How and for how long

it is possible to secure a sustainable growth of oil supply

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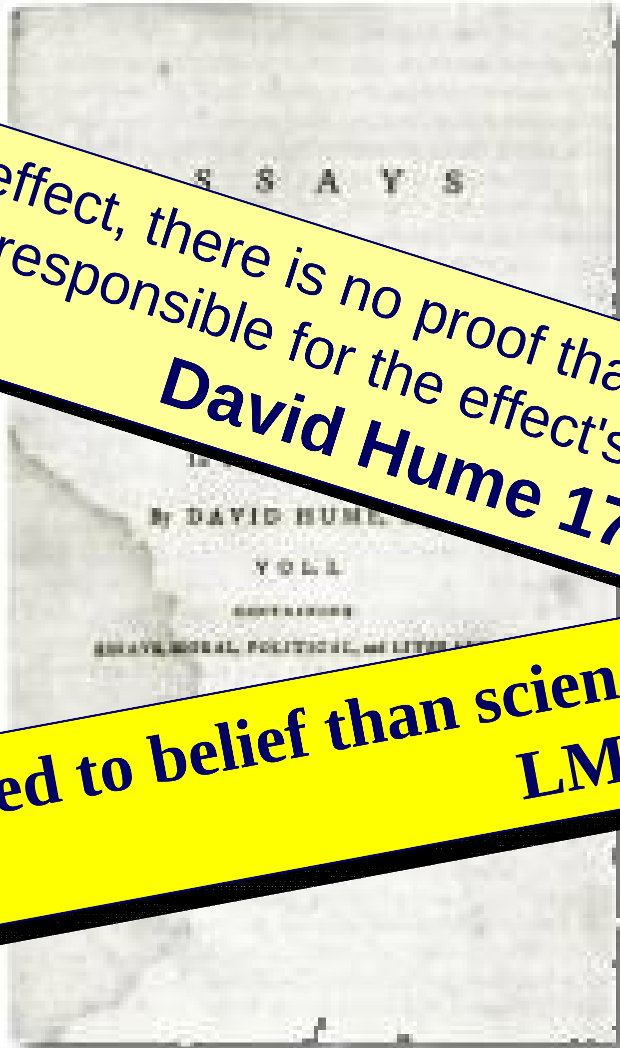
“even though the cause preceded the effect, there is no proof that the cause is responsible for the effect's occurrence”

David Hume 1711 - 1776

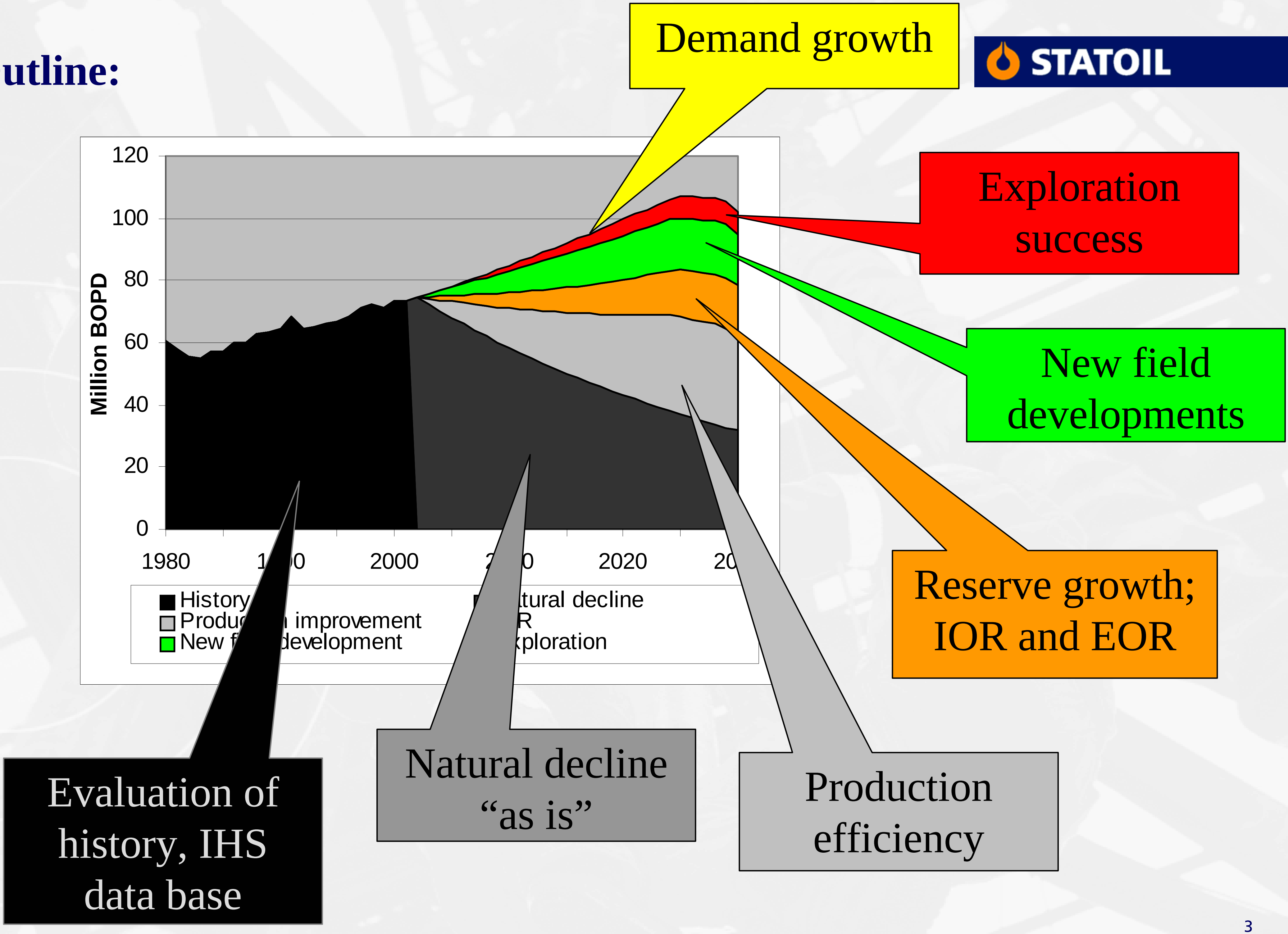


Prediction is more often related to belief than science

LMM

To be a little bit philosophical

Outline:



Demand growth
Exploration success
New field developments
Reserve growth; IOR and EOR
Production efficiency
Natural decline "as is"
Evaluation of history, IHS data base
120
100
80
60
40
20
0
Million BOPD
1980
2000
2020
History
Natural decline
Production improvement
New field development
Exploration

The economic history of the last century is preserved in the annual rings of oil production growth

