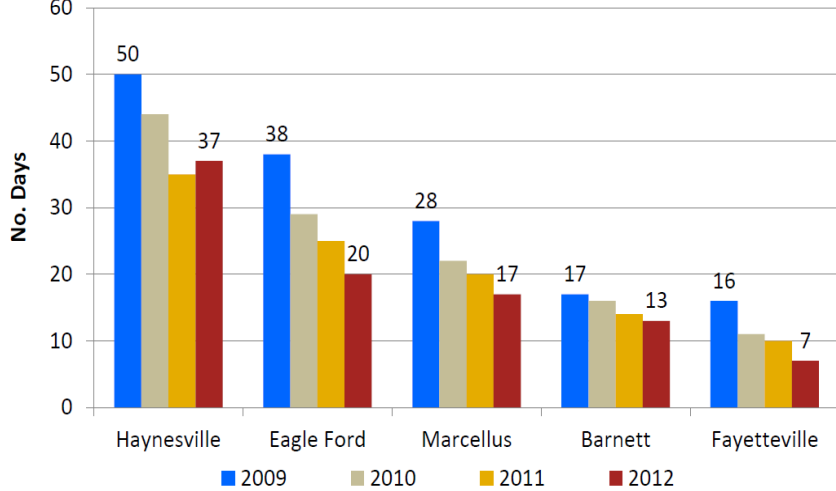
Henry Hub



Onshore rigs in activity



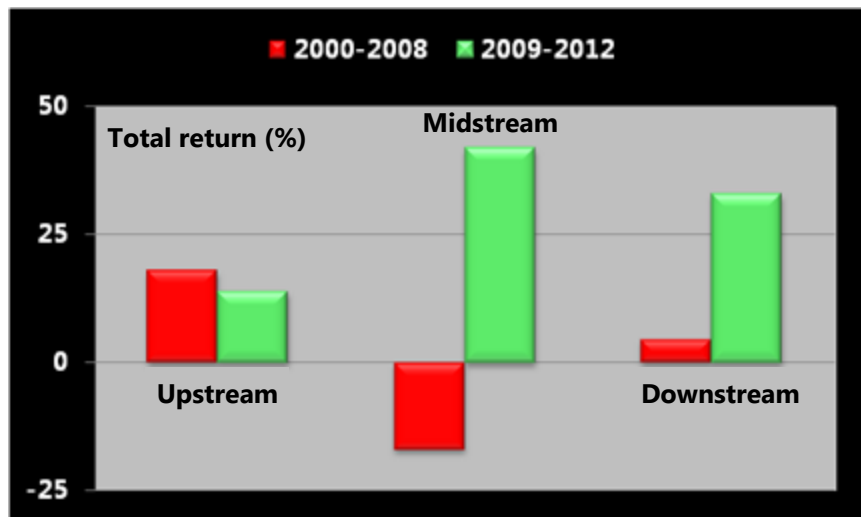
Days required to drill one well*



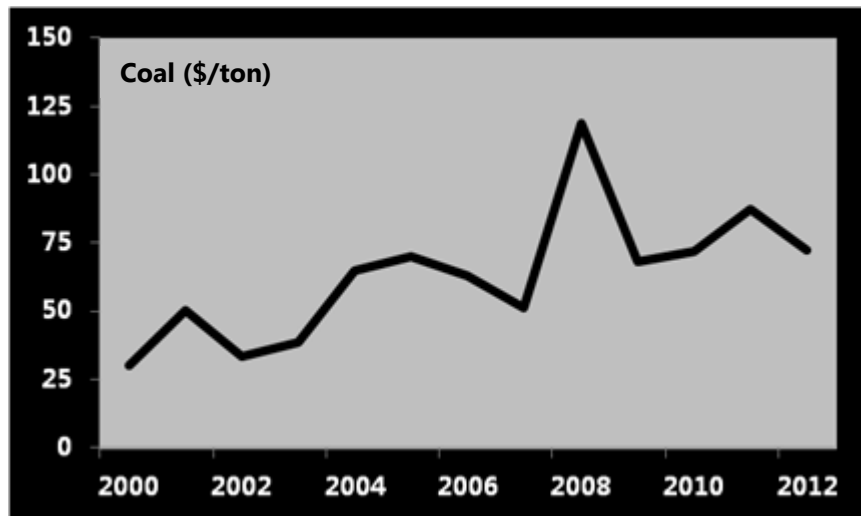
* Source: Bentek



SHORT TERM IMPACT OF SHALE OIL & GAS ON US ECONOMY

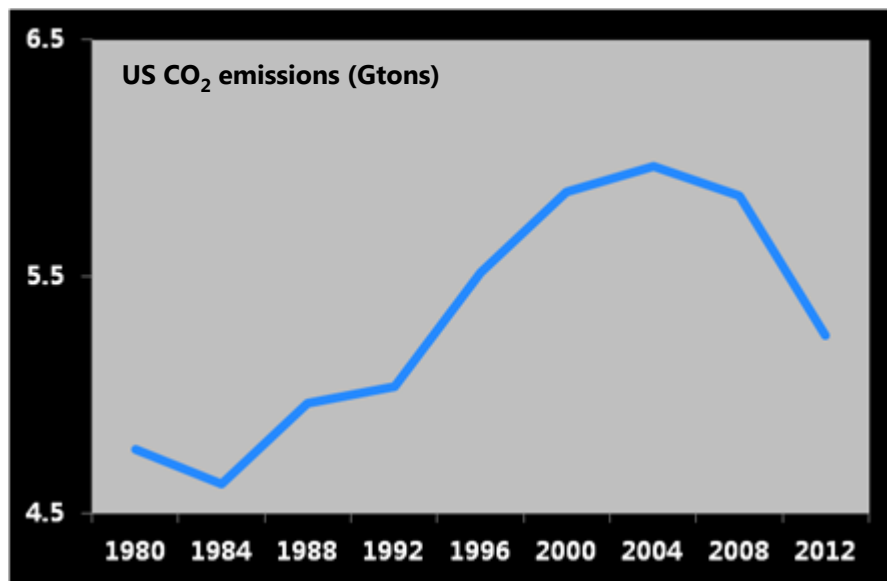


Source McKinsey Corporate Performance Analysis Tool



BP outlook 2013

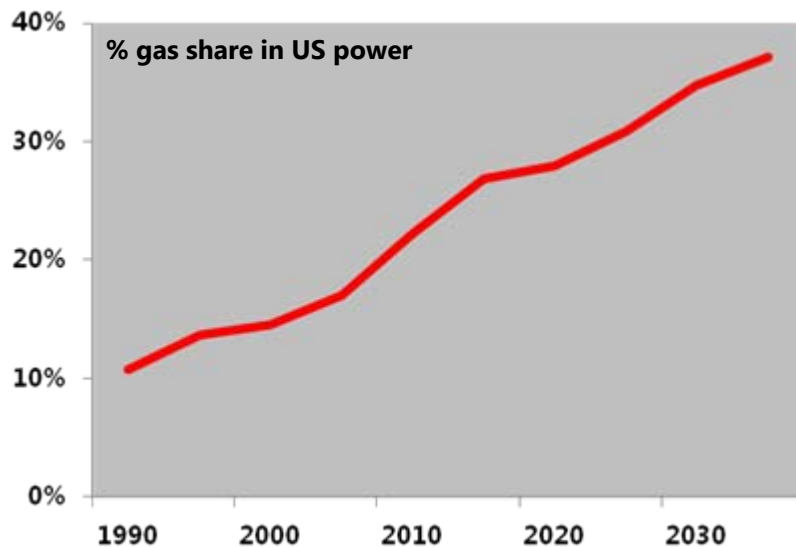
