

***How and for how long  
it is possible to secure a sustainable growth of oil  
supply***

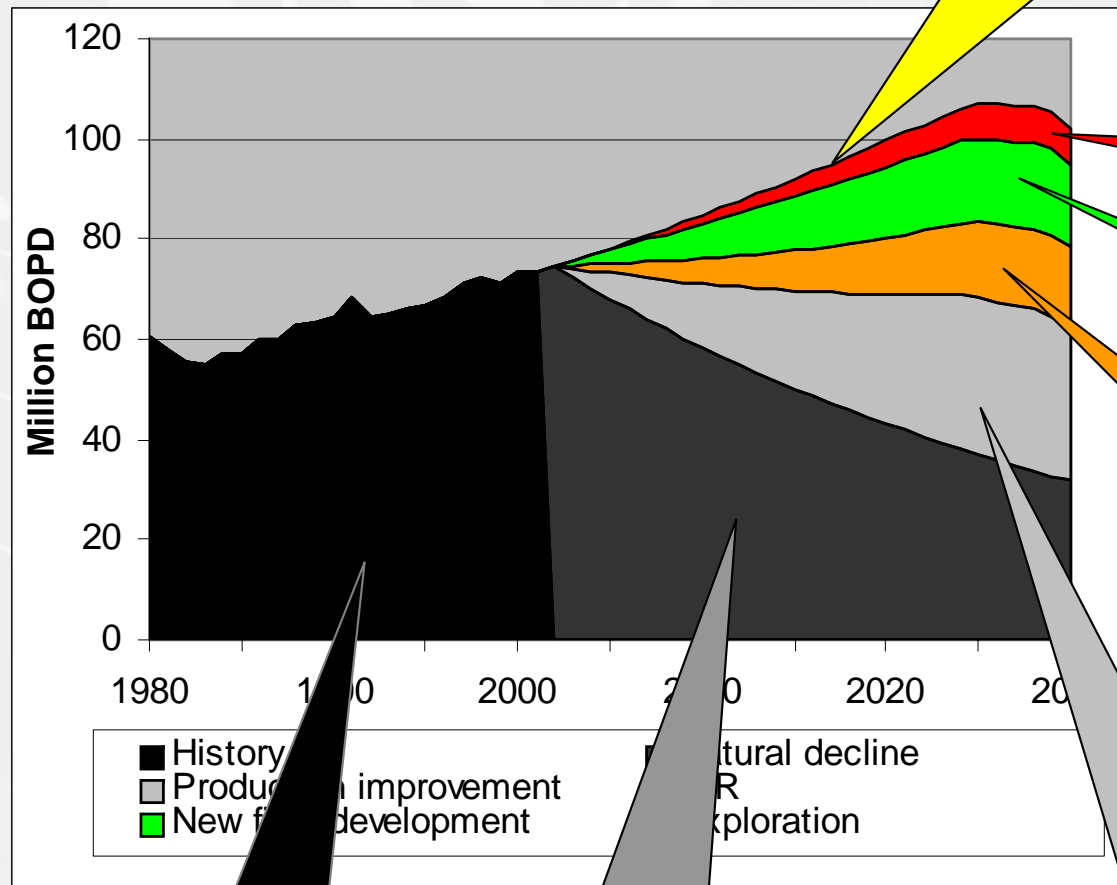
**Leif Magne Meling, Statoil ASA**

"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:



Evaluation of  
history, IHS  
data base

Natural decline  
"as is"