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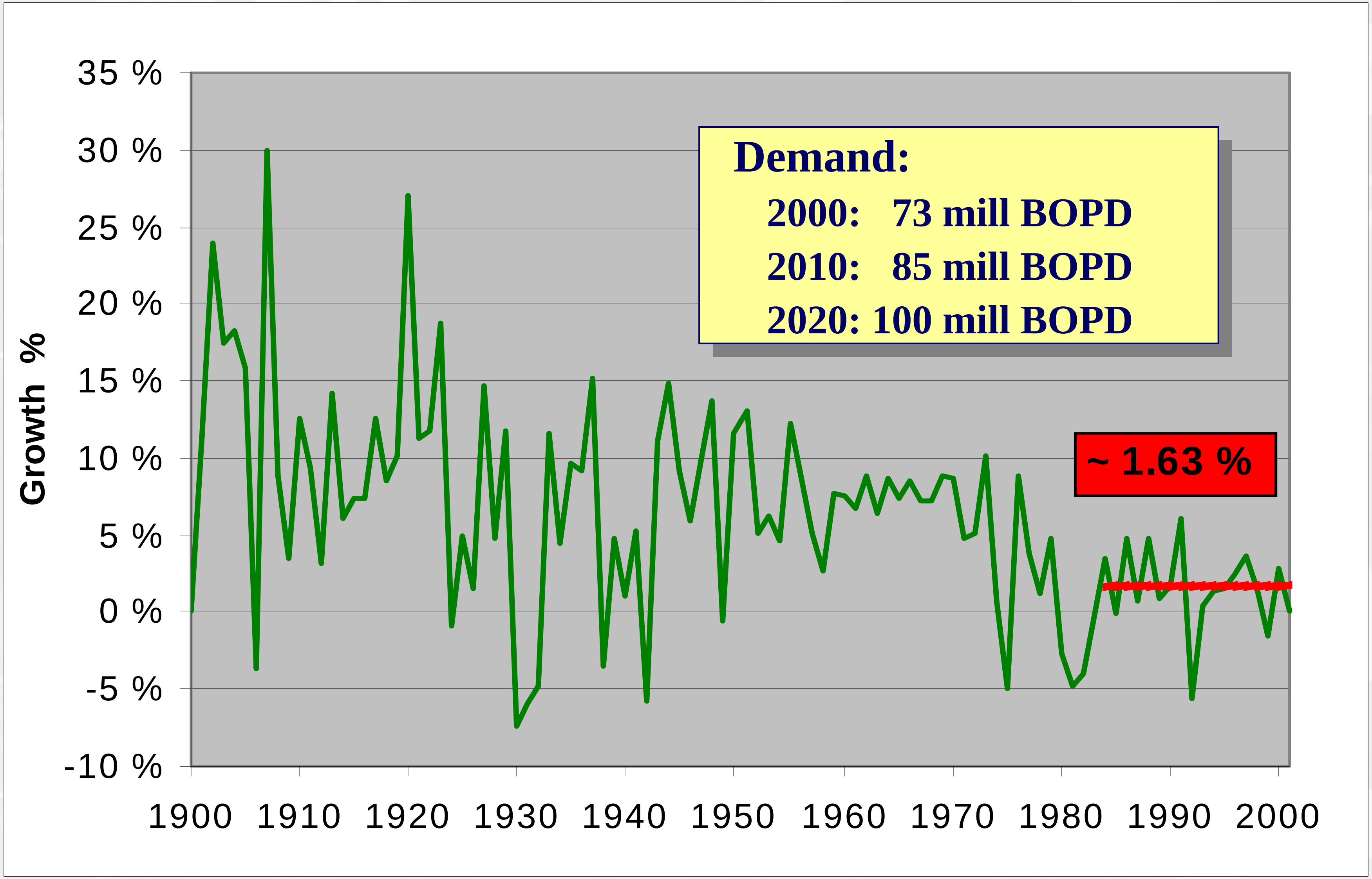
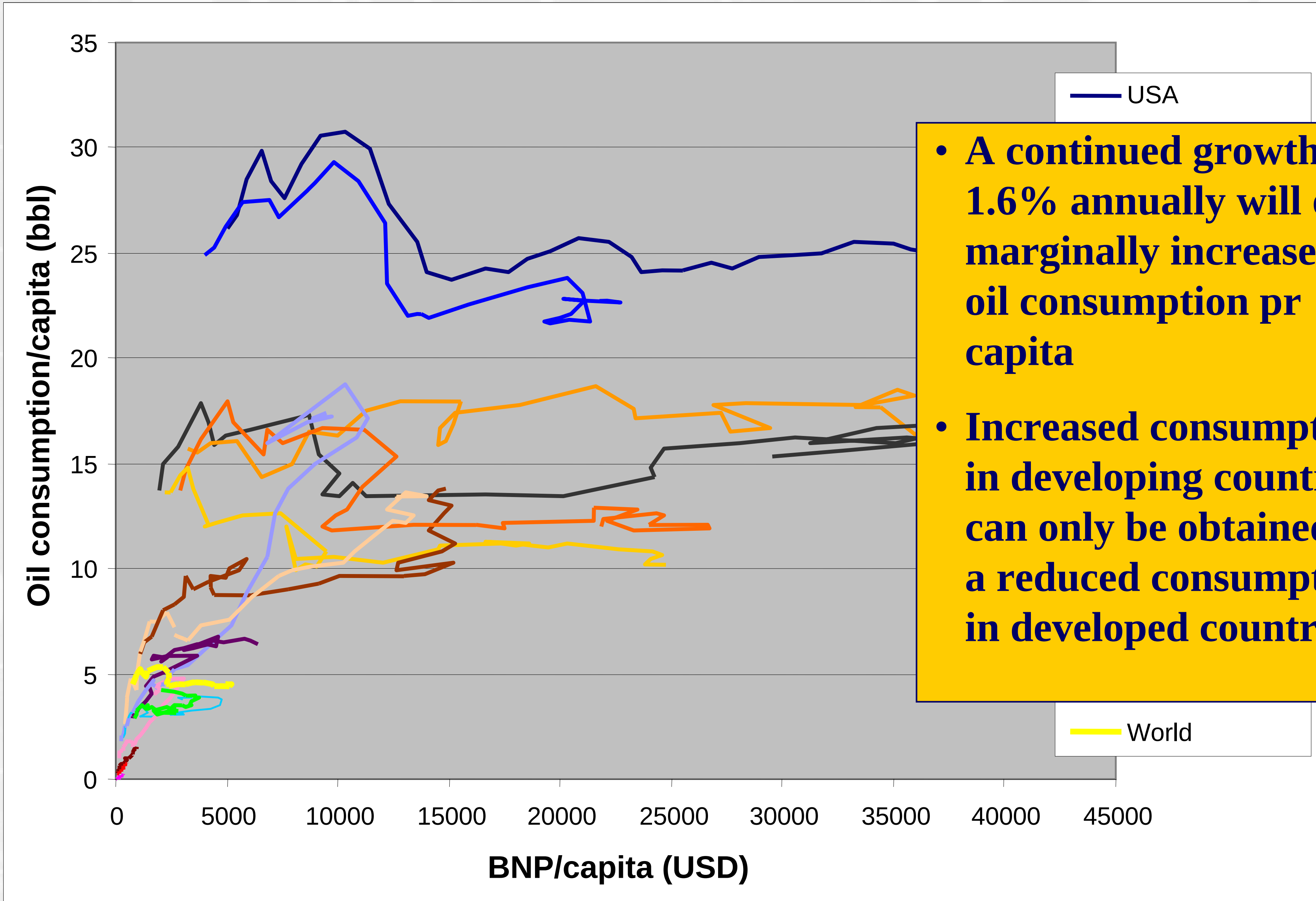
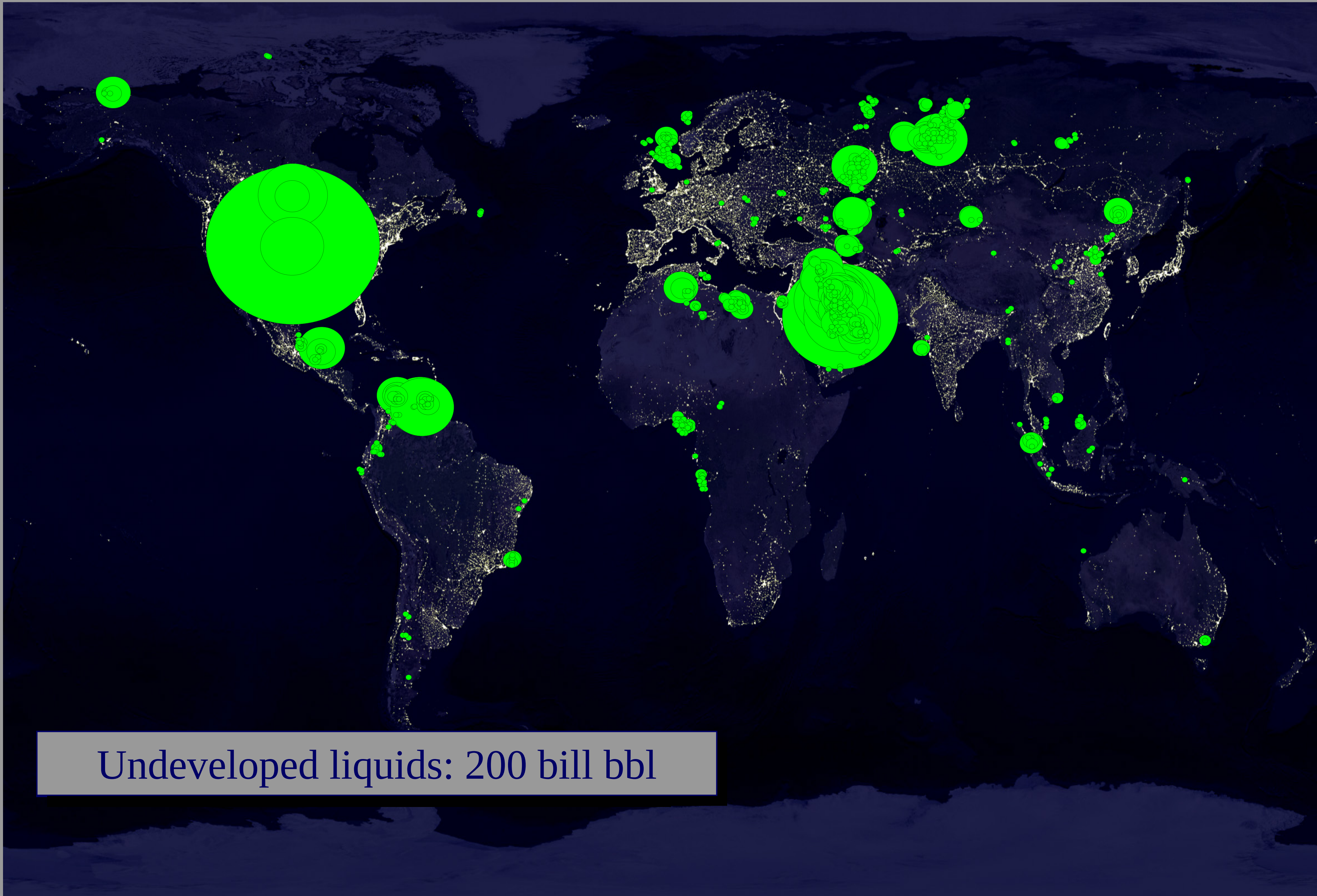


Sustainable development – clash of the civilisations?



- **A continued growth of 1.6% annually will only marginally increase the oil consumption pr capita**
- **Increased consumption in developing countries can only be obtained by a reduced consumption in developed countries**


Undeveloped liquids: 200 bill bbl

Stockpiling from the “As is Agreement” in 1928 and harvesting after the “79 –81 Oil Shock”