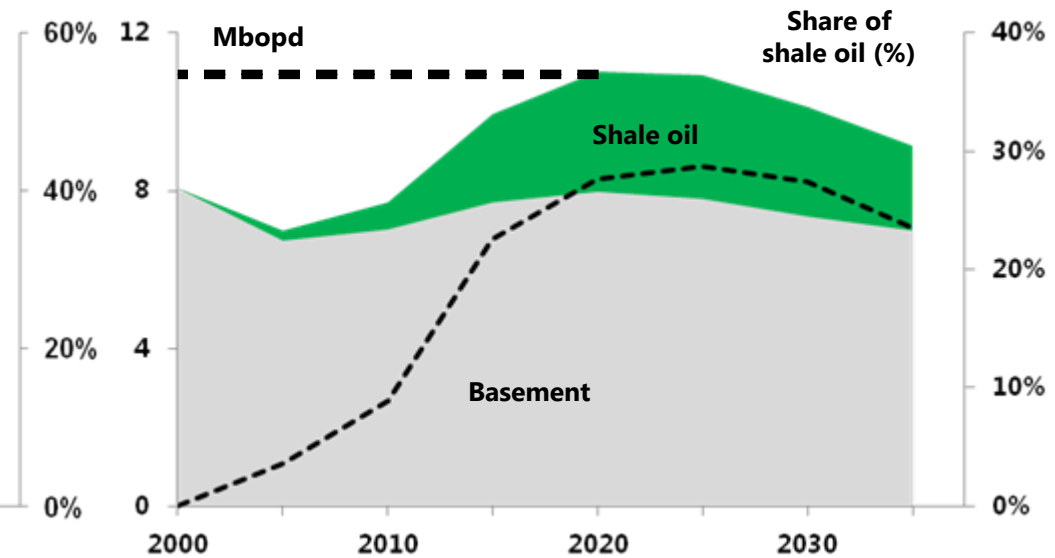
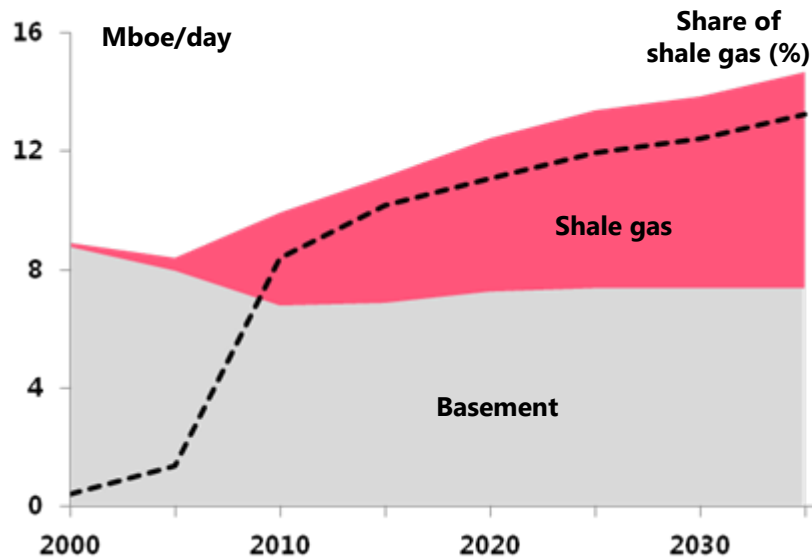
**Profitable to midstream/downstream
Unprofitable to upstream**



**1,75 M jobs (75% indirect/induced)
2010 : + 70 G\$ PIB
13% reduction GHG emissions**

**Coal has significantly decrease
Displacement coal gas power plant**

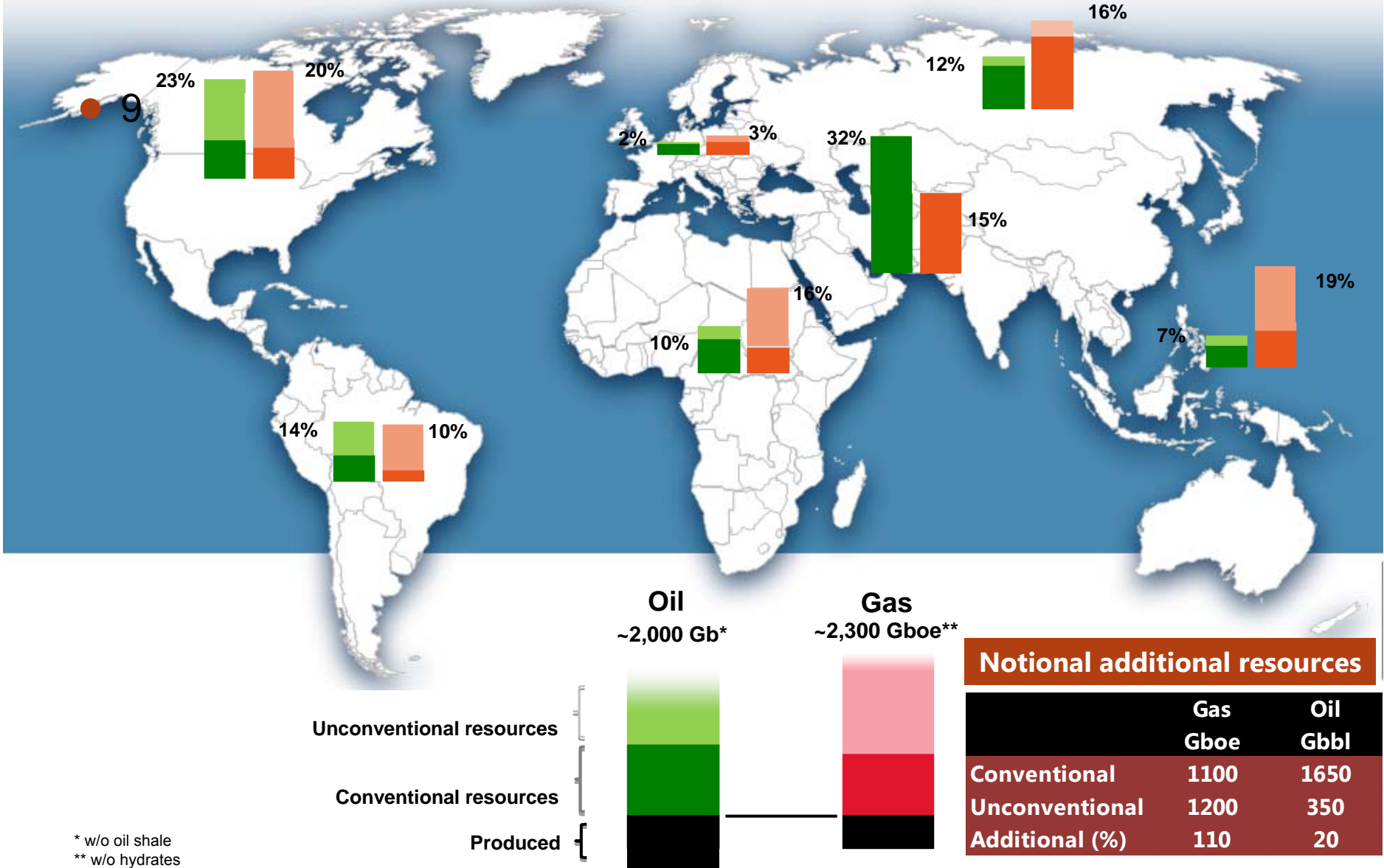
US MEDIUM AND LONG TERM VIEW : DREAM OR REALITY ?