Production  
efficiency

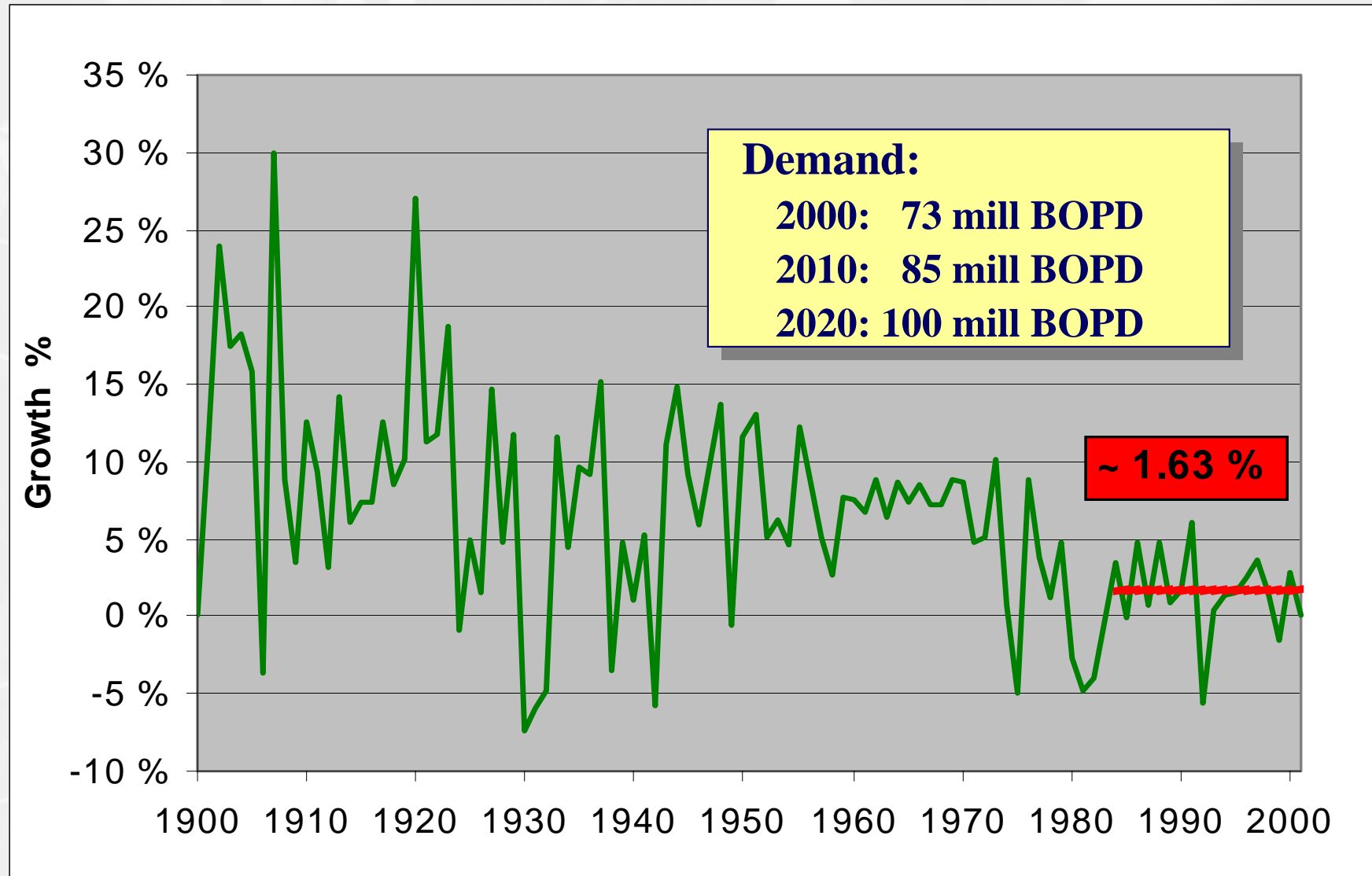
Reserve growth;  
IOR and EOR

Exploration  
success

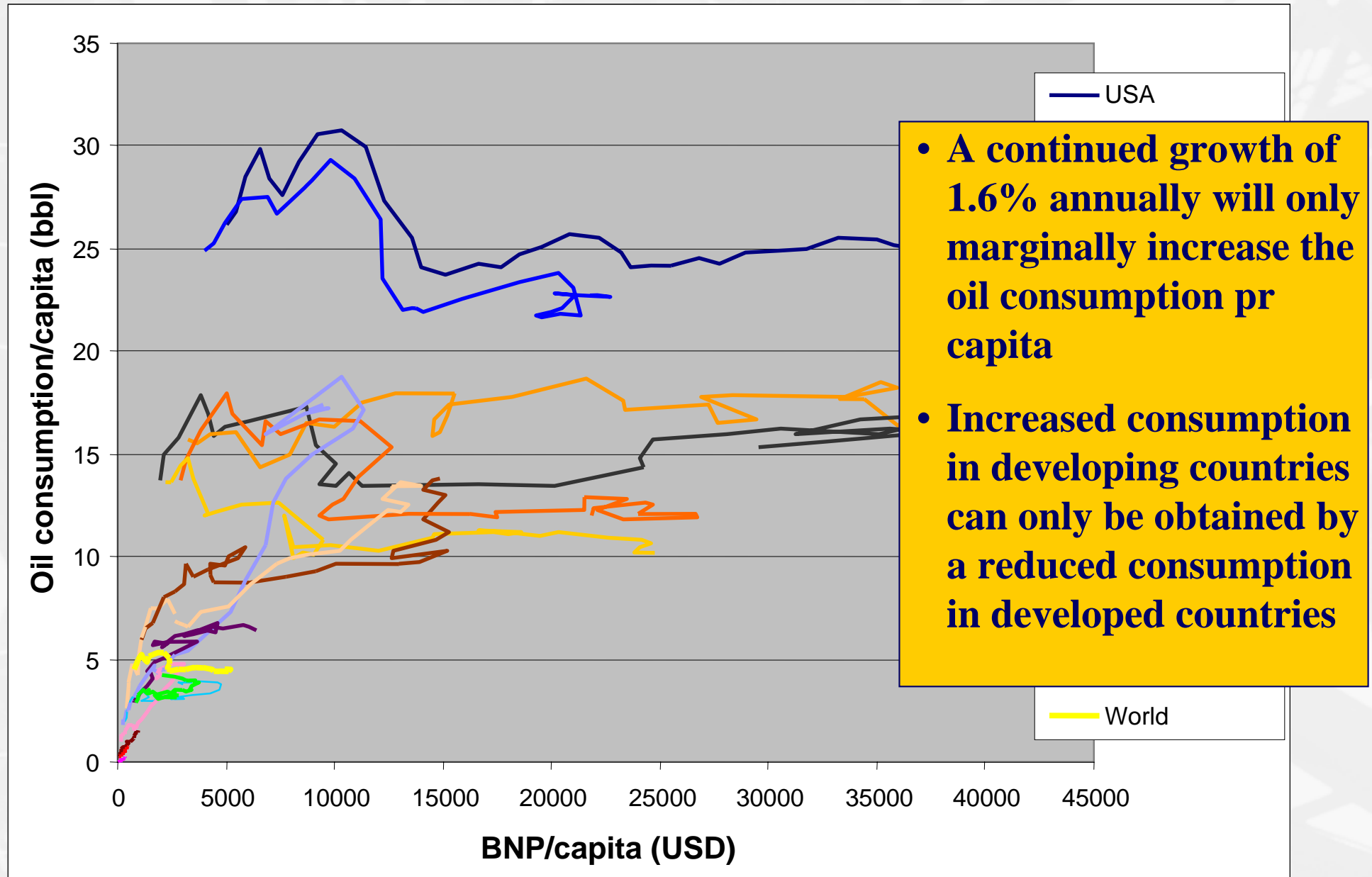
New field  
developments

Demand growth

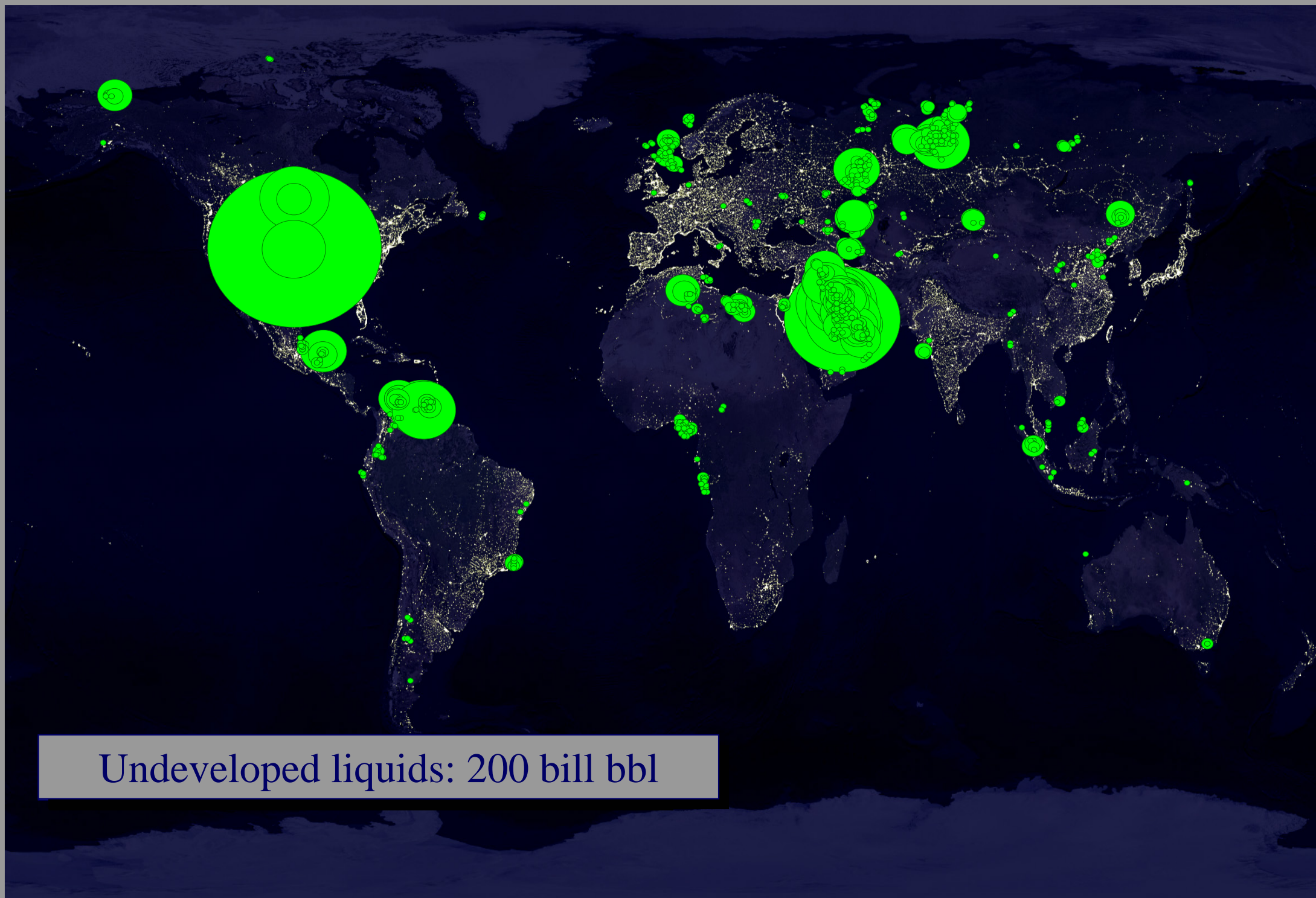
# The economic history of the last century is preserved in the annual rings of oil production growth



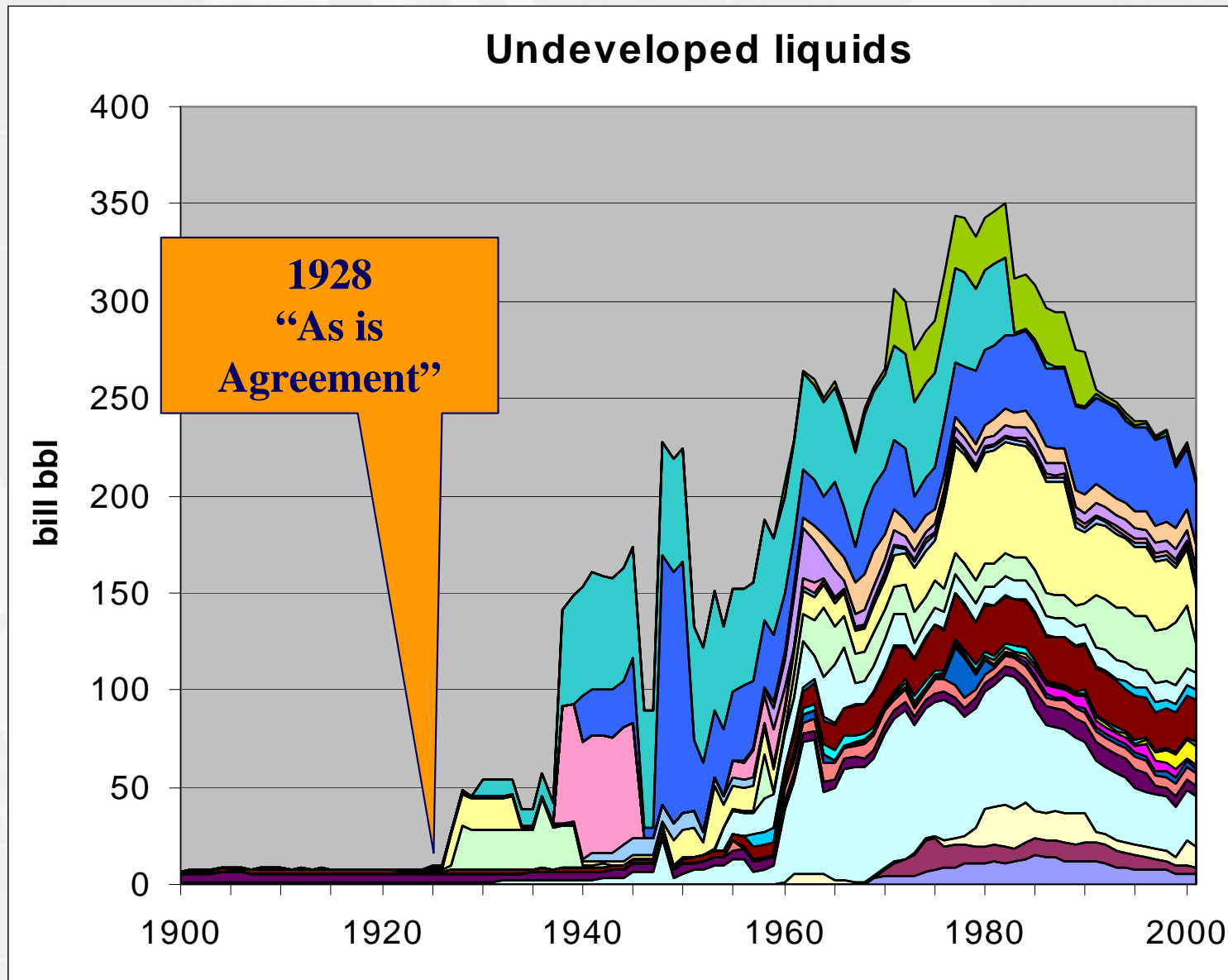
# Sustainable development – clash of the civilisations?