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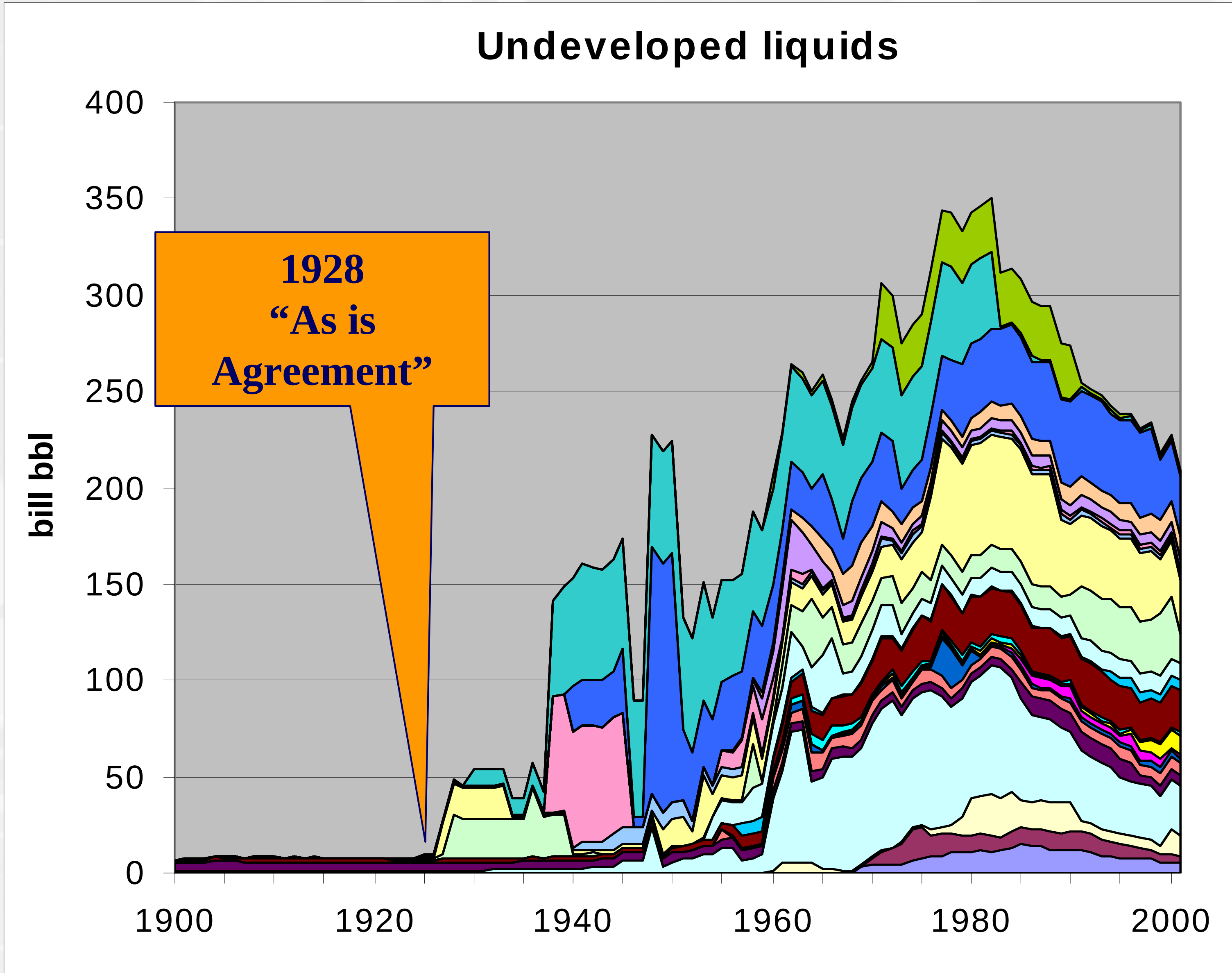
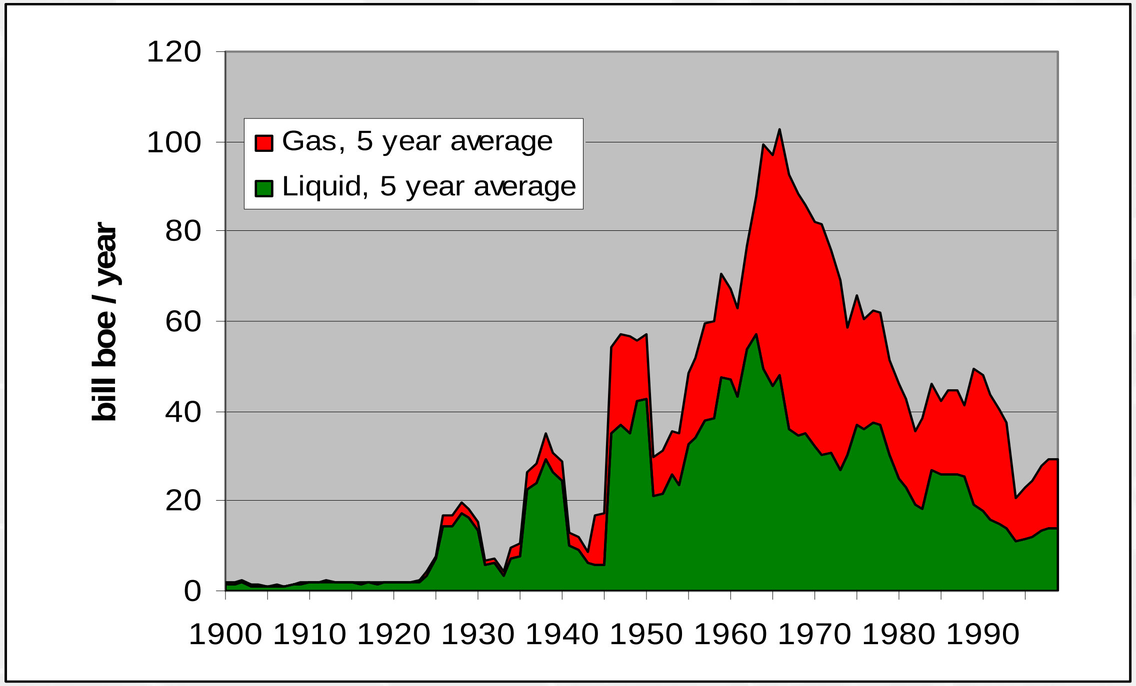
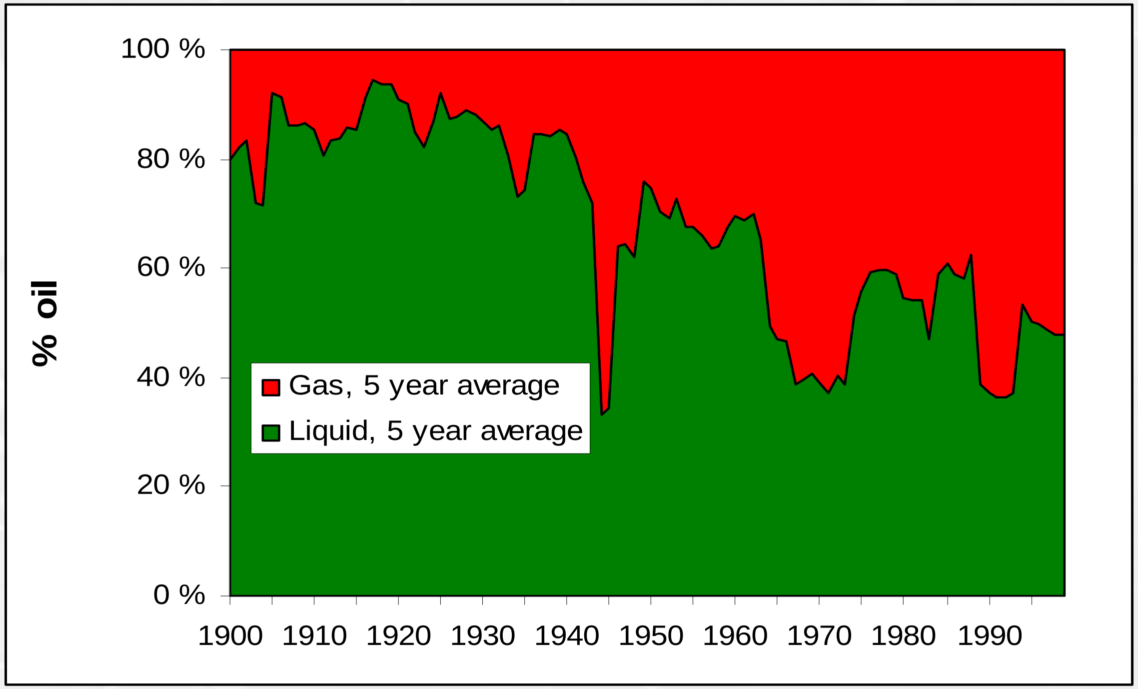


~200 bill bbl

The Middle East contains more than 50% of all undeveloped liquids.

25% in Russia, Kazakhstan, Angola and Nigeria





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Decreasing volumes by exploration, larger proportion of gas

- Oil resources added through exploration additions reached a peak in the 1960's
- The proportion of gas relative to oil has increased
- Currently the percentage of oil discovered relative to total hydrocarbon volume is less than 50%

The overall technical exploration success is increasing, for oil it have stabilized close to 20%