- **US largely self sufficient in gas**
- **up to 40% of electric power from gas**
- **US not oil independent**
- **Import from Middle East decreases**
- **Significant reduction in CO₂ emissions**
- **Job impact 3 Millions in 2035**

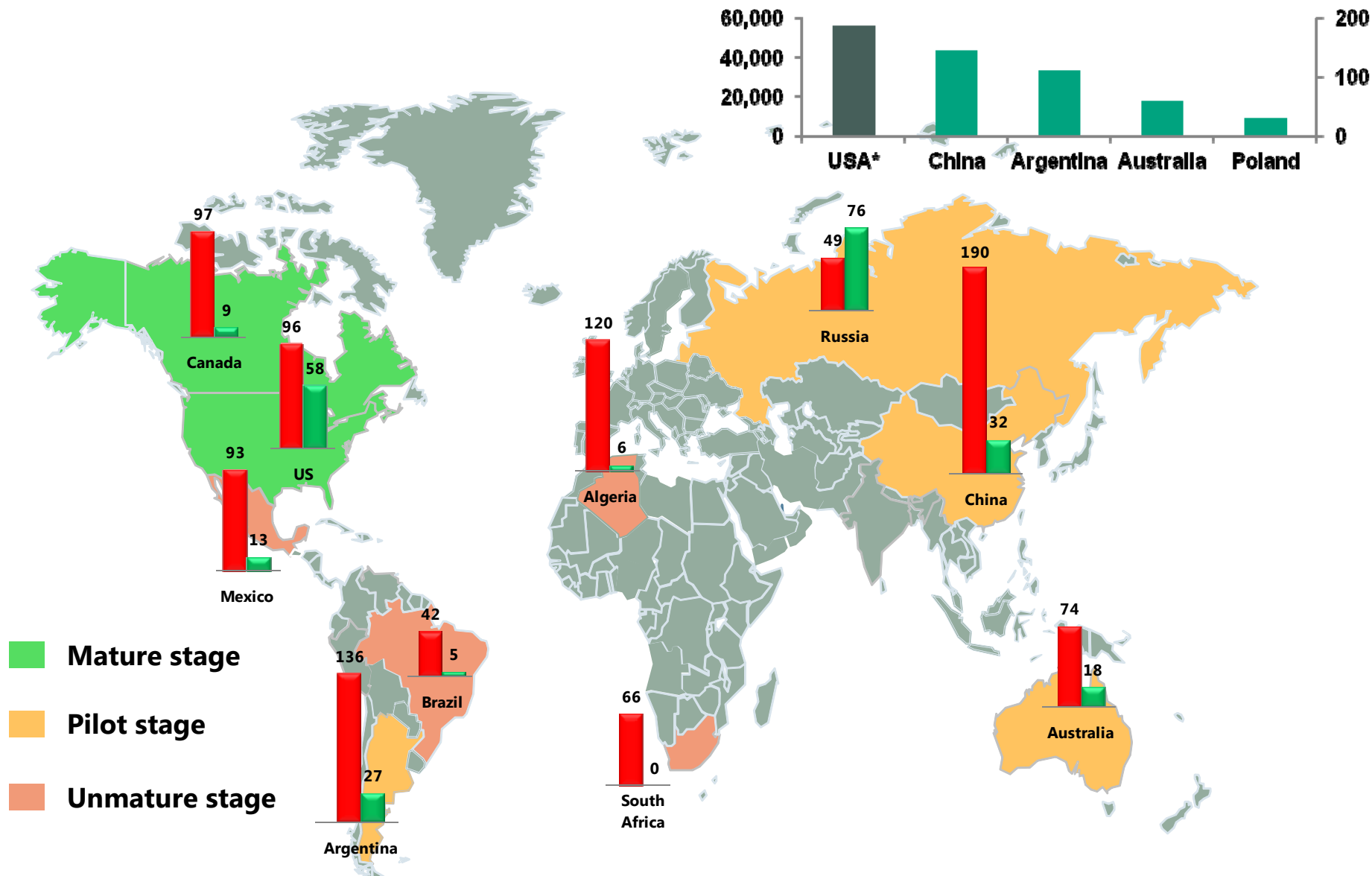
*BP outlook 2013
EIA, IEA outlook 2012
IHS CERA*

