

Sustainable Energy Authority of Ireland
Seminar on Energy Security and Global Economics
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Global Oil Depletion Analysis

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Summary of Presentation

1. Why does oil production in a region peak?
2. Peak is *counter-intuitive*
3. Past forecasts – were they really wrong?
4. UKERC 2009 *Global Oil Depletion* report
5. There is a lot of oil & ‘nearly-oil’ - *but*
6. The conventional oil peak is likely to dominate

The University of Reading, UK
‘Oil Resources Group’: Past & present

Postgraduate Research Institute for Sedimentology

Prof. M.L. Coleman (ex-BP), Prof. B.W. Sellwood.

Department of Engineering

Dr. J.D. Burton, Mr. R.H. Booth (ex-Shell),

Dr. R.M. Mayer (ex-BP), Prof. P.D. Dunn,

MSc. students (also City University).

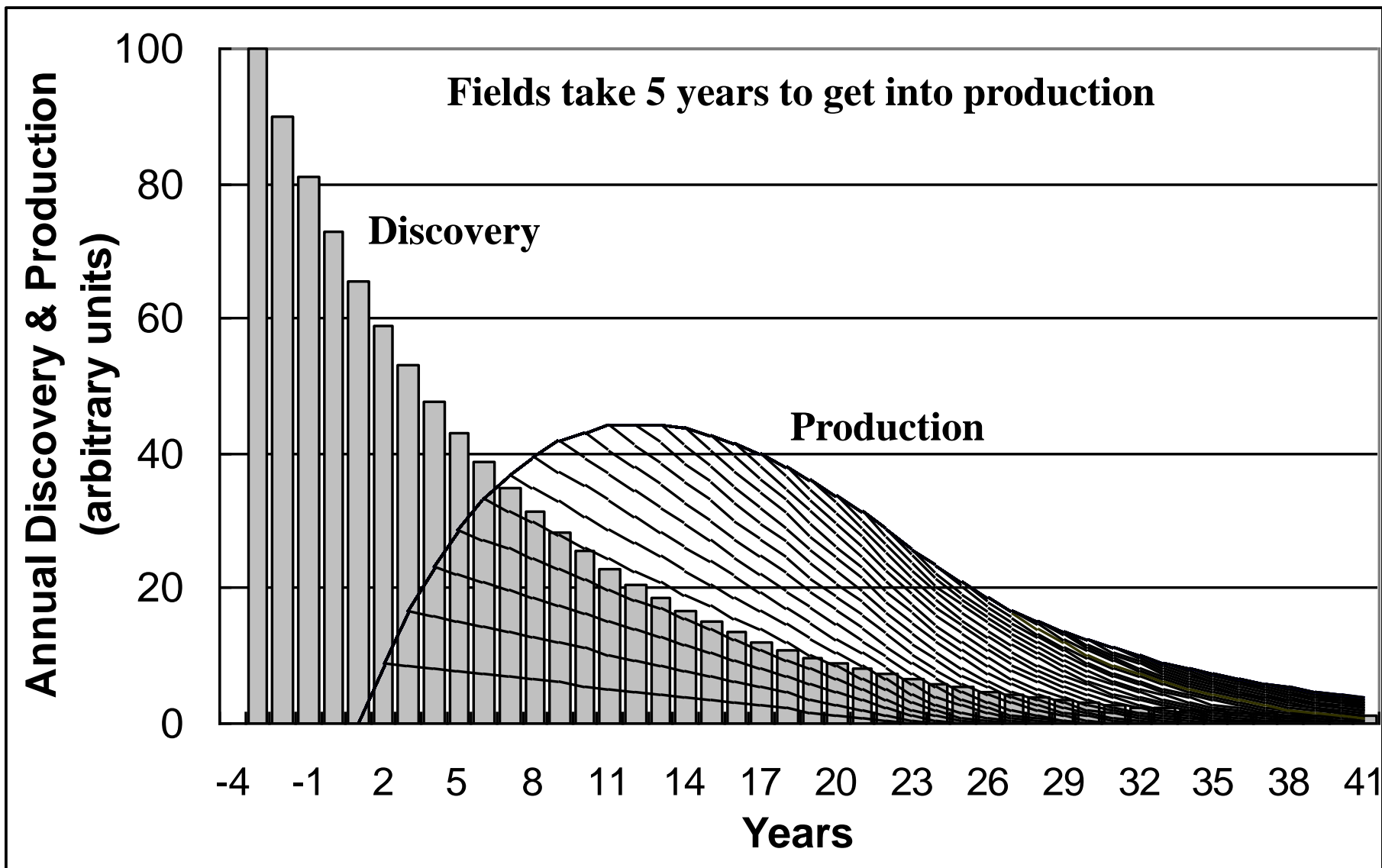
Department of Cybernetics

Dr. G.R. Whitfield, Dr. R.W. Bentley (ex-Exxon).