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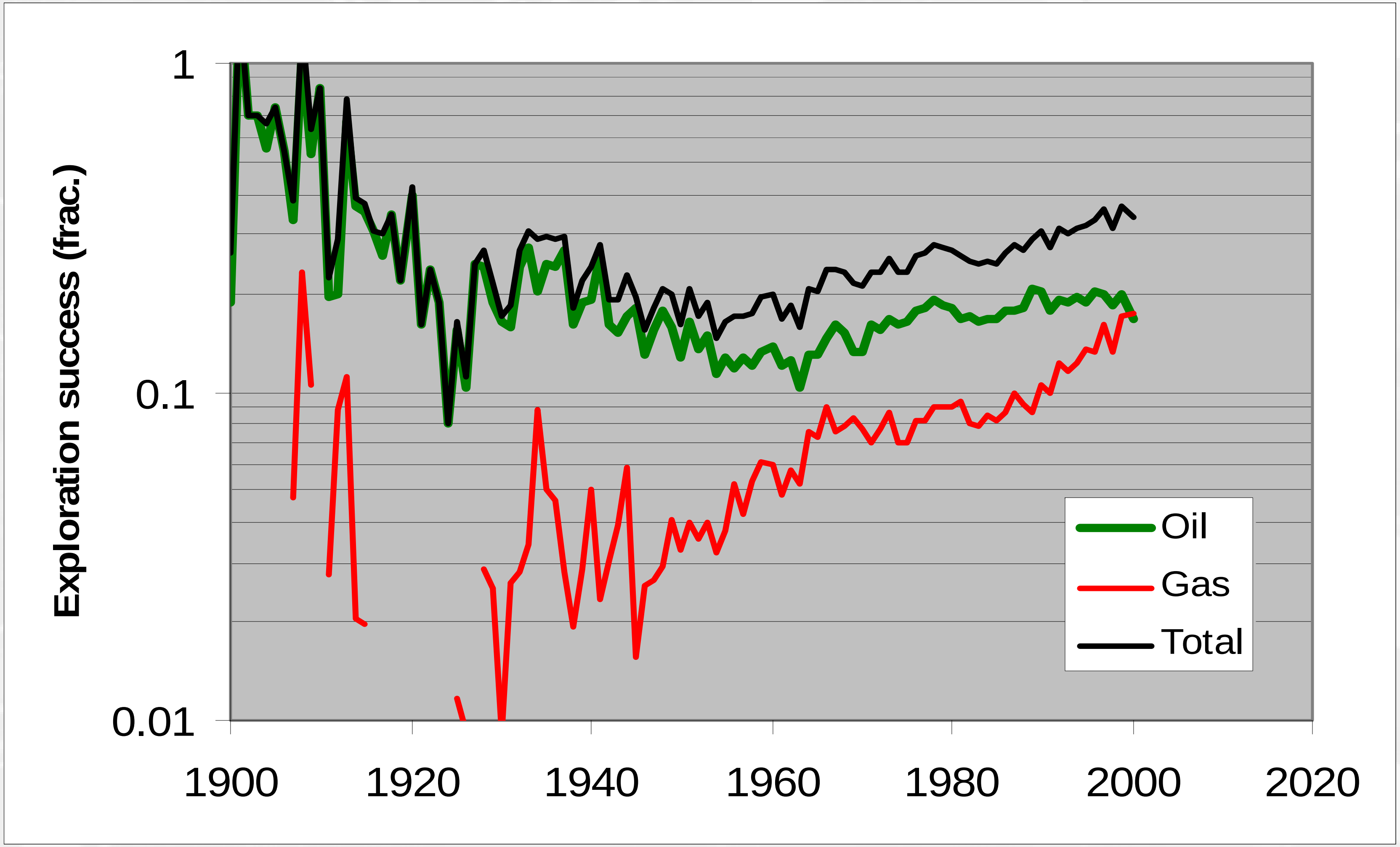
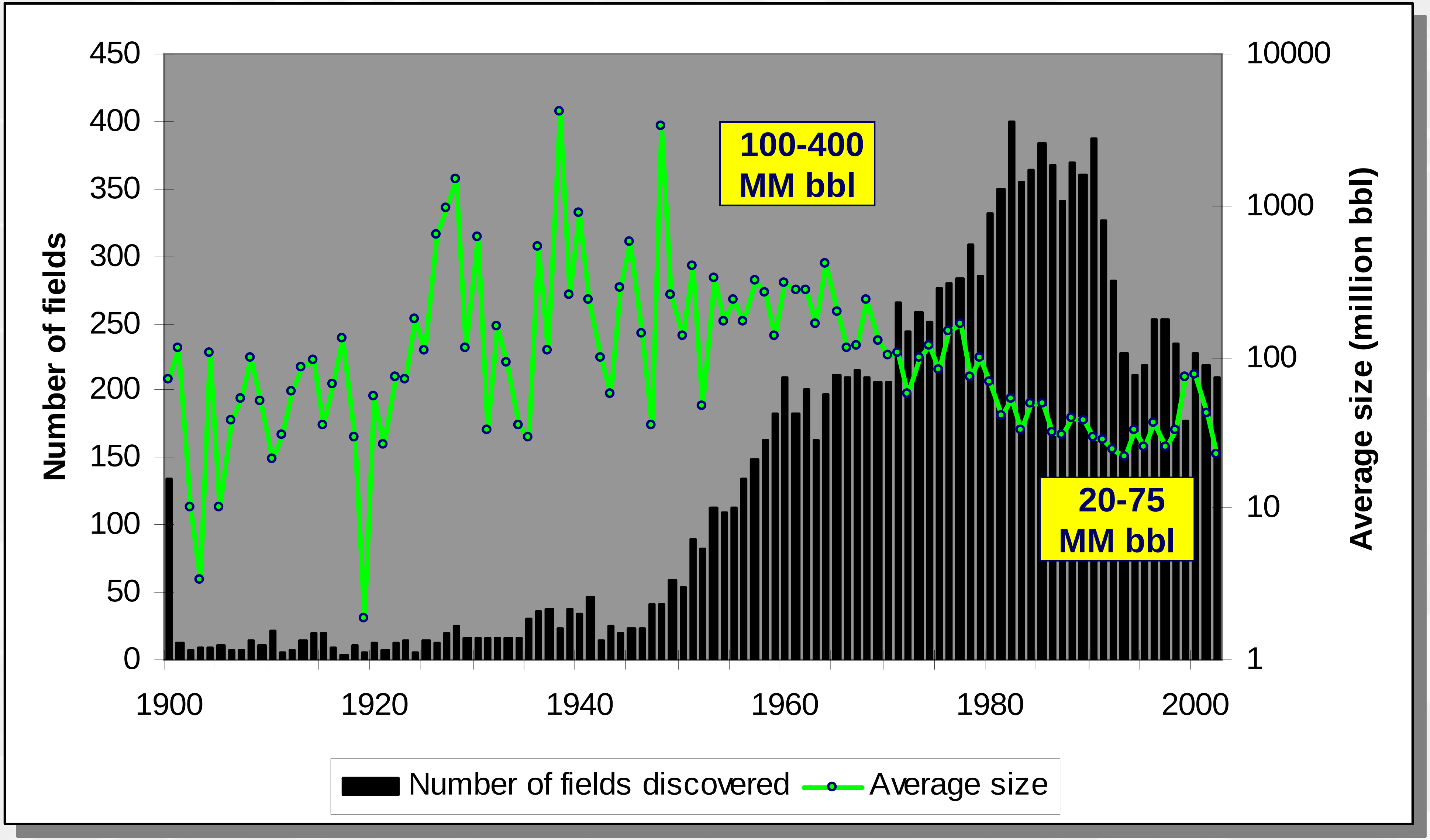


Based on wildcat wells only

The declining exploration additions are strongly related to reduction of average field size



A very poor exploration performance, extrapolates to an exploration potential of some 200 bill bbl