A LARGE WORLDWIDE OIL & GAS RESOURCES BASE

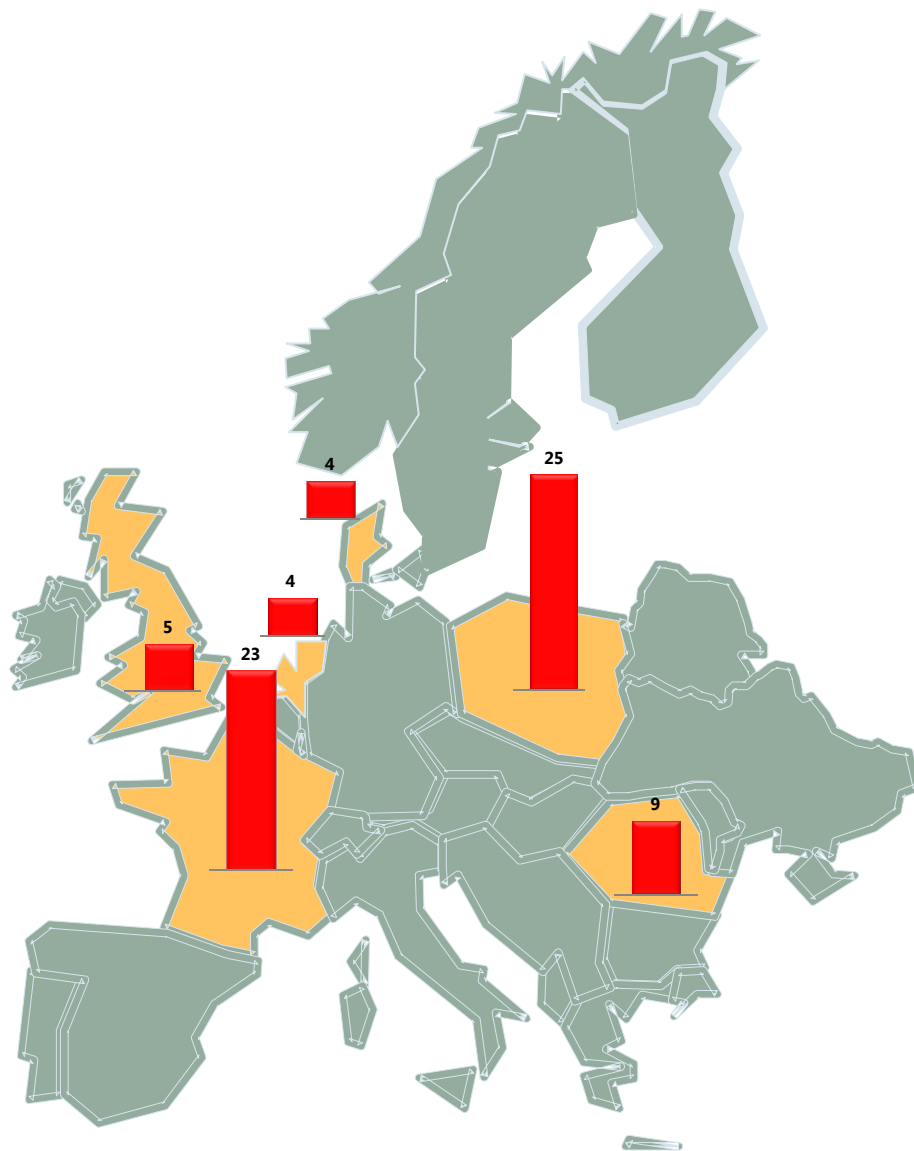


WORLD SHALE OIL & GAS STAKES

Nb of shale wells drilled so far

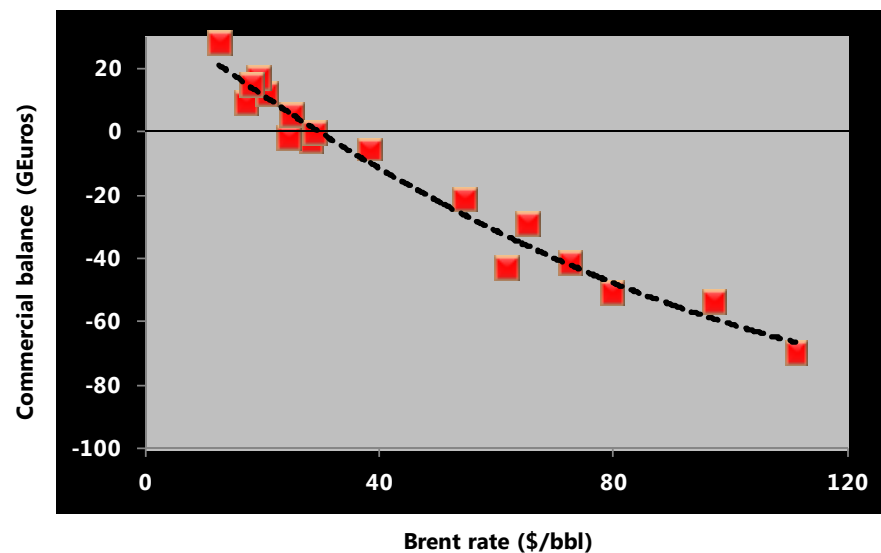


EUROPEAN SHALE OIL & GAS STAKES

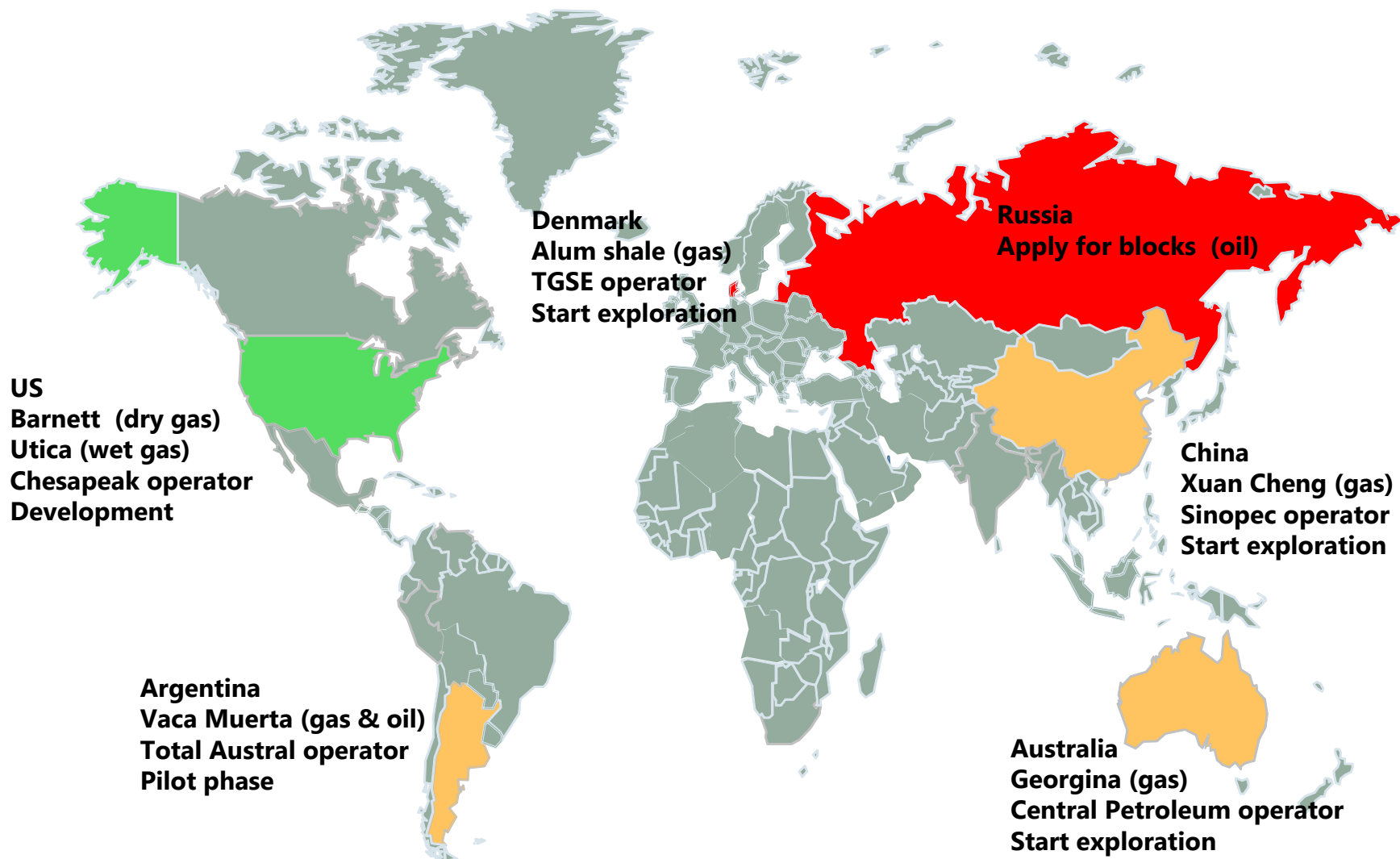


Country	Shale gas		Shale oil	Total
	TCF	Gboe	Gbbl	
Poland	148	25	3,3	28
France	137	23	4,7	28
