

Supply with Fossil Fuels

Workshop on Oil and Gas Resources

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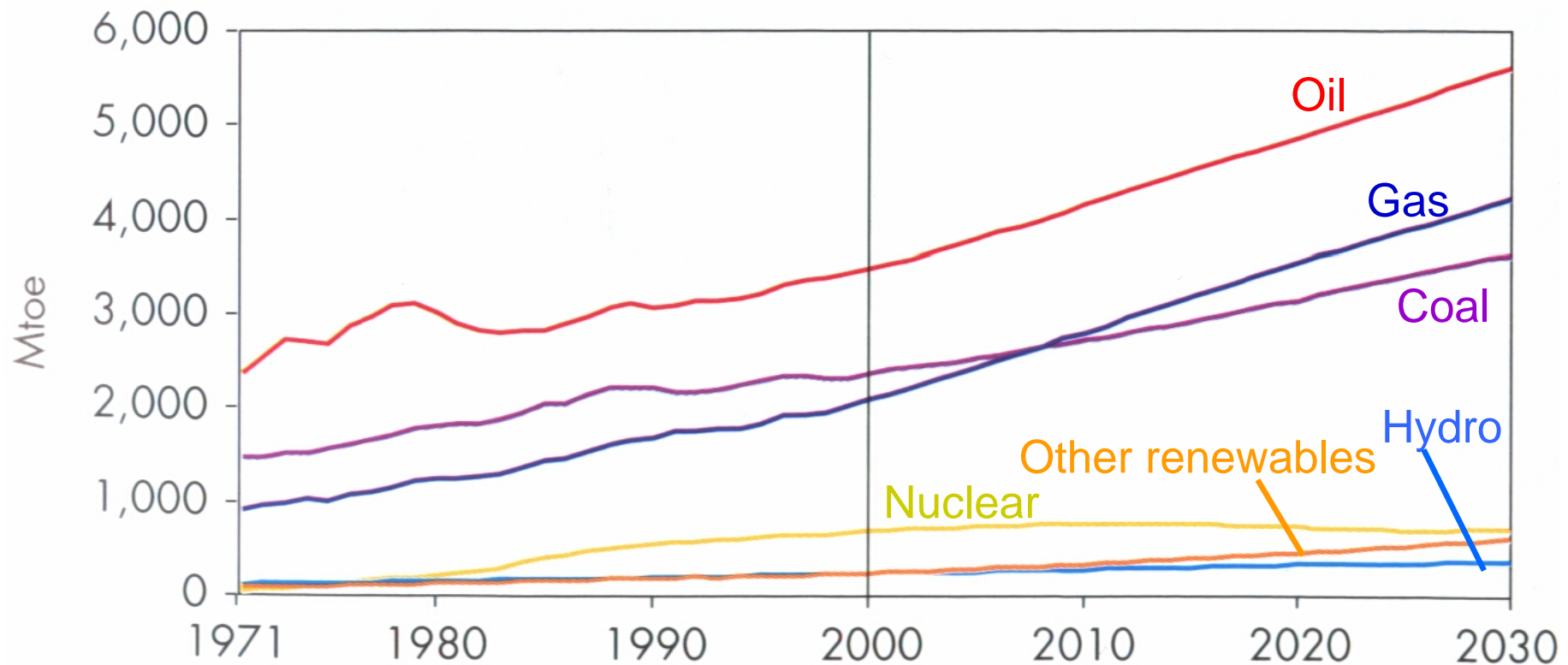
The Next 15 Minutes...

1. The Topic of the Study
2. The Relevance of Fossil Fuels
3. Measuring Reserves and Resources
4. Other Causes of Shortages
5. Future Energy Prices and their Implications
6. Summary

1. The Topic of the Study

❖ How much longer can the supply with fossil fuels be guaranteed?