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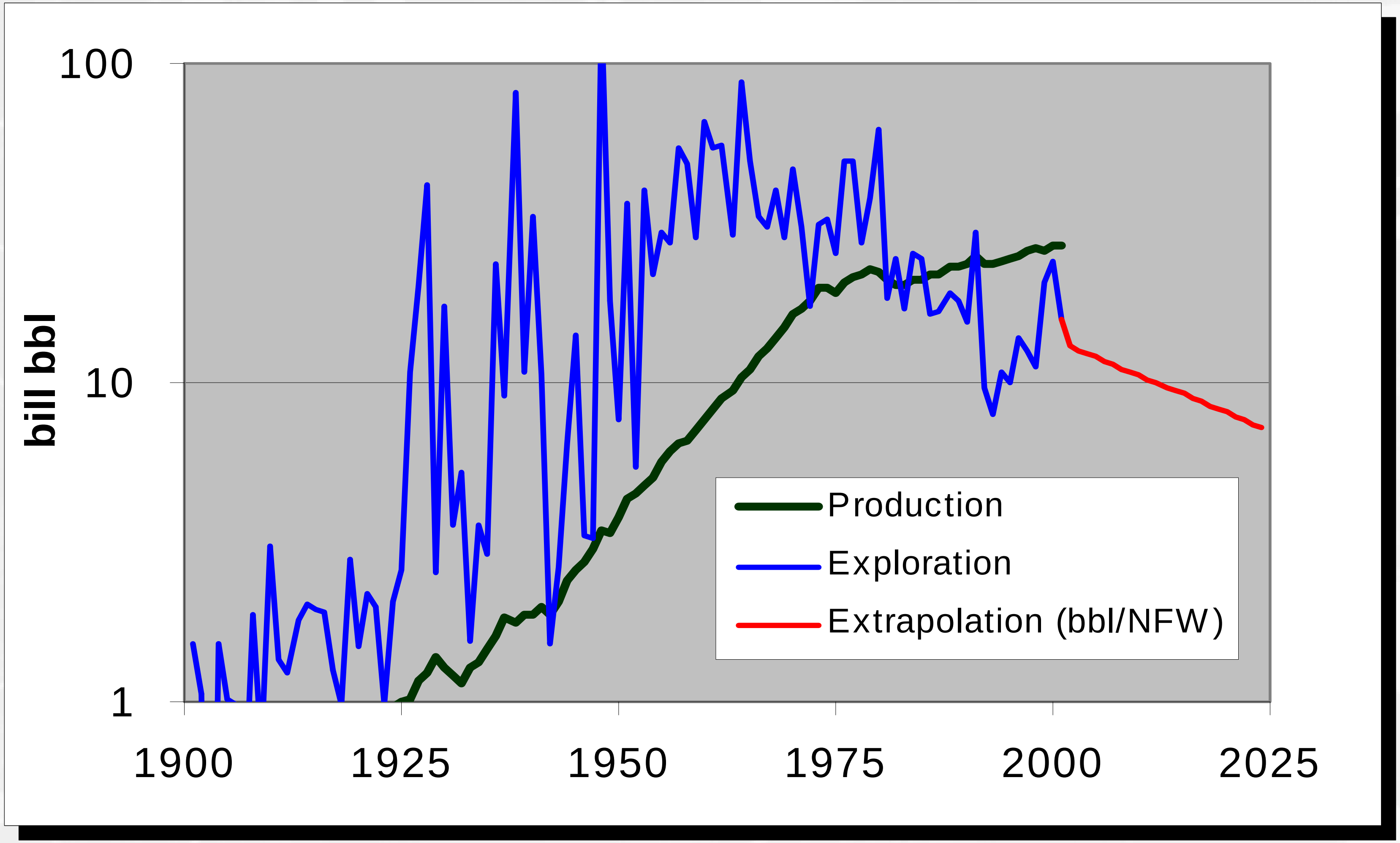
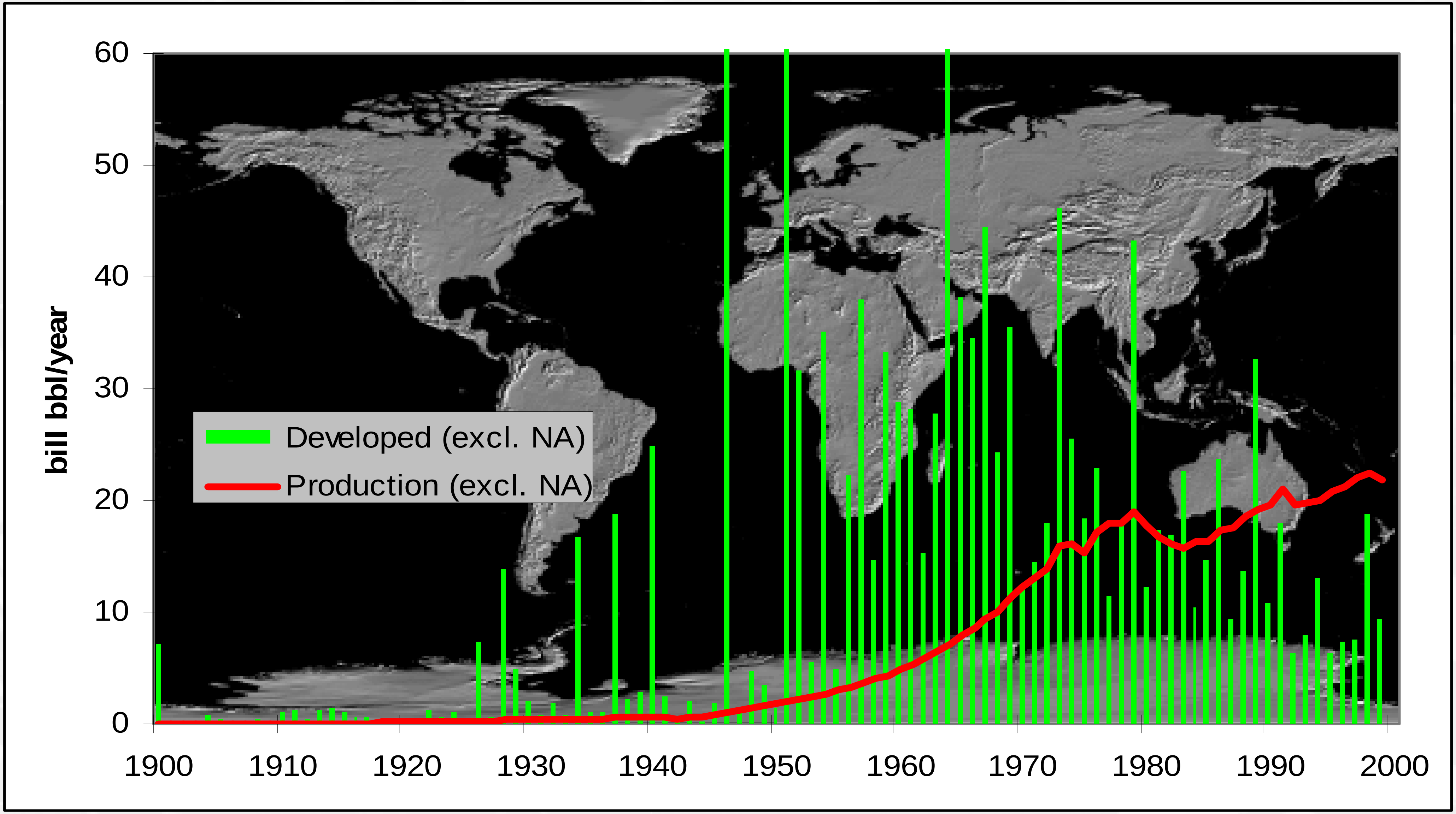


Adding 100 bill bbl for frontier basins gives a total of 300 bill bbl

The oil industry has under invested in new field developments for more than a decade



Production efficiency; dependent on reservoir quality, drainage methods, fiscal terms and regulations

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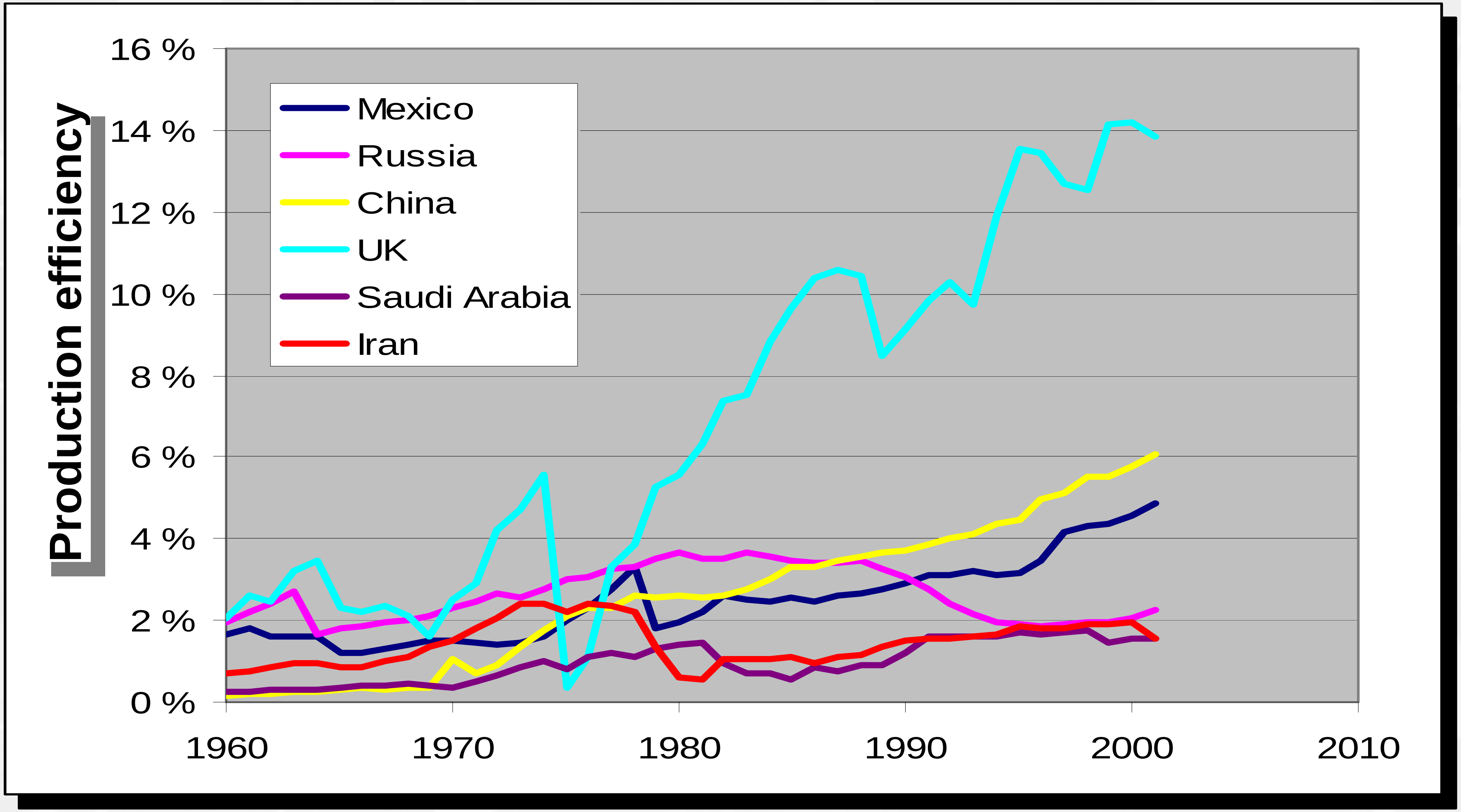

Production efficiency (PE) is a measure of the yearly outtake of remaining developed reserves

Increased production efficiency has allowed the oil industry to develop less oil than produced