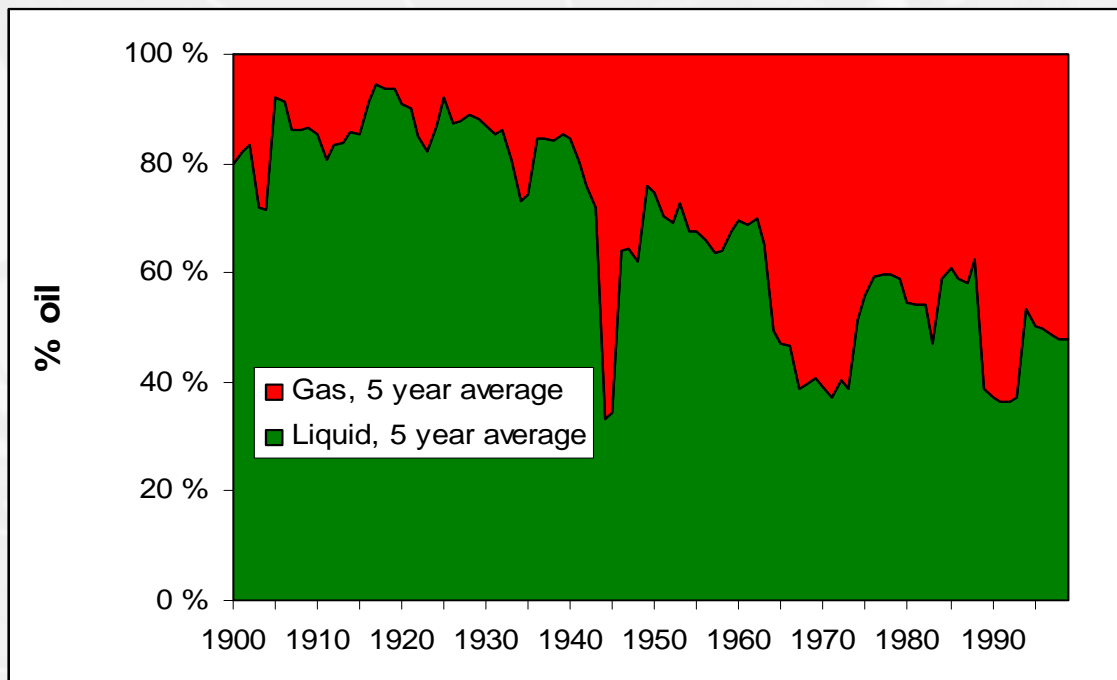
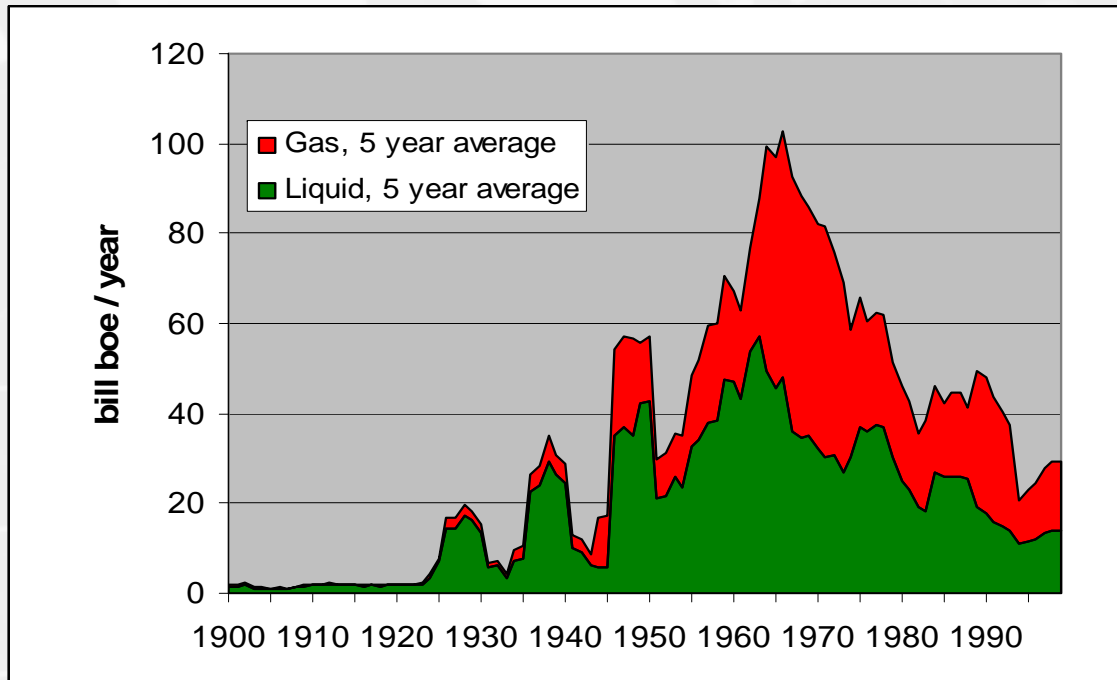
# Stockpiling from the “As is Agreement” in 1928 and harvesting after the “79 –81 Oil Shock”