2. The Relevance of Fossil Fuels: World Primary Energy Demand

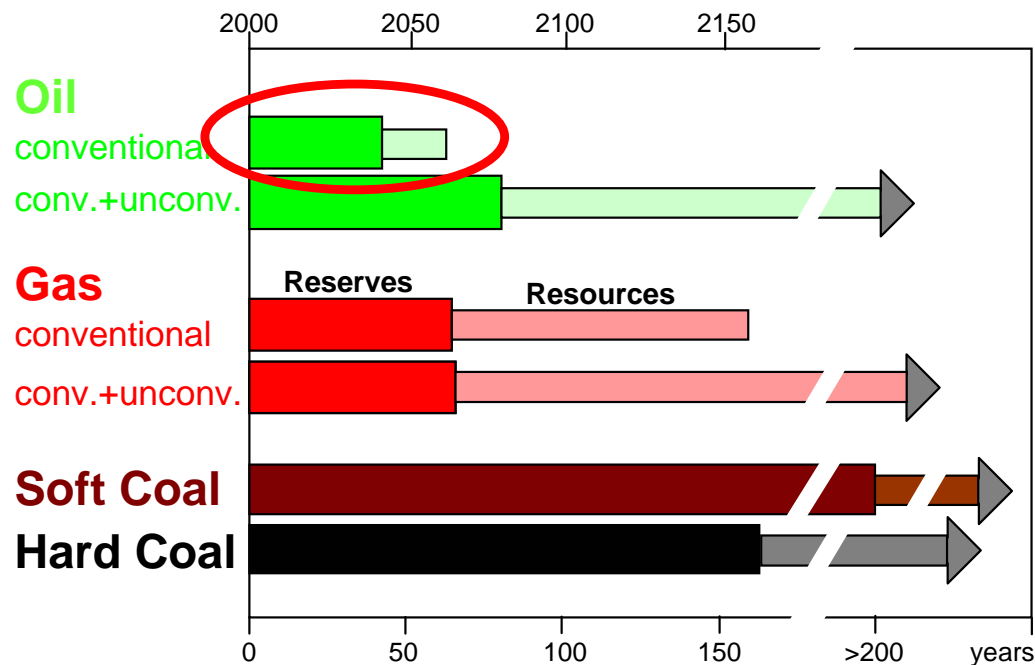


3. Measuring Reserves and Resources

❖ Definitions

- *Reserves:*
Known deposits that can be exploited profitably with today's technology and at today's prices.
- *Resources:*
Known or expected deposits that can not be exploited profitably today either because of financial or technical barriers.
- *Static Reserves or Resources:*
Number of years for which the current yearly demand can be satisfied disregarding *any* barriers (technical, economical, natural...)

3.1 Static Reserves and Resources



Source: adapted from BGR

3.2 Different Viewpoints

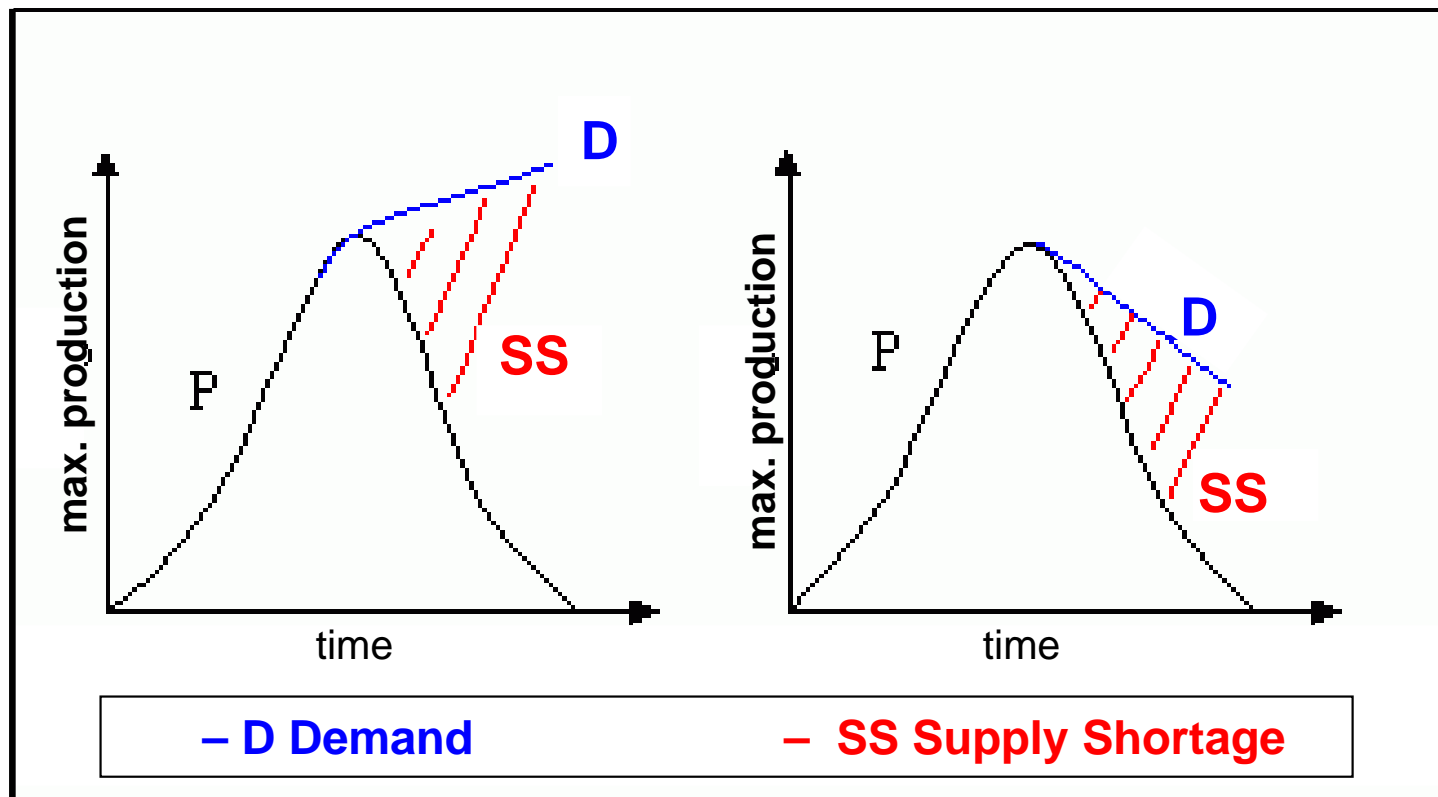
❖ So-called Pessimists:

- Supply shortage expected in the very close future

❖ So-called Optimists:

- No supply shortage expected within the next 30 (or more) years

3.3 Pessimists: The Hubbert-Model



3.4 Pessimists: Political Influence on Data

- ❖ Heavy political bias for high reserve and resource estimates
 - OPEC: Reserve quantities determine production quotas (and therefore revenues).
 - Non-OPEC: High reserves demonstrate independence from OPEC-countries.

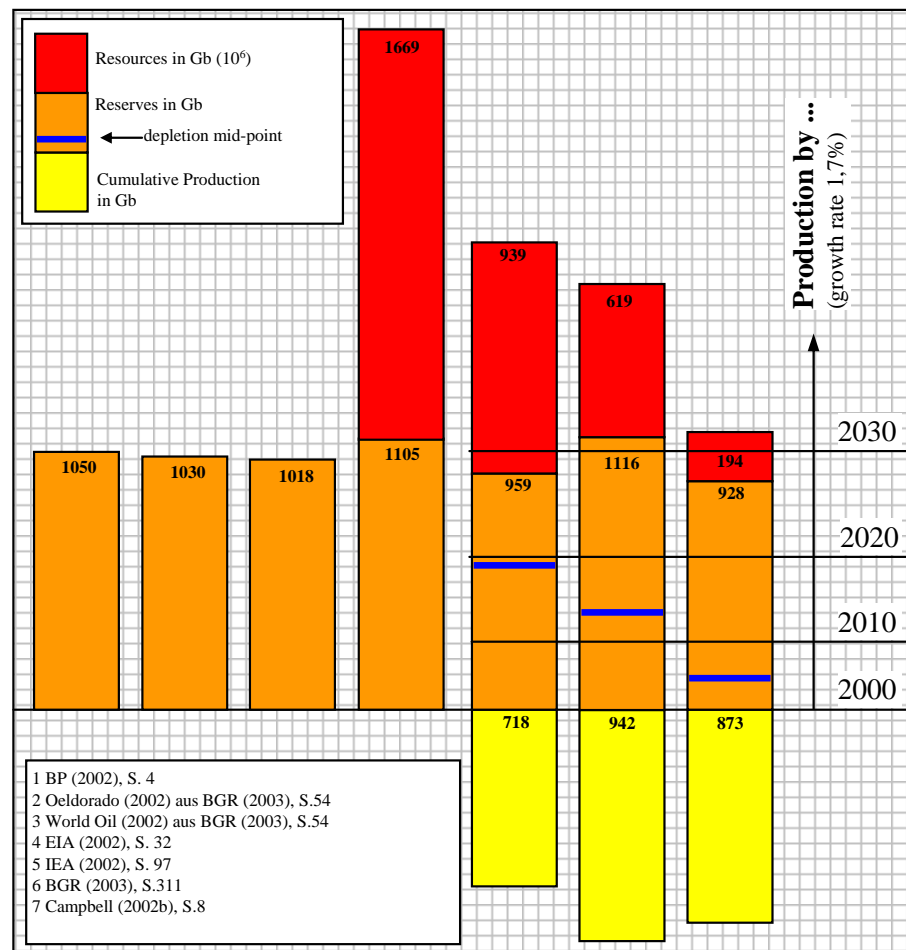
3.5 Pessimists: Only Weak Influence of Technical Progress

- ❖ Basis: Industrialized economies rely on *cheap* energy
- ❖ Even technical progress will not reduce the price of unconventional fuels to that of conventional fuels.
- ❖ Exclusion of certain reserves and resources

3.6 Optimists: Arguments

- ❖ Criticism of the Hubert-model
 - No theoretical basis
 - Not sufficient evidence
 - The area under the Hubbert-curve can not be determined prospectively
- ❖ Technical progress
 - Higher reserves and resources estimates
 - Production of new fuels (Oil sands, aquifers etc.)
- ❖ Earlier forecasts have all been too pessimistic