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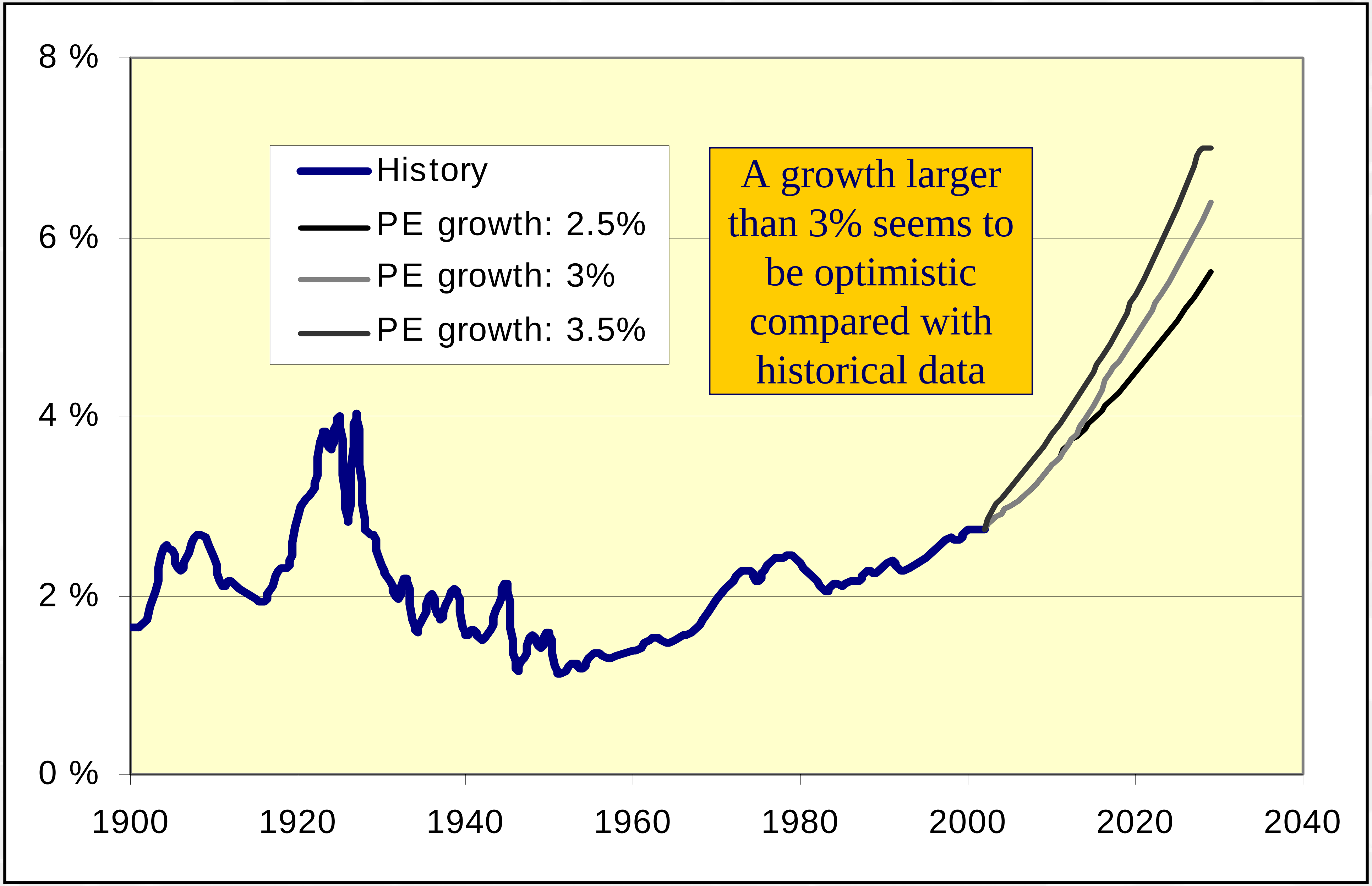
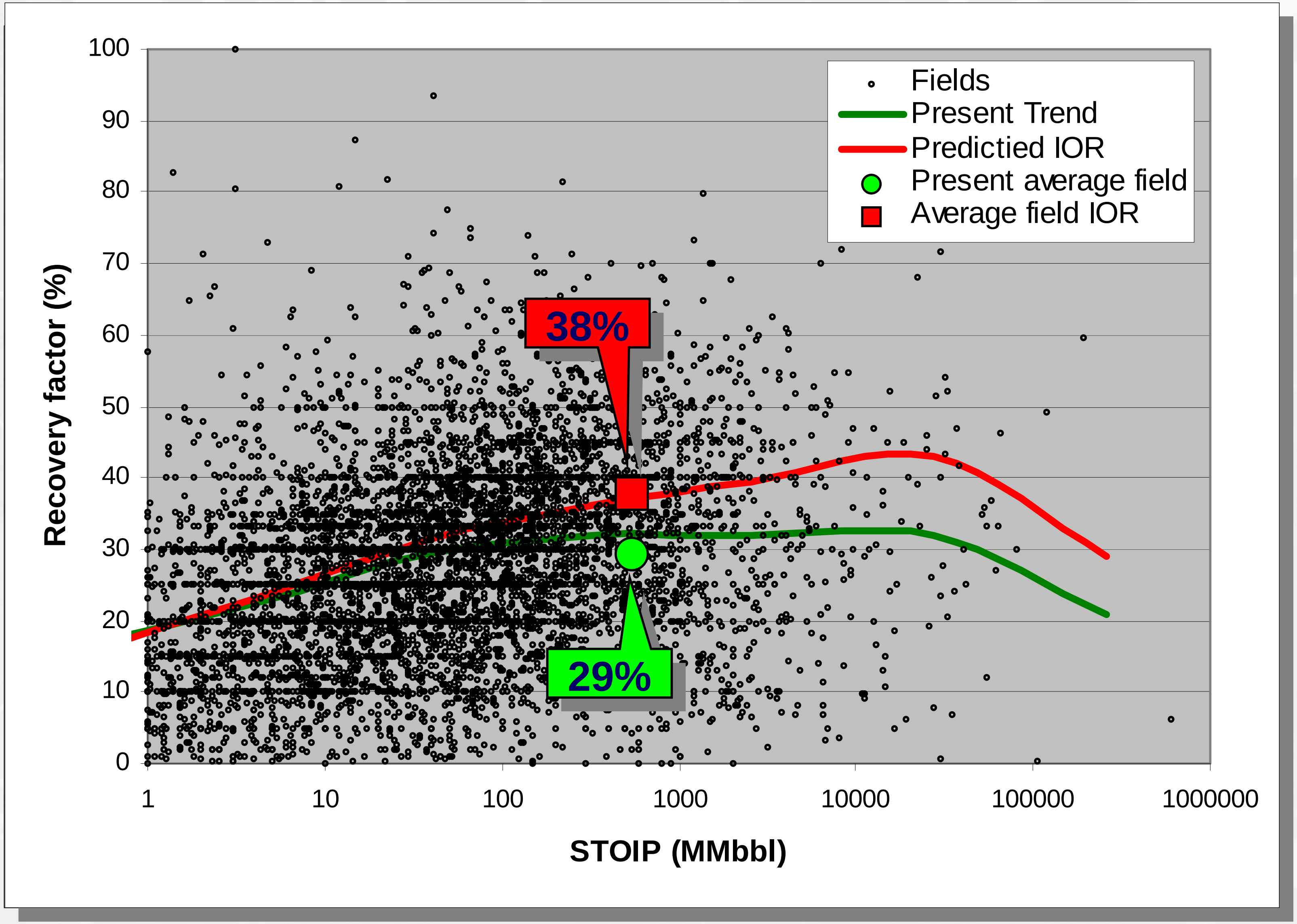


A significant reserve growth potential, 600–700 billion bbl



Increased production efficiency and reserve growth and will be the most critical issues regarding sustainable oil supply.

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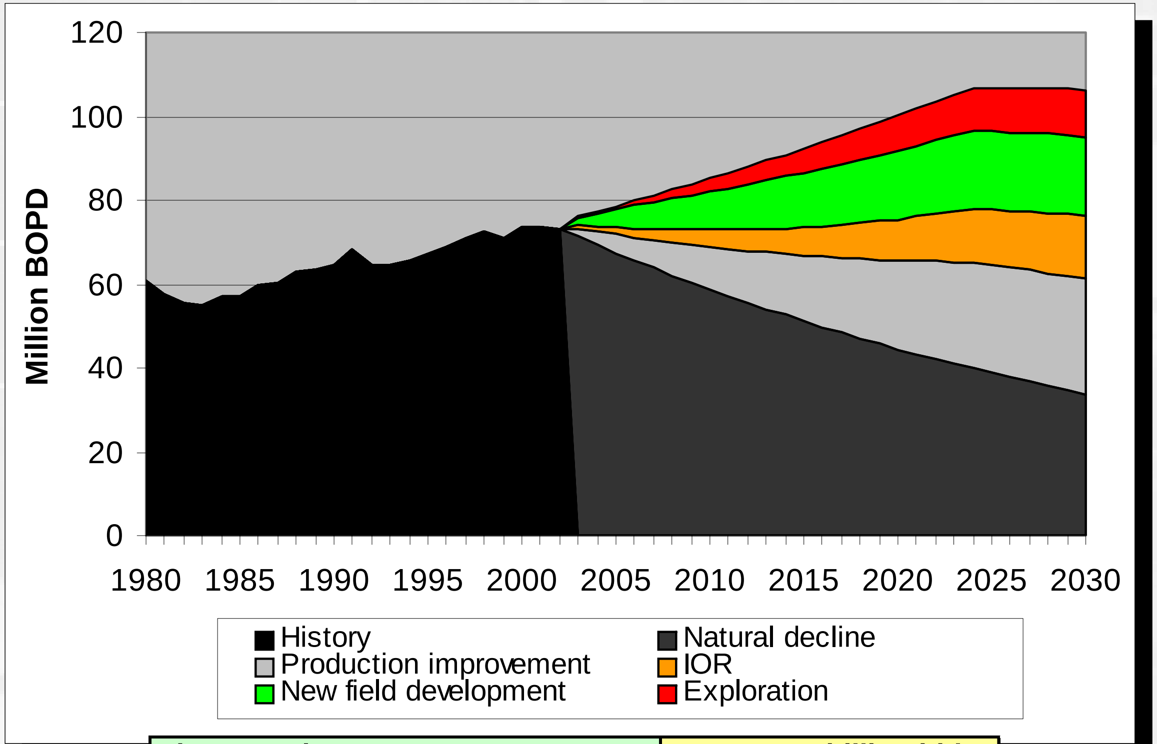
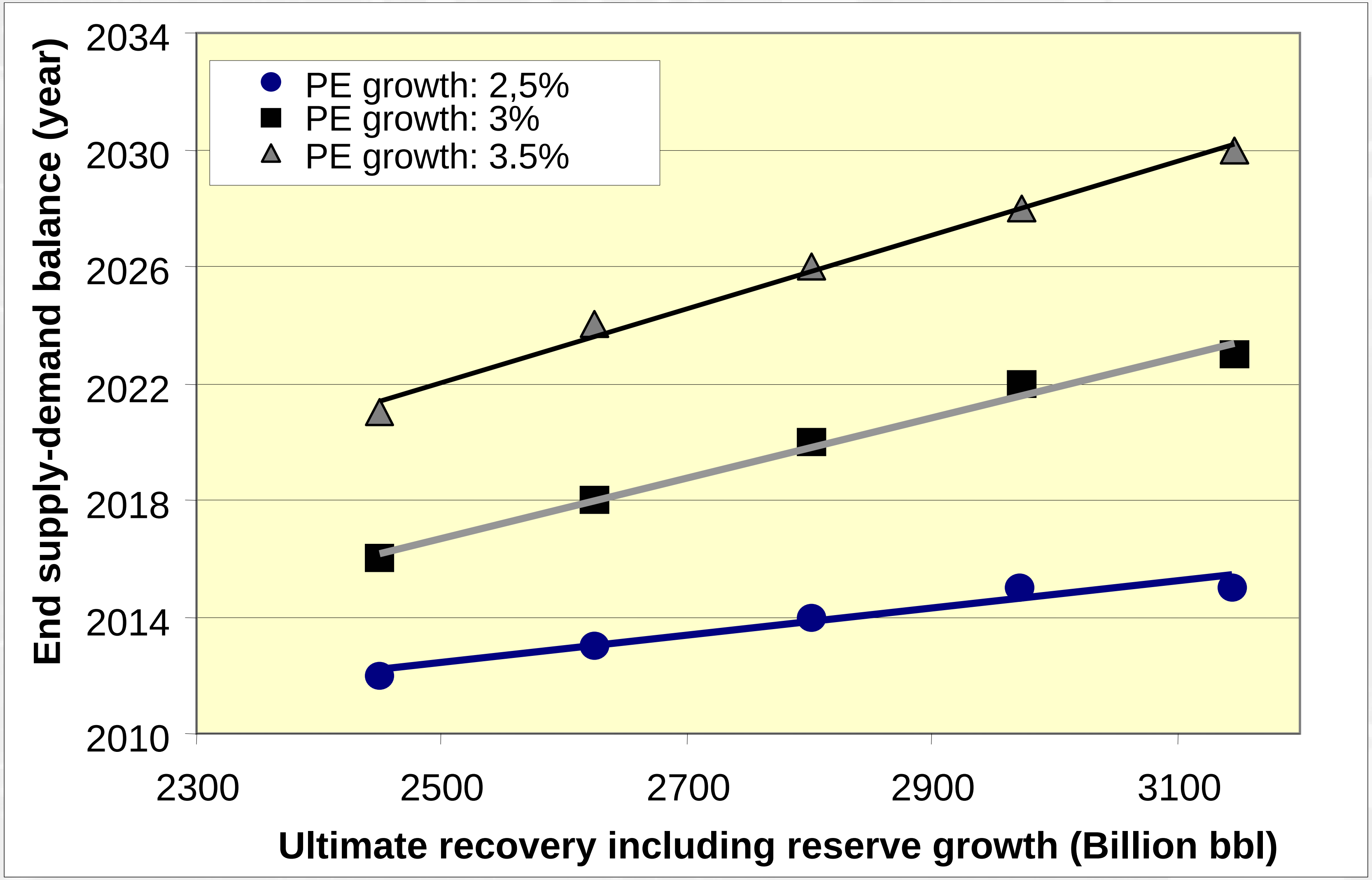