Romania	51	9	0,3	9
Denmark	32	5	0	5
UK	26	4	0,7	5
Netherlands	26	4	2,9	7
Others	50	9	1	10
Total	470	80	12,9	93

French commercial balance

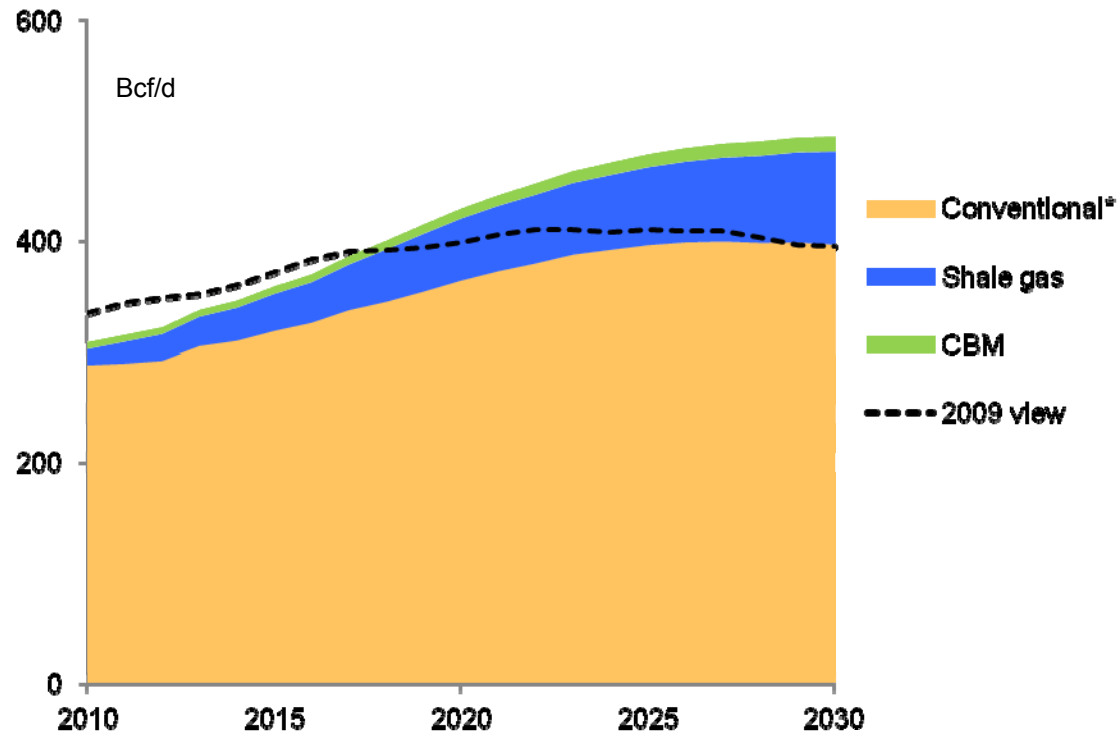


EXAMPLE OF A MAJOR PORTFOLIO: TOTAL SHALE OIL & GAS STAKES

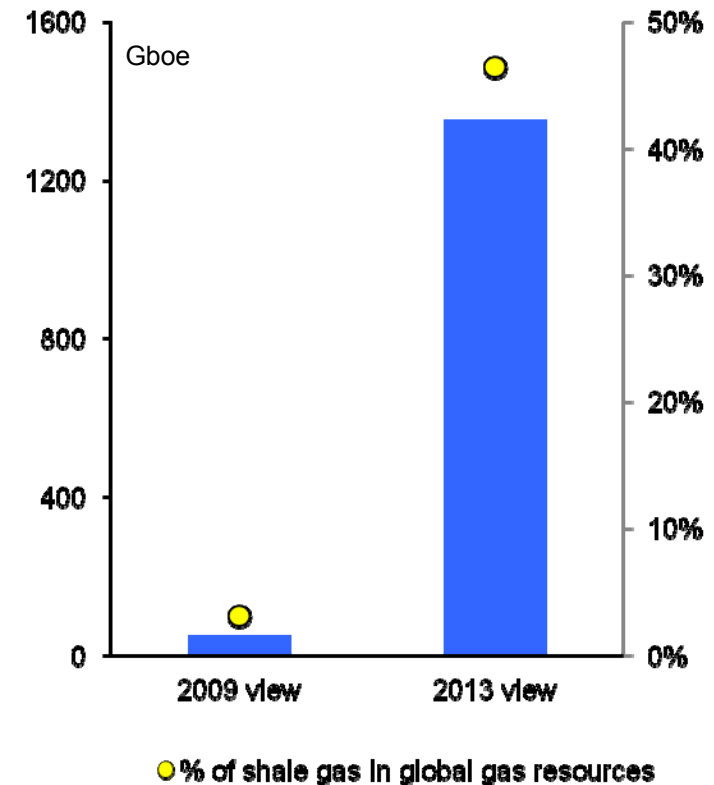


IMPACT ON GLOBAL GAS SUPPLY: SPECTACULAR INCREASE WIDELY DRIVEN BY SHALE GAS...