3.7 Comparison of Estimates



3.8 Recent Developments

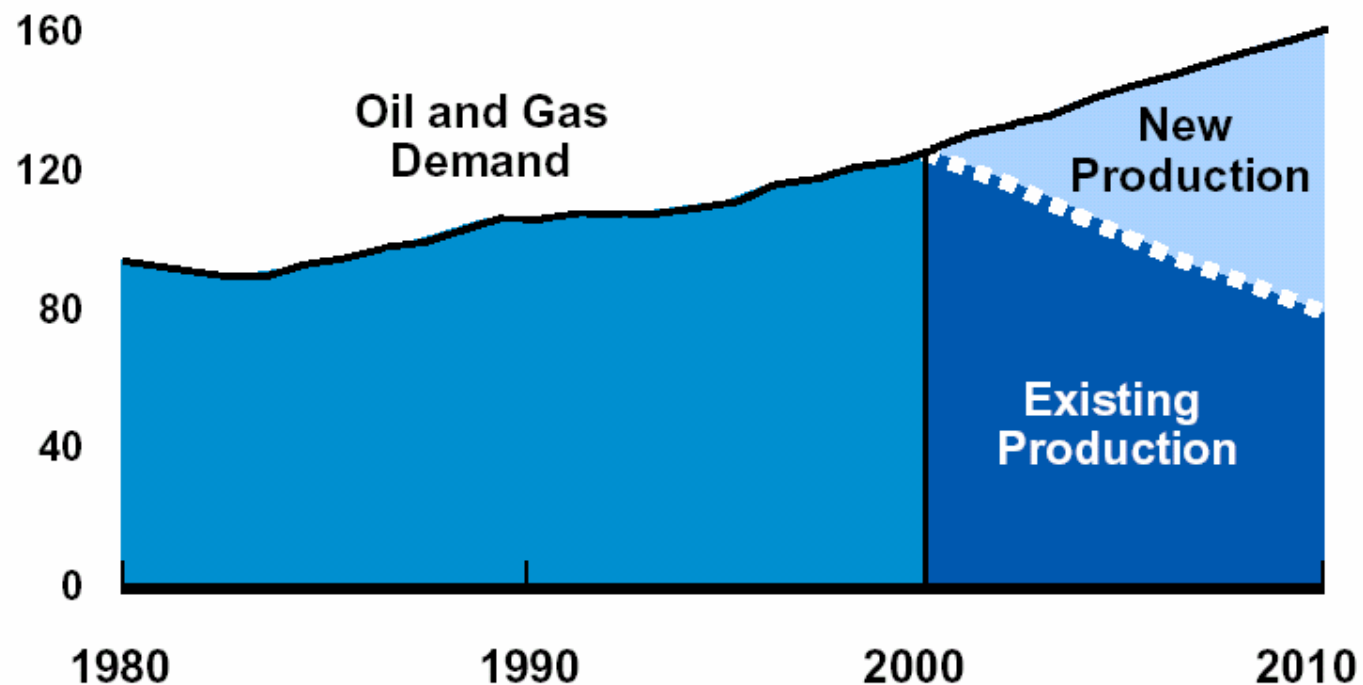
- ❖ Convergence of positions:
 - Too optimistic technological forecasts proved to be wrong
 - Too pessimistic forecasts proved to be wrong too
 - Criticism of how the Hubert-model is used recently from inside the pessimistic camp
- ❖ Emergence of a „moderate optimistic camp“
 - Peak for *conventional* oil not before 2015 _____

4. Other Causes of Shortages

❖ 3 further points

4.1 Required New Production Capacity for Oil and Gas by 2010

MBDOE



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MBDOE = Million Barrels per Day Oil Equivalent

Source: Exxon 2002

4.2 Geopolitical events could disrupt supply

Geographical distribution of Oil and Gas



Strategic Eclipse:
70% of world oil reserves
65 % of world gas reserves

Source: BGR

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4.3 Environmental Laws

- ❖ Environmental restrictions may reduce conventional and unconventional production

5. Future Energy Prices and their Implications

- ❖ No explosion of the oil price expected in the next decades.
- ❖ Multiple possibilities of substitution
 - Primary energy: Gas and Coal
 - Hydrogen as energy storage (produced from gas, coal, renewables or nuclear power etc...)

6. Summary

- ❖ Strong convergence between the forecasts of the Optimists and the Pessimists in recent years
- ❖ No resource induced shortage of oil or gas to be expected in the next two decades
- ❖ Alternatives to oil as an energy source, keep oil price tied to other energy prices
- ❖ Supply shortages do not justify enforced and rapid switch to renewables, however environmental/ climate protection arguments do.