**~200 bill bbl**

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

**25% in Russia,  
Kazakhstan,  
Angola and  
Nigeria**

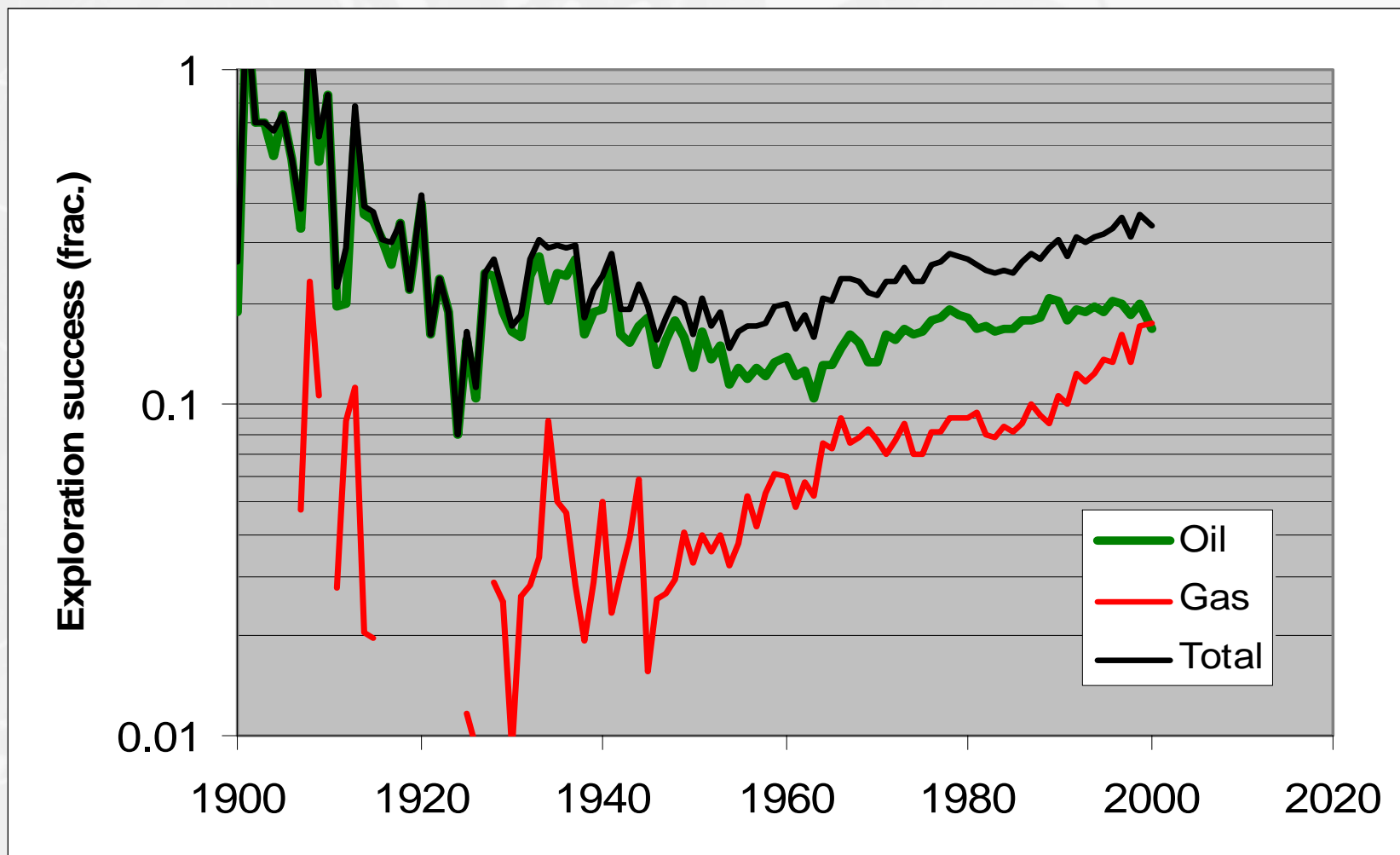


## Decreasing volumes by exploration, larger proportion of gas

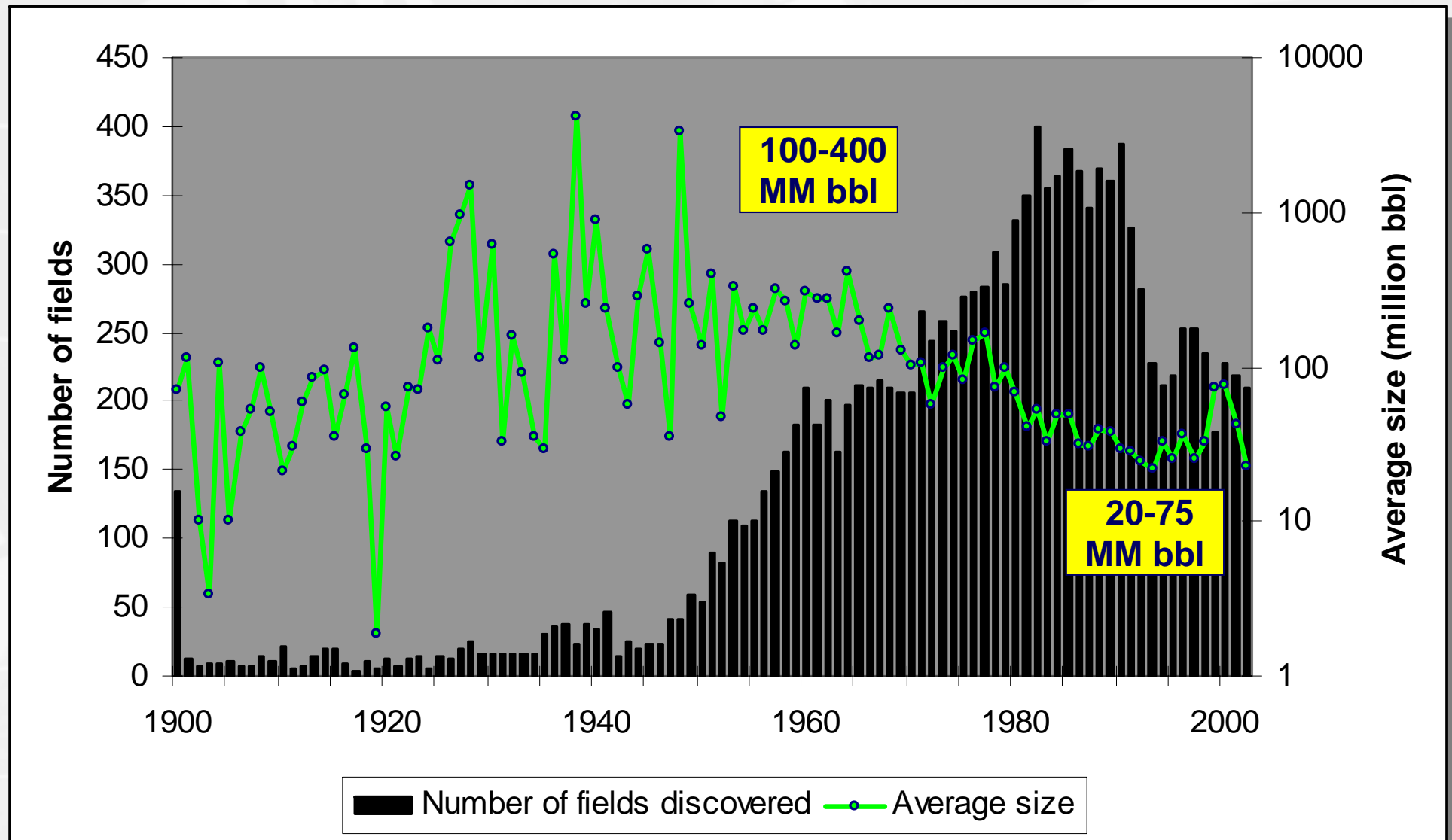
- Oil resources added through exploration additions reached a peak in the 1960's
- The proportion of gas relative to oil has increased
- Currently the percentage of oil discovered relative to total hydrocarbon volume is less than 50%



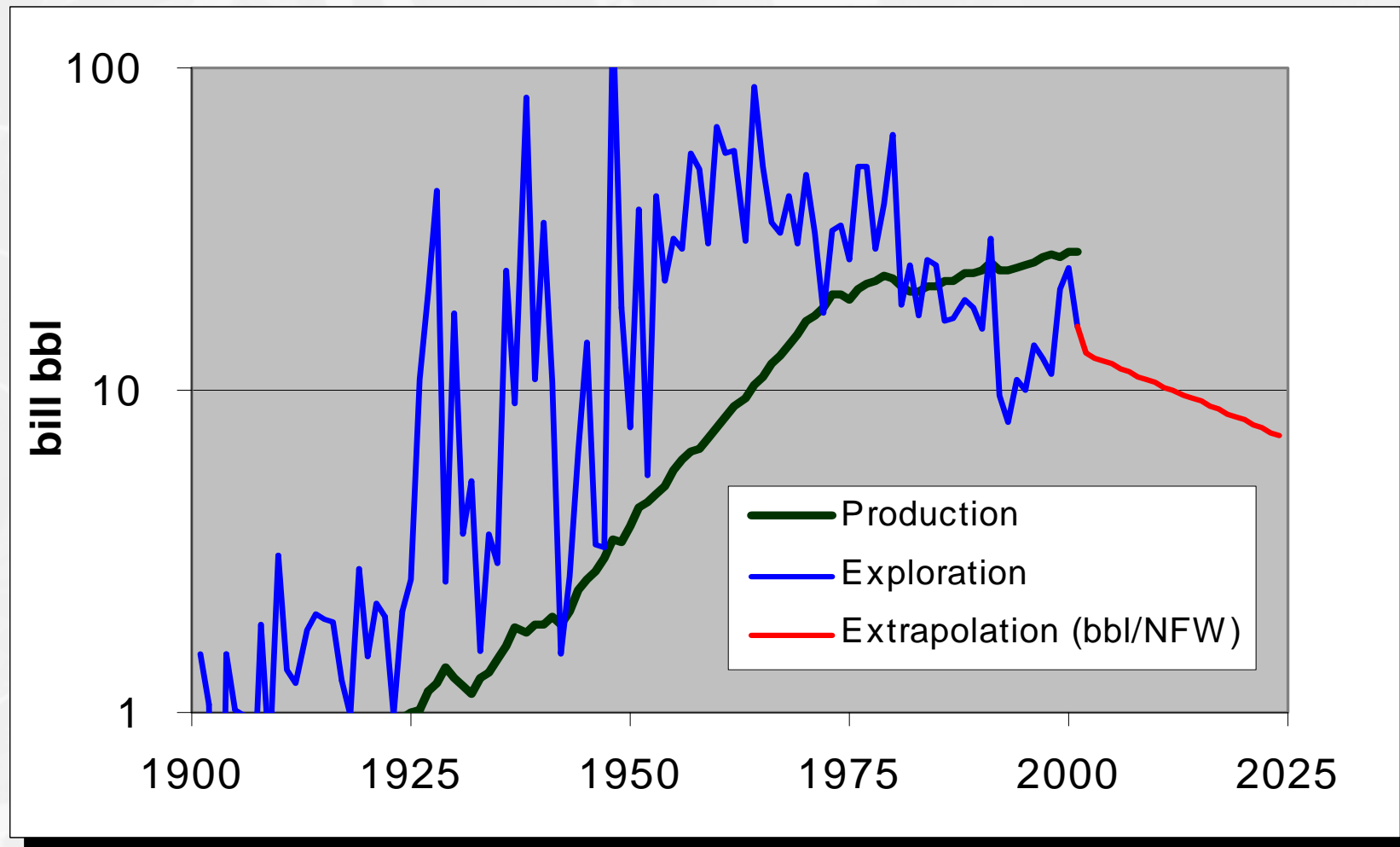
**The overall technical exploration success is increasing, for oil it have stabilized close to 20%**