Global gas production potential



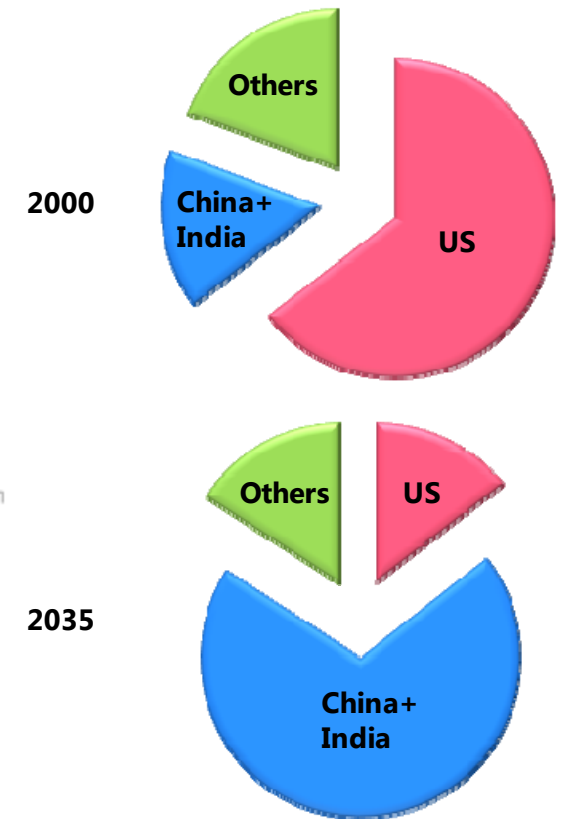
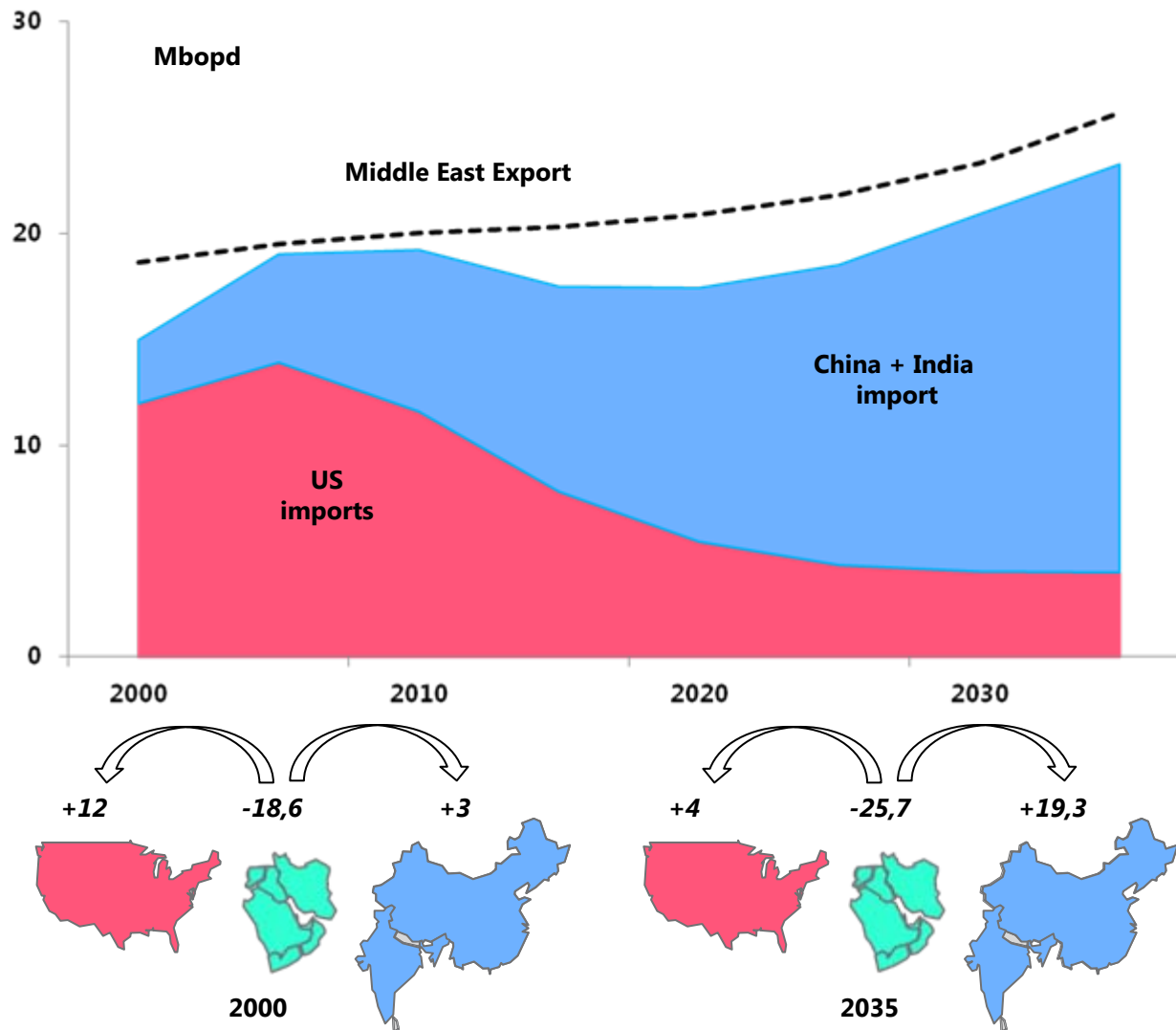
Shale gas resources**



* incl. tight gas

** Unriksed ultimate resources

IMPACT ON OIL EXCHANGES : A SWITCH US VS FAR EAST



Source : BP outlook 2013 and IEA outlook 2012

IMPACT ON LNG EXCHANGES

LNG market 2012 : 250 Mtons

Production (Mtons)			Consumption (Mtons)		
Qatar	75	31%	Japan	79	33%
Malaysia	25	10%	Korea	36	15%
Indonesia	21	9%	Uk	19	8%
Australia	19	8%	Spain	17	7%
Nigeria	19	8%	China	13	5%
Trinidad	13,9	6%	India	13	5%
Other	68,6	28%	Other	66	27%
Total	242	100%	Total	242	100%

LNG US export

- ✓ 20 M tons 2020
- ✓ 40 Mtons 2025
- ✓ 90 Mtons 2035

Consequences

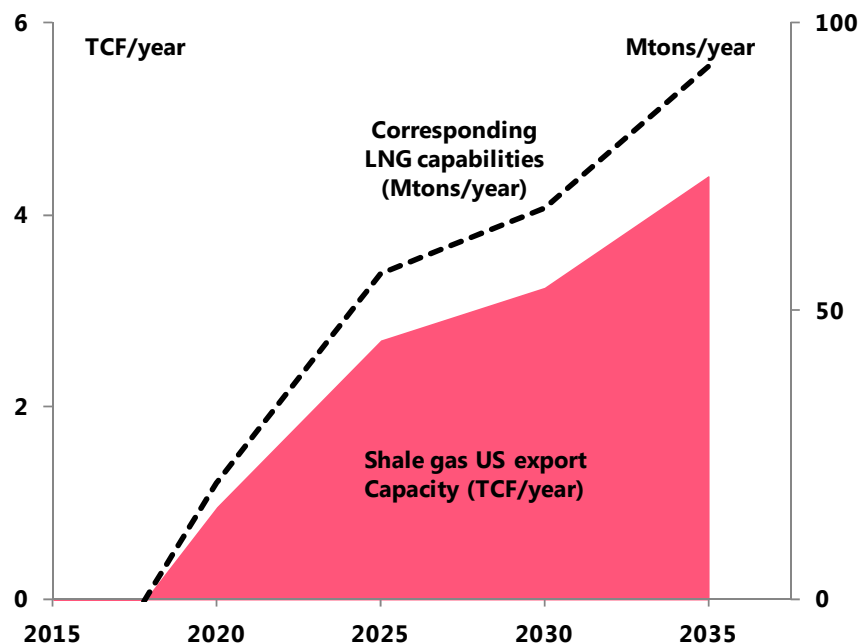
- ✓ Flow to China & India
- ✓ Impact on LNG prices
- ✓ Risk of surproduction