Discovered	2138	billion bbl
Ultimate	3143	billion bbl
Exploration potential	311	billion bbl
Improved oil recovery	693	billion bbl
Remaining discovered	1180	billion bbl
Remaining developed	980	billion bbl
Undeveloped	200	billion bbl
PE	2.9	%
PE growth	3.0	%
PE max	6.5	%
Spare production capacity	4.0	million BOPD

If we believe in reserve growth and reported reserves:

- Some 60% of additional oil production additions till 2010 will probably be due to increased production efficiency and improved oil recovery
- Exploration will only marginal add production

Without reserve growth, supply will be a challenge from 2010-15, including growth the challenge will be postponed to 2020-25.



Russia will be the major contributor to future production additions outside OPEC

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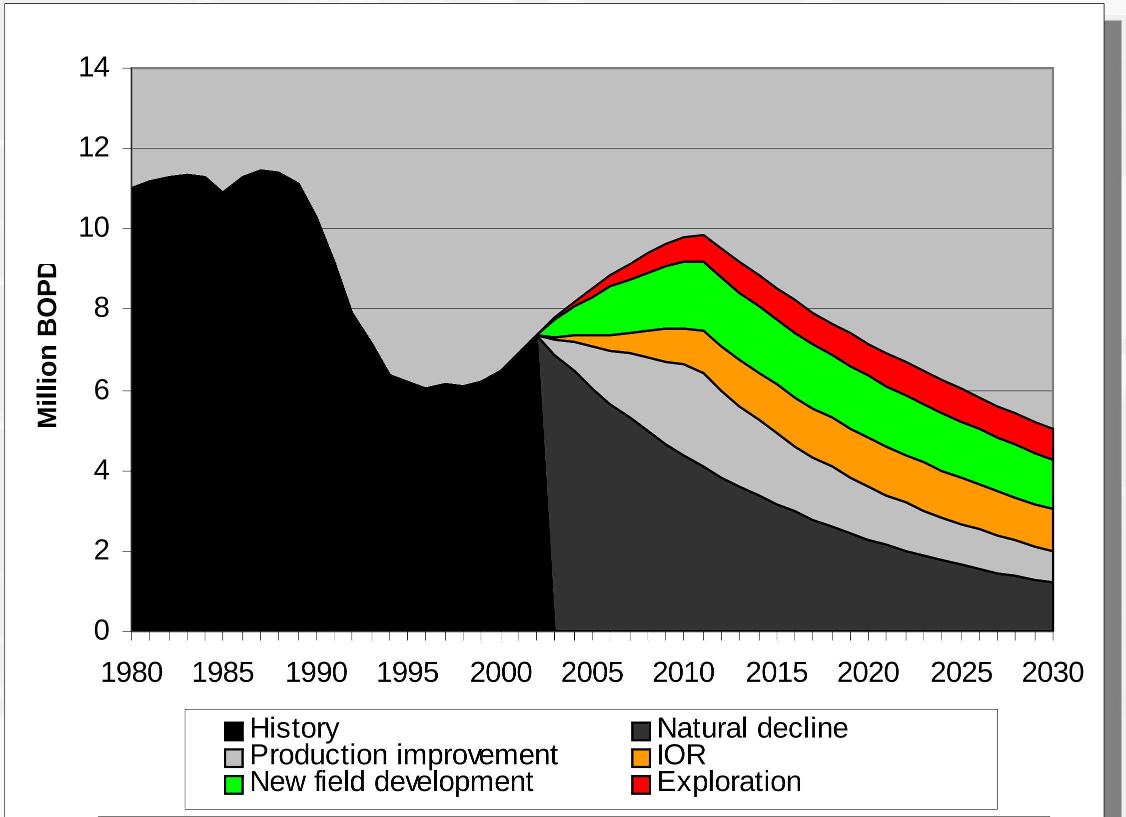

Discovered	182	bill bbl
Ultimate	240	bill bbl
Exploration potential	26	bill bbl
Improved oil recovery	37	bill bbl
Remaining discovered	59	bill bbl
Remaining developed	43	bill bbl
Undeveloped	17	bill bbl
Present production efficiency	6	%
Maximum production efficiency	10	%

- Russia is expected to produce at least some 9 million BOPD in 2010
- If their clamed reserves are correct (137 bill bbl), they may have the potential to produce up to 12-13 million BOPD

There will be a major shift in supply from non-OPEC to oil rich Middle East OPEC countries

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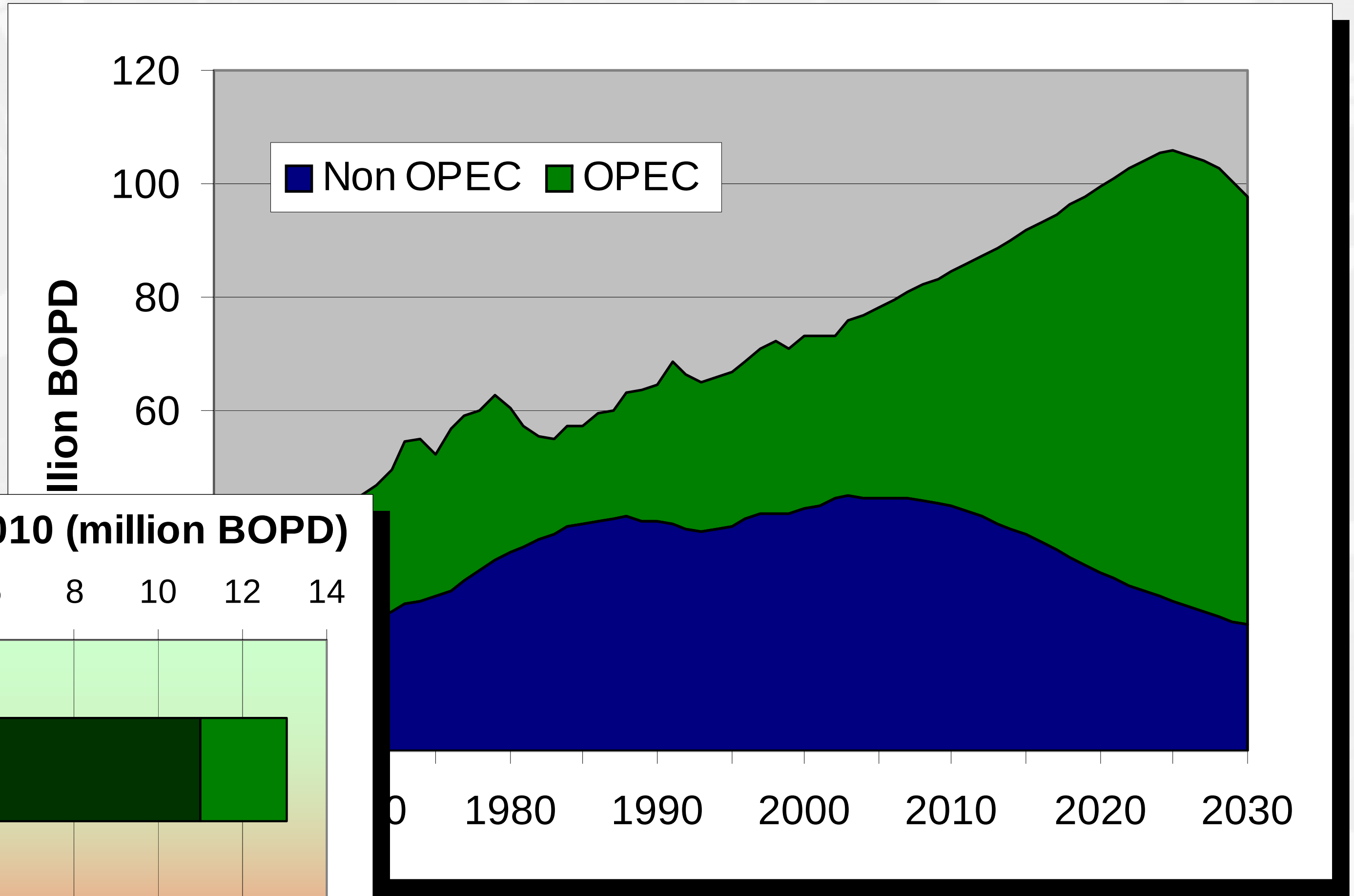