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

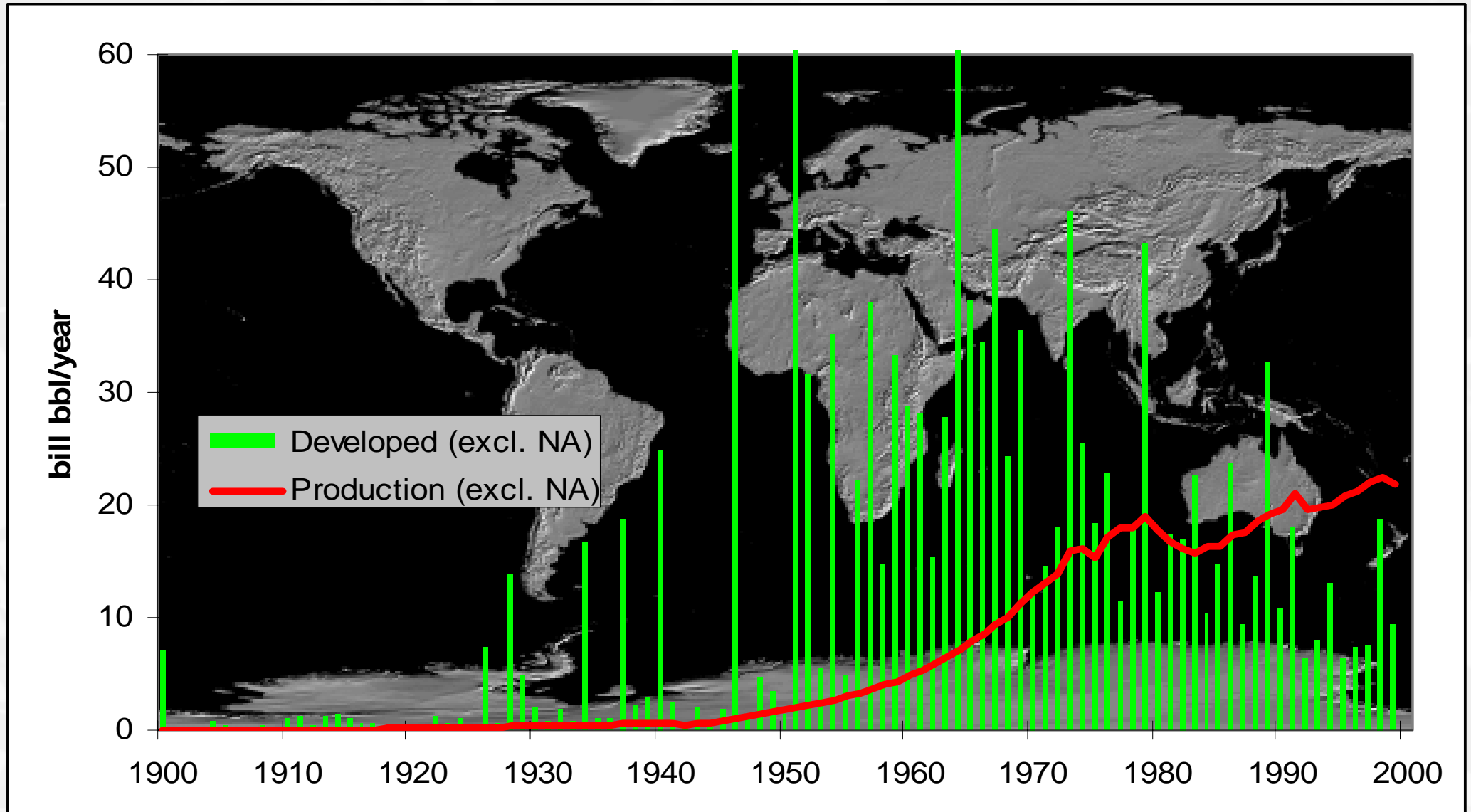


**A very poor exploration performance, extrapolates to an exploration potential of some 200 bill bbl**

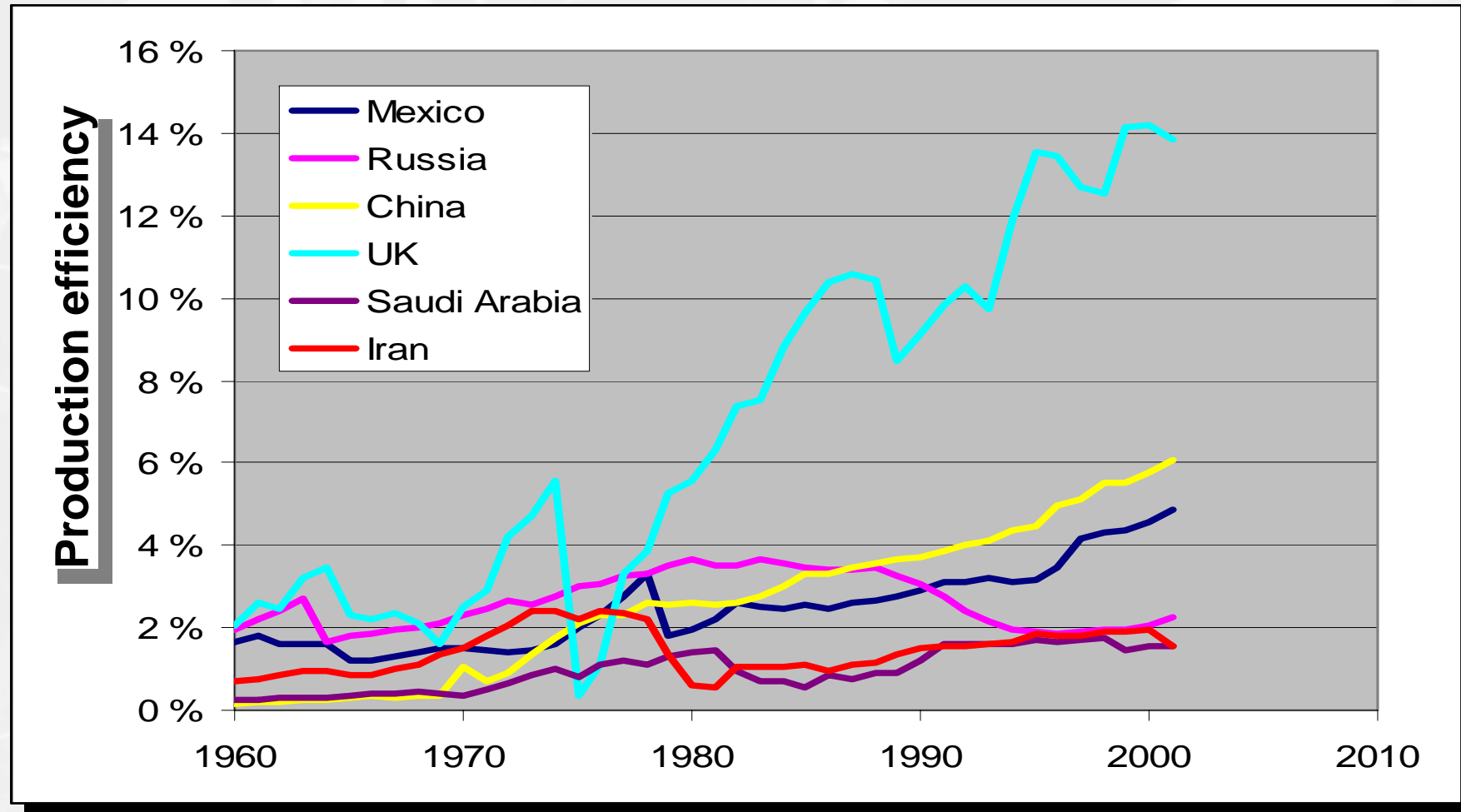


**Adding 100 bill bbl for frontier basins gives a total of 300 bill bbl**

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