LNG market 1990 : 50 Mtons, 2000 : 100 Mtons

EIA US forecasts 2005 for 2010 = 23% of the world market

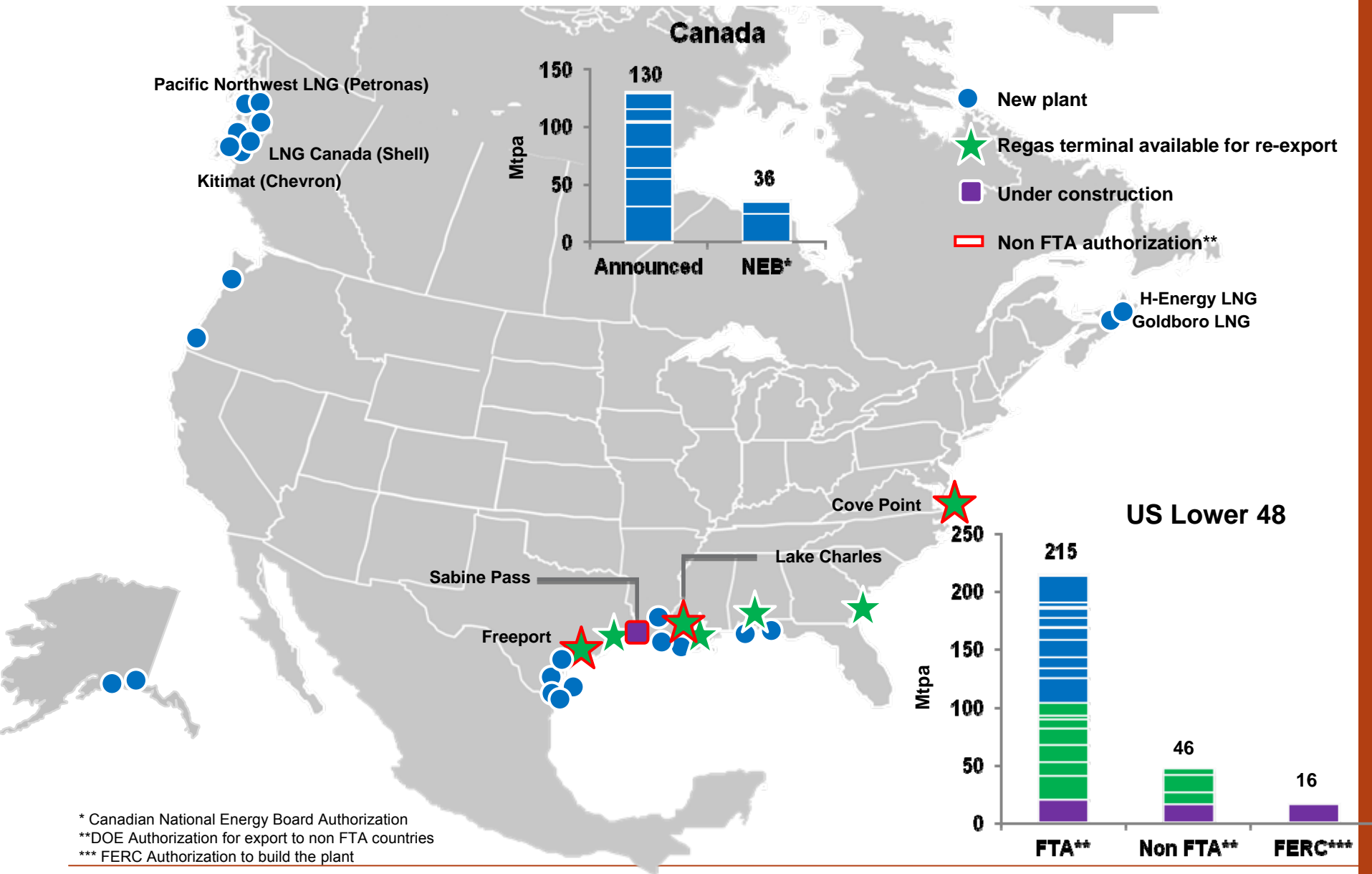
LNG market 2012 : 250 Mtons

US LNG = 2,4% of the world market



NORTH AMERICAN LNG EXPORTS FIRMING UP...

PROJECTS & APPROVALS OVERVIEW



PEAK OIL AND PEAK GAS : CONVENTIONAL RESERVES ONLY

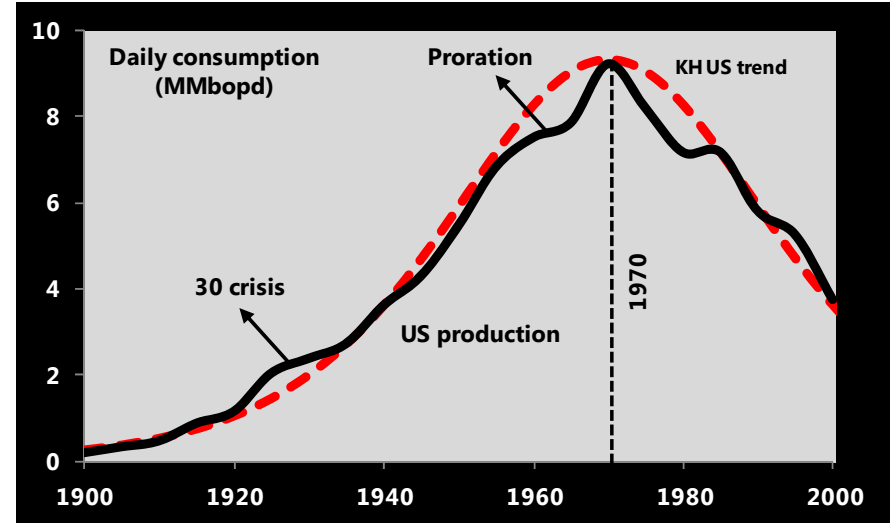
$$P(t) = \frac{2P_m}{1 + \cosh[-b(t - t_m)]}$$