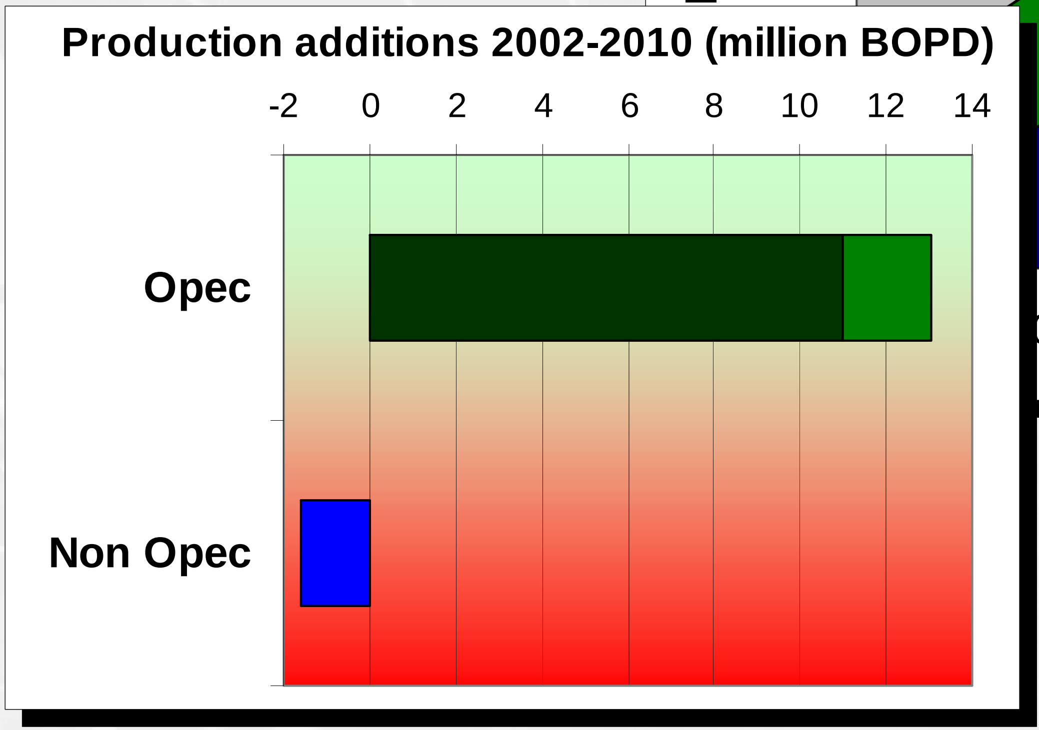

The maximum future production potential for non-OPEC countries may not exceed 45 million BOPD

Conclusions

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- For two decades, the exploration liquid additions have not counterbalanced production. The declining exploration additions are strongly related to reduction of average field size.
- The reserve growth potential or IOR is probably twice as high as the exploration potential.
- Some 60% of additional oil production additions in 2010 will probably be a result of increased production efficiency and reserve growth and will be the most critical issues regarding sustainable oil supply.
- Without reserve growth, supply will be a challenge from 2010-15, including growth the challenge will be postponed to 2020-25.
- Production additions due to exploration additions will not be of major importance before after 2010 due to the time lag from discovery to development.
- Within the decade there will be a major shift in supply from non-OPEC to oil rich Middle East OPEC countries. The only major exception will be Russia.

Summa sumarium:

It’s a question of money and the capabilities of reservoir and production engineers

Remaining, developed and undeveloped liquid

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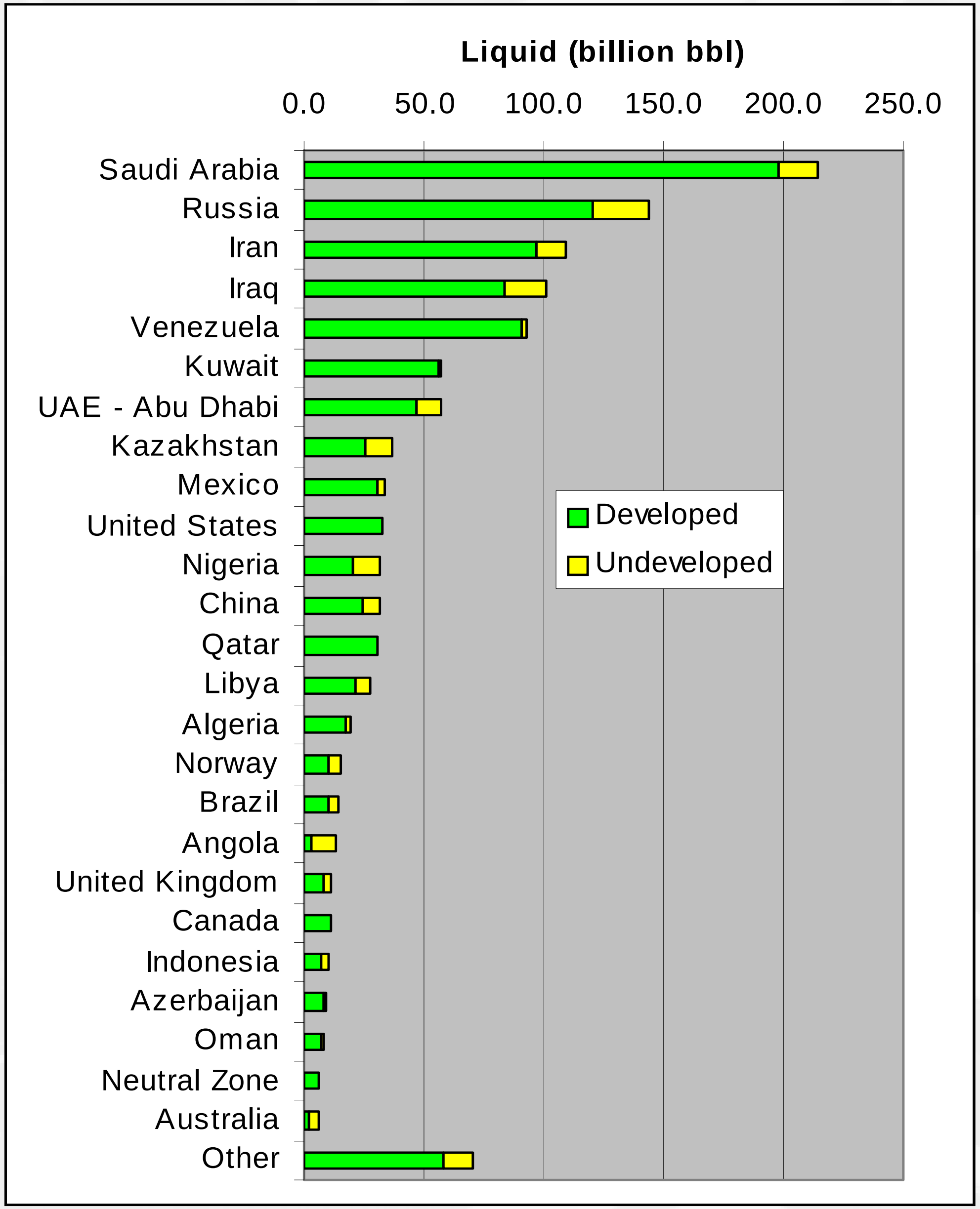
	Remaining	Developed	Undeveloped
Saudi Arabia	214.4	197.8	16.6
Russia	144.1	120.3	23.8
Iran	109.5	96.8	12.7
Iraq	101.2	83.6	17.5
Venezuela	93.0	90.4	2.6
Kuwait	57.4	55.6	1.7
UAE - Abu Dhabi	56.7	47.3	9.4
Kazakhstan	36.7	25.5	11.2
Mexico	33.3	30.6	2.7
United States	32.9	32.9	
Nigeria	32.0	20.2	11.9
China	31.7	24.5	7.2
Qatar	31.1	30.9	0.2
Libya	28.0	21.6	6.4
Algeria	19.6	17.2	2.4
Norway	15.8	10.6	5.2
Brazil	13.8	10.1	3.7
Angola	13.2	3.5	9.8
United Kingdom	11.3	7.9	3.4
Canada	11.2	11.2	
Indonesia	10.5	7.3	3.2
Azerbaijan	9.4	8.0	1.4
Oman	8.4	7.1	1.4
Neutral Zone	6.6	5.9	0.6
Australia	5.9	2.4	3.5
Other	70.2	57.8	12.5
Total	**1198**	**1027**	**171**



The size and quality of undeveloped field resource base is deteriorating