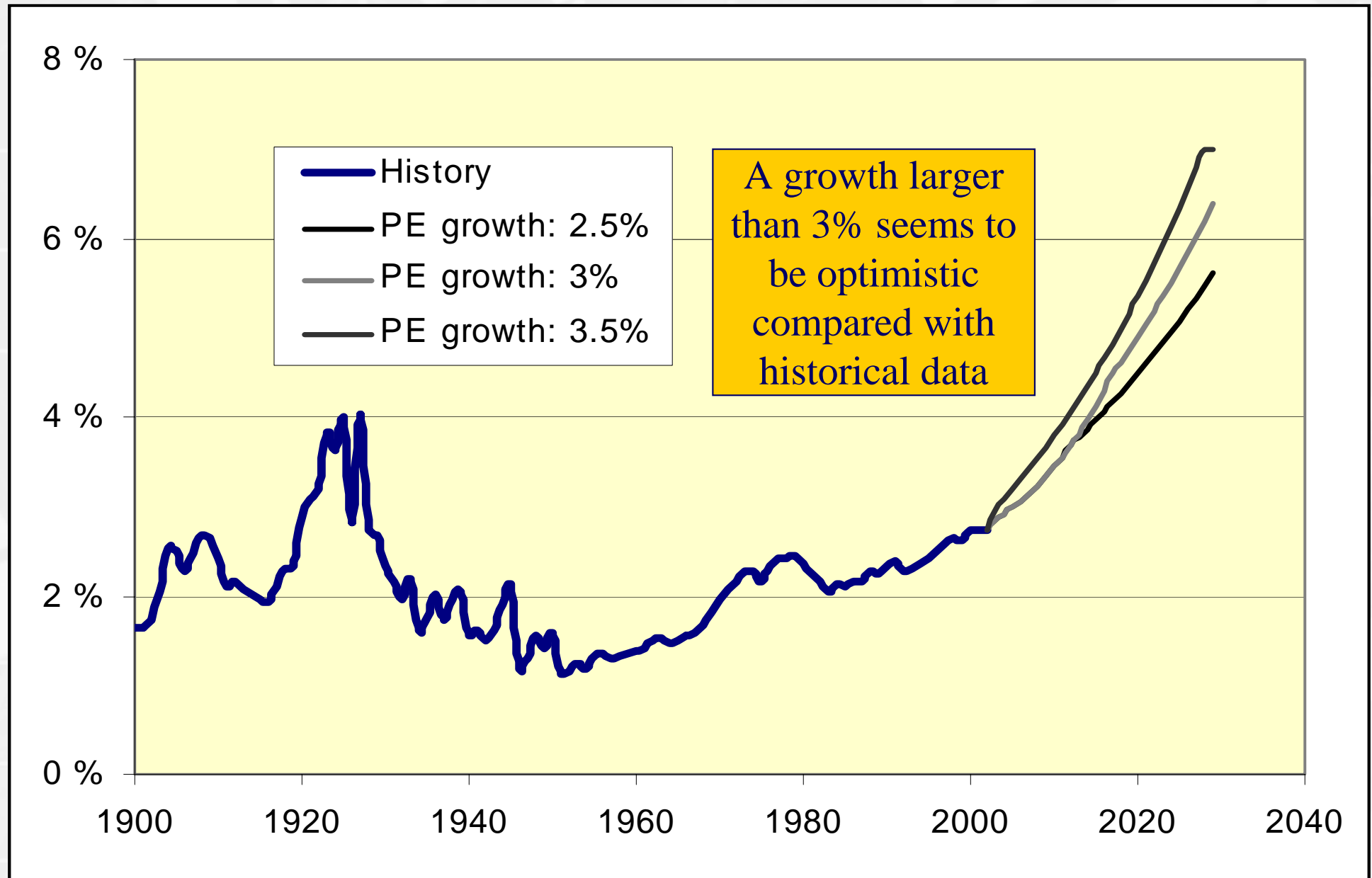


# Production efficiency; dependent on reservoir quality, drainage methods, fiscal terms and regulations



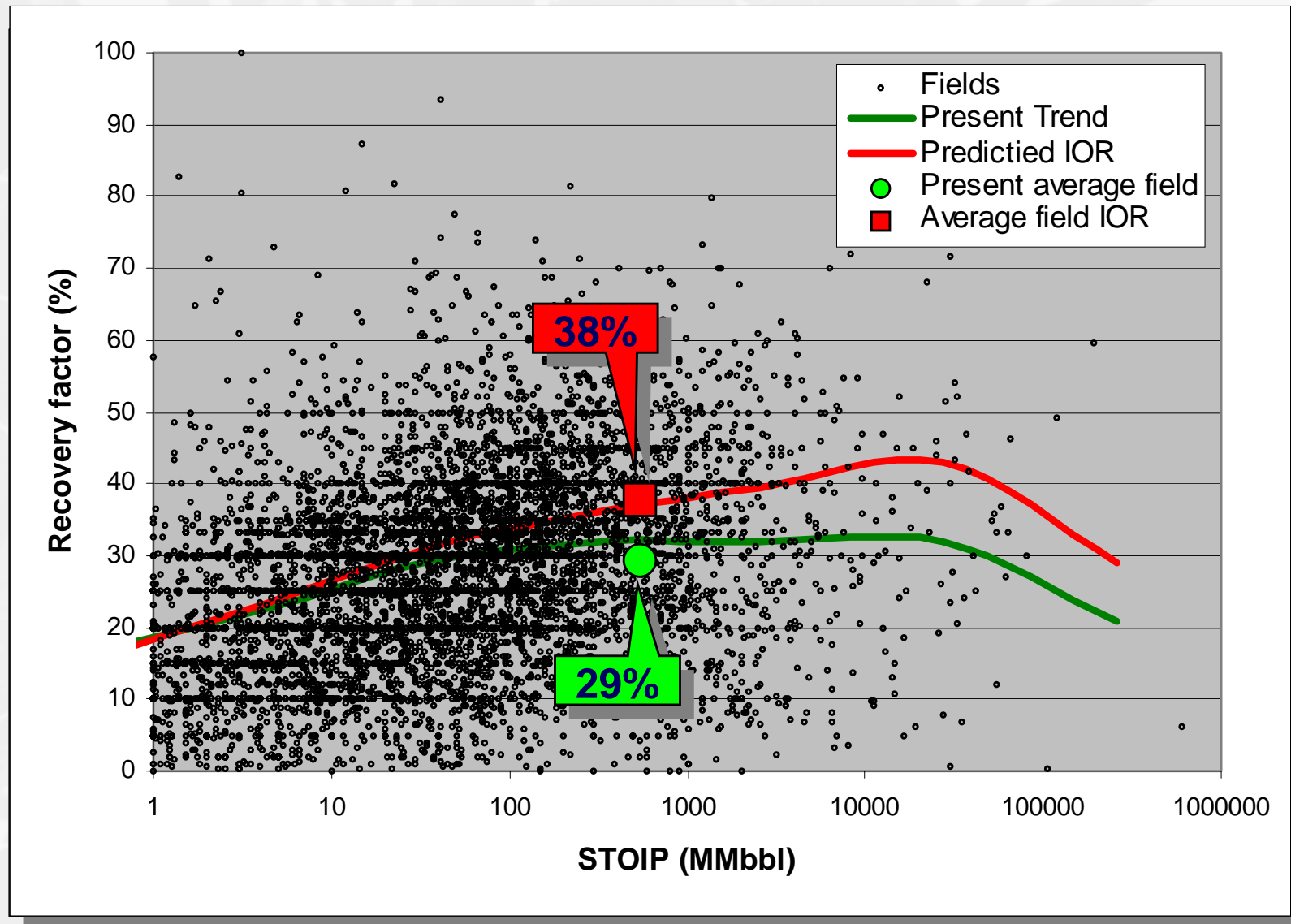
**Production efficiency (PE) is a measure of the yearly outtake of remaining developed reserves**

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

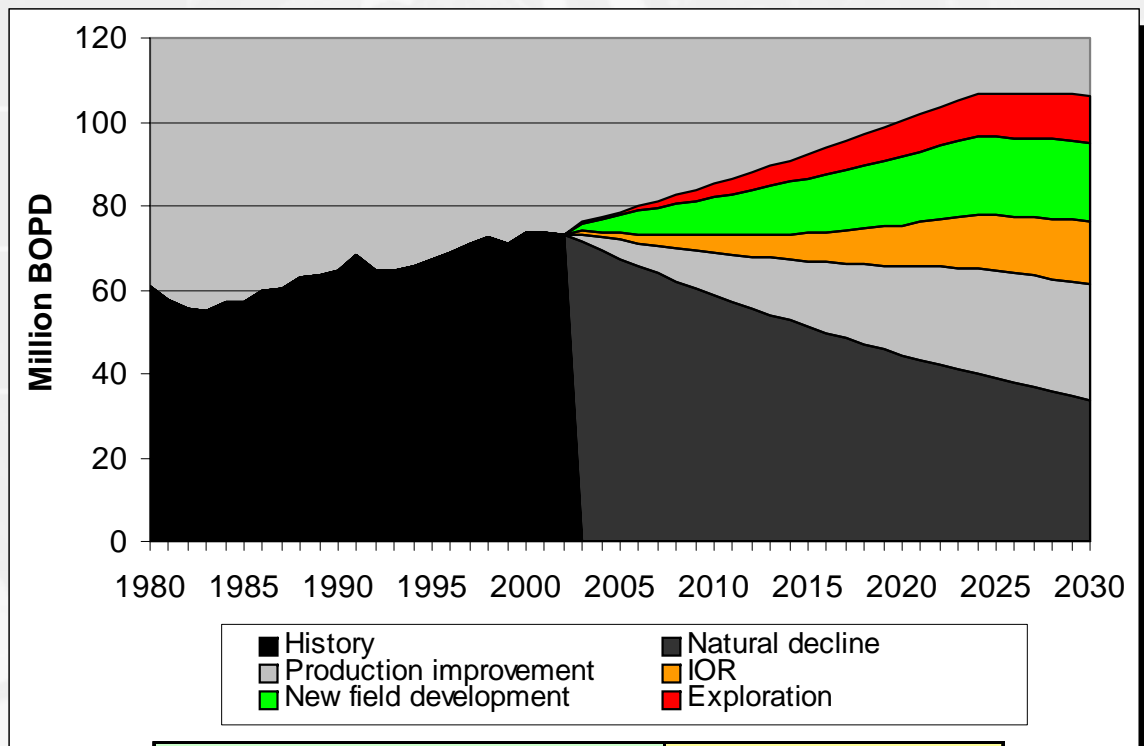




# A significant reserve growth potential, 600–700 billion bbl



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

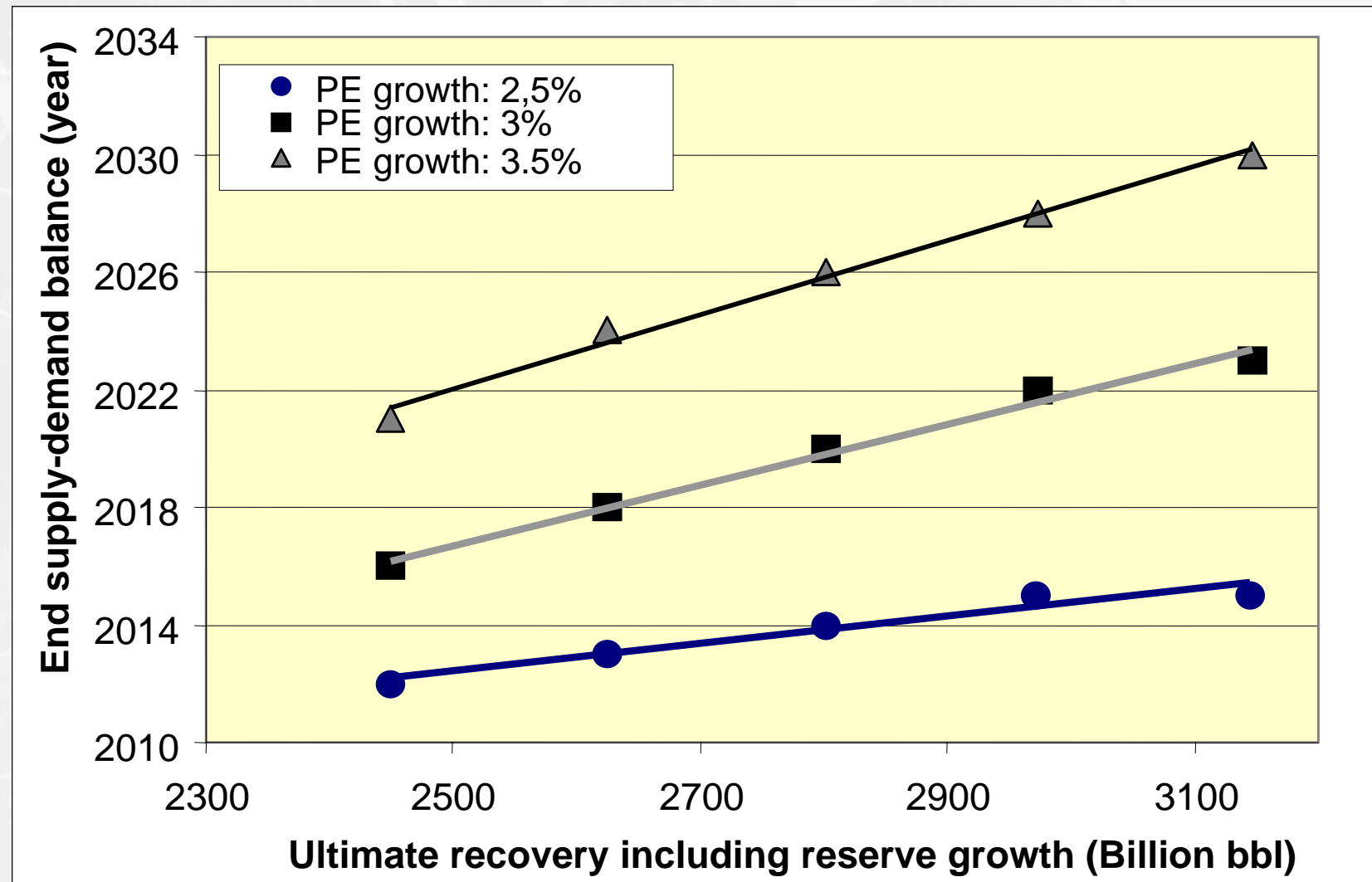


Discovered	2138	billion bbl
Ultimate	3143	billion bbl
Exploration potential	311	billion bbl
Improved oil recovery	693	billion bbl
Remaining discovered	1180	billion bbl
Remaining developed	980	billion bbl
Undeveloped	200	billion bbl
PE	2.9	%
PE growth	3.0	%
PE max	6.5	%
Spare production capacity	4.0	million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

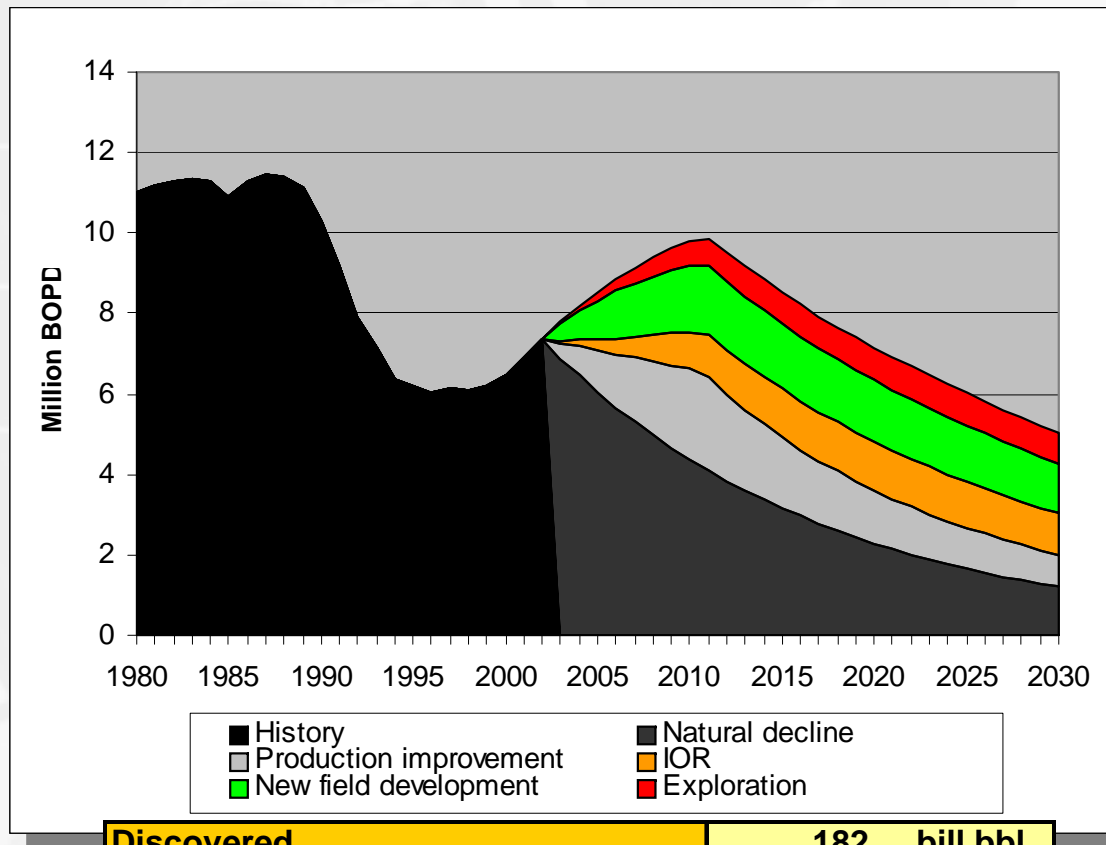
If we believe in reserve growth and reported reserves:

- 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.**



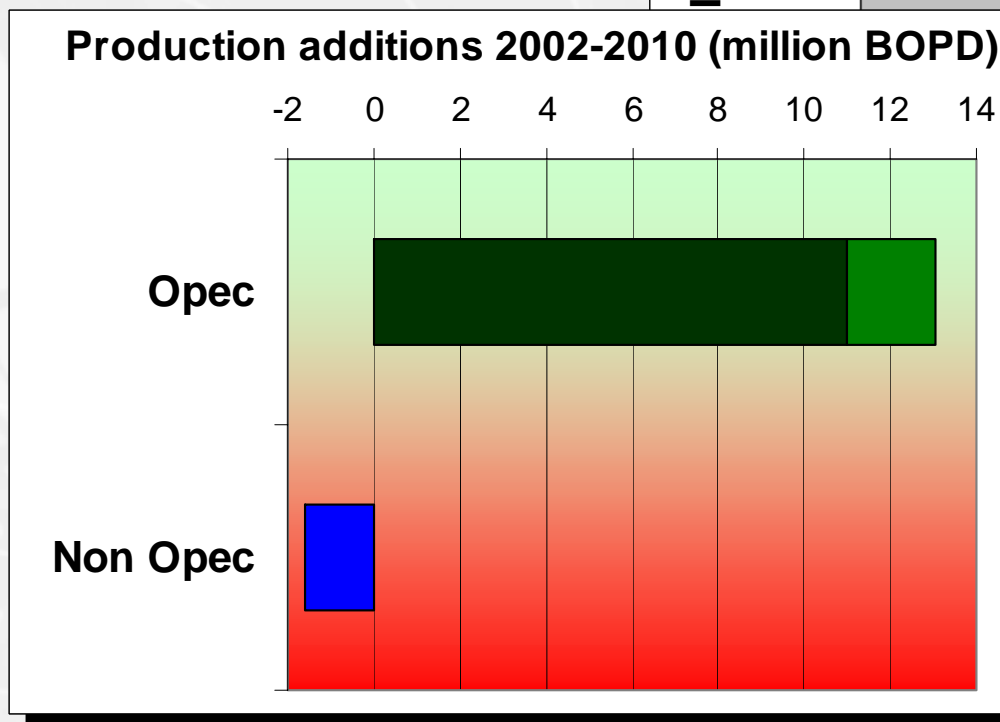
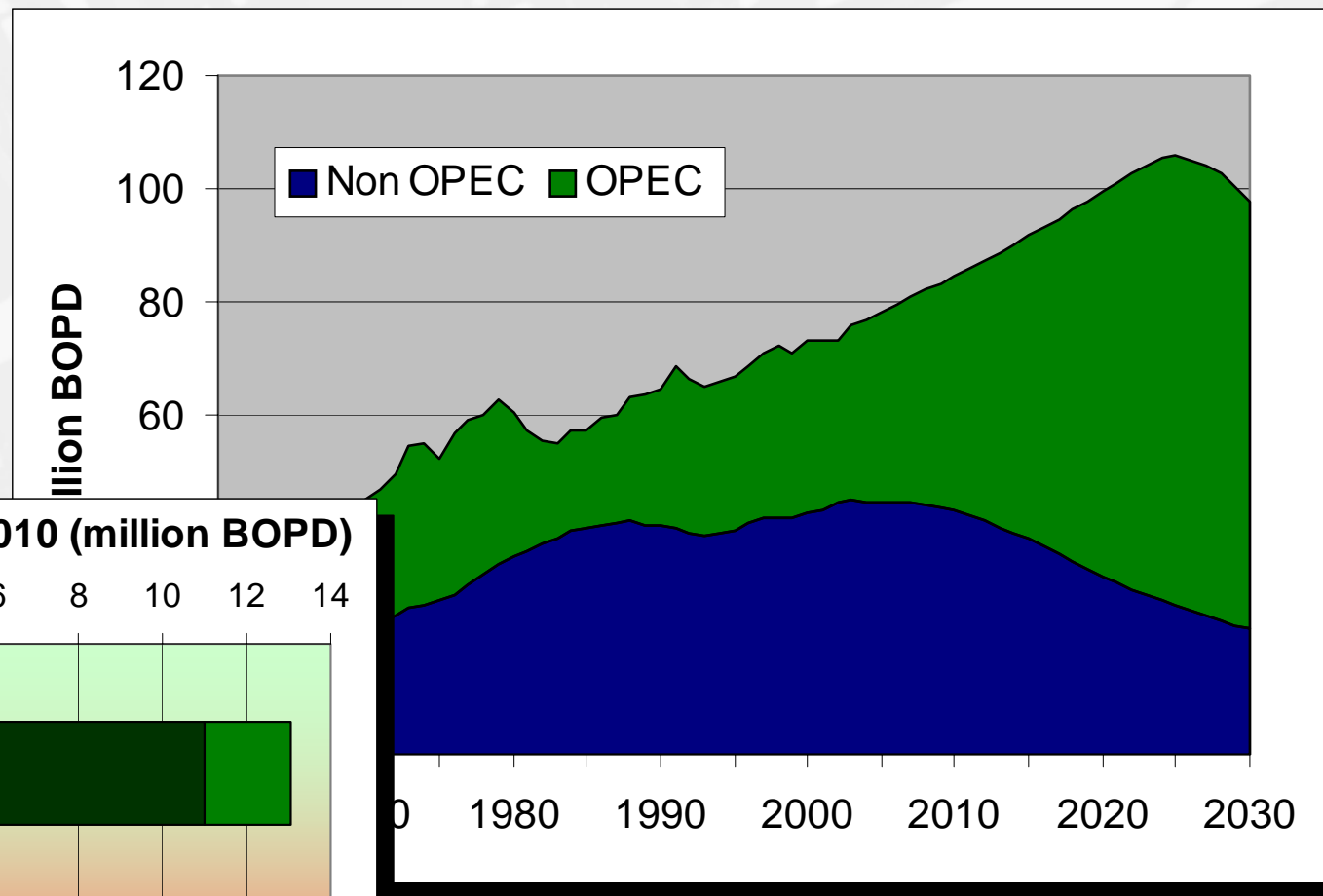
# Russia will be the major contributor to future production additions outside OPEC



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

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	%

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



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

## Conclusions

- **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.**



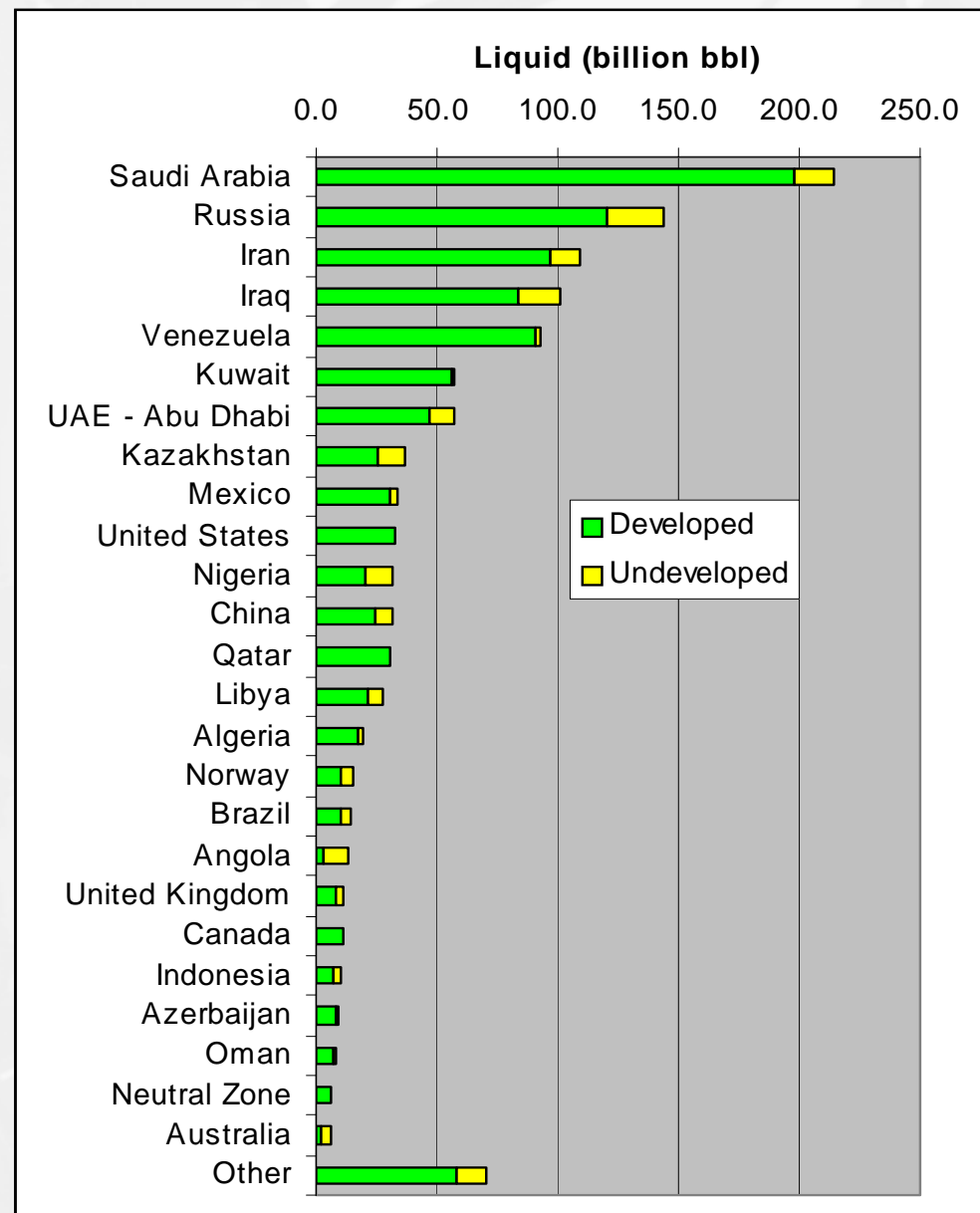


# **Summa summarium:**

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

# Remaining, developed and undeveloped liquid

	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
<b>Total</b>	<b>1198</b>	<b>1027</b>	<b>171</b>



# The size and quality of undeveloped field resource base is deteriorating