P_m and t_m are time and production at the peak

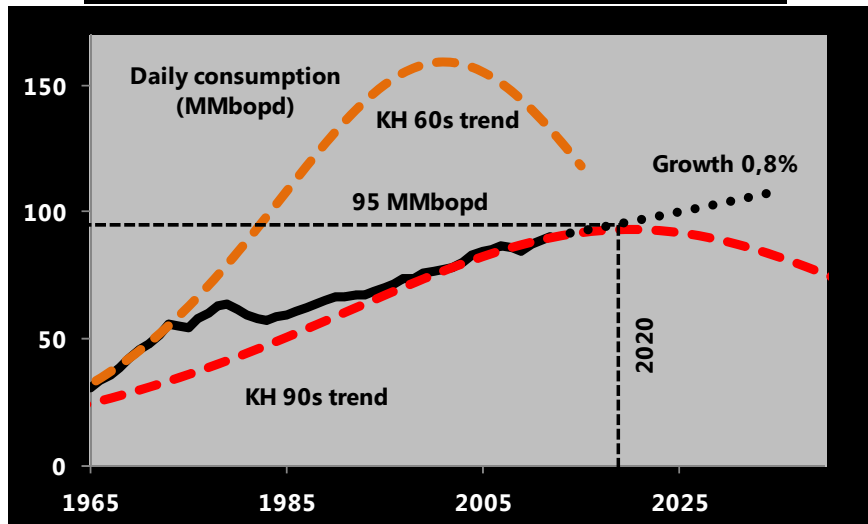
$$P_m = \frac{Ub}{4}$$

U are the ultimate reserves

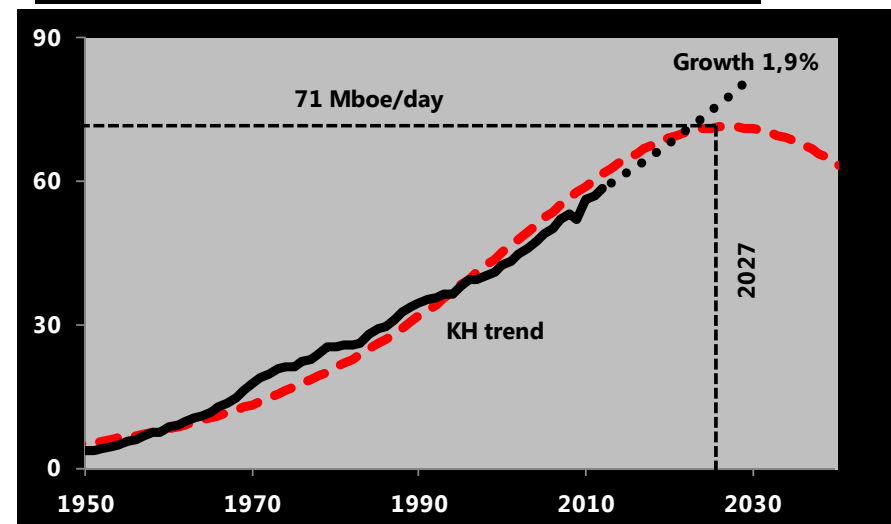
US peak gas w/o unconventional



World peak oil w/o unconventional

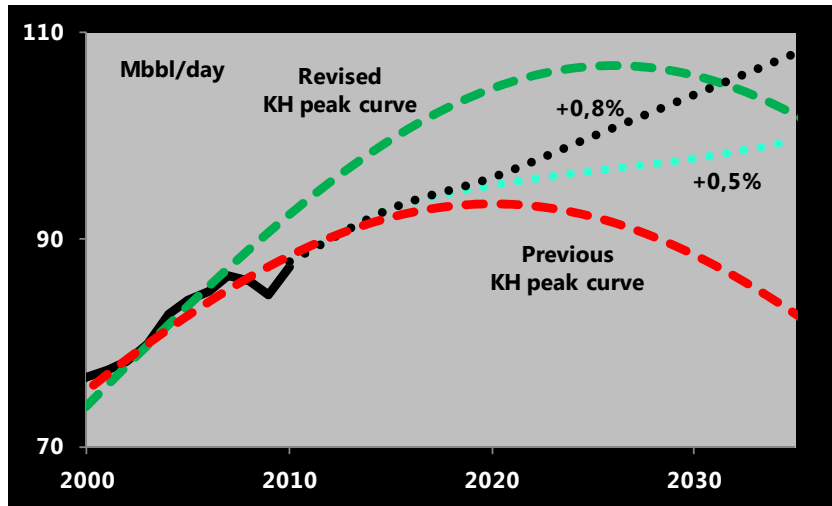


World peak gas w/o unconventional

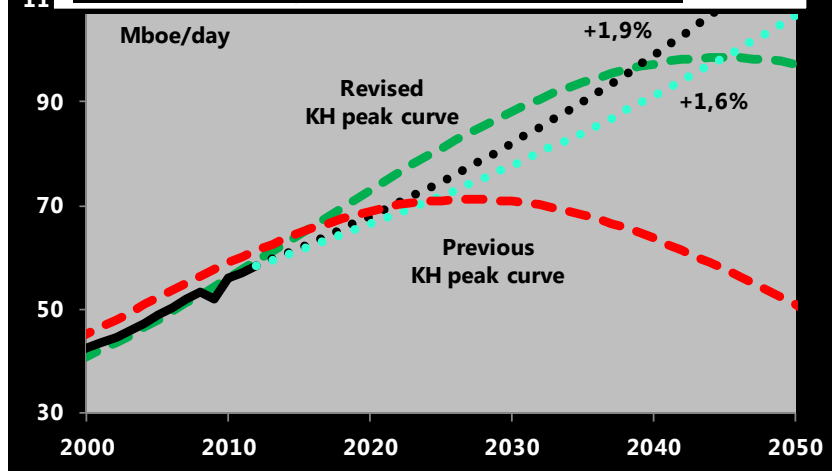


NOTIONAL OIL AND GAS PEAKS WITH UNCONVENTIONAL

World peak oil w/ unconventional



World peak gas w/ unconventional



Peak oil = +10 yrs

Peak gas = + 20 yrs

CONCLUSIONS

- ✓ **Spectacular increase of global Gas supply widely driven by shale gas...**
- ✓ **Extent and pace of shale gas (and tight oil) development in North America are impressive, with following consequences:**
 - ✓ US exporting LNG and reducing massively oil exports
 - ✓ An oil flux from Middle East to India & China
- ✓ **Resources outside North America are potentially huge, but their development should not be as fast as in USA (starting with Russia)**
- ✓ **Unconventional boom impact international crude and LNG markets but high prices environment remain most probable in the long term given the expected demand growth (Oil prices expected quite stable : 100 to 120 \$/bbl)**
- ✓ **Unconventional resources are a “game changer”**
 - ✓ Hydrocarbon resources perceived as less scarce than before
 - ✓ Many new opportunities for IOCs outside oil & gas historical areas
 - ✓ Lower dependency (or even independency) of North America on Middle East and Russia resources
 - ✓ Cheap energy price giving a strong competitive advantage to the American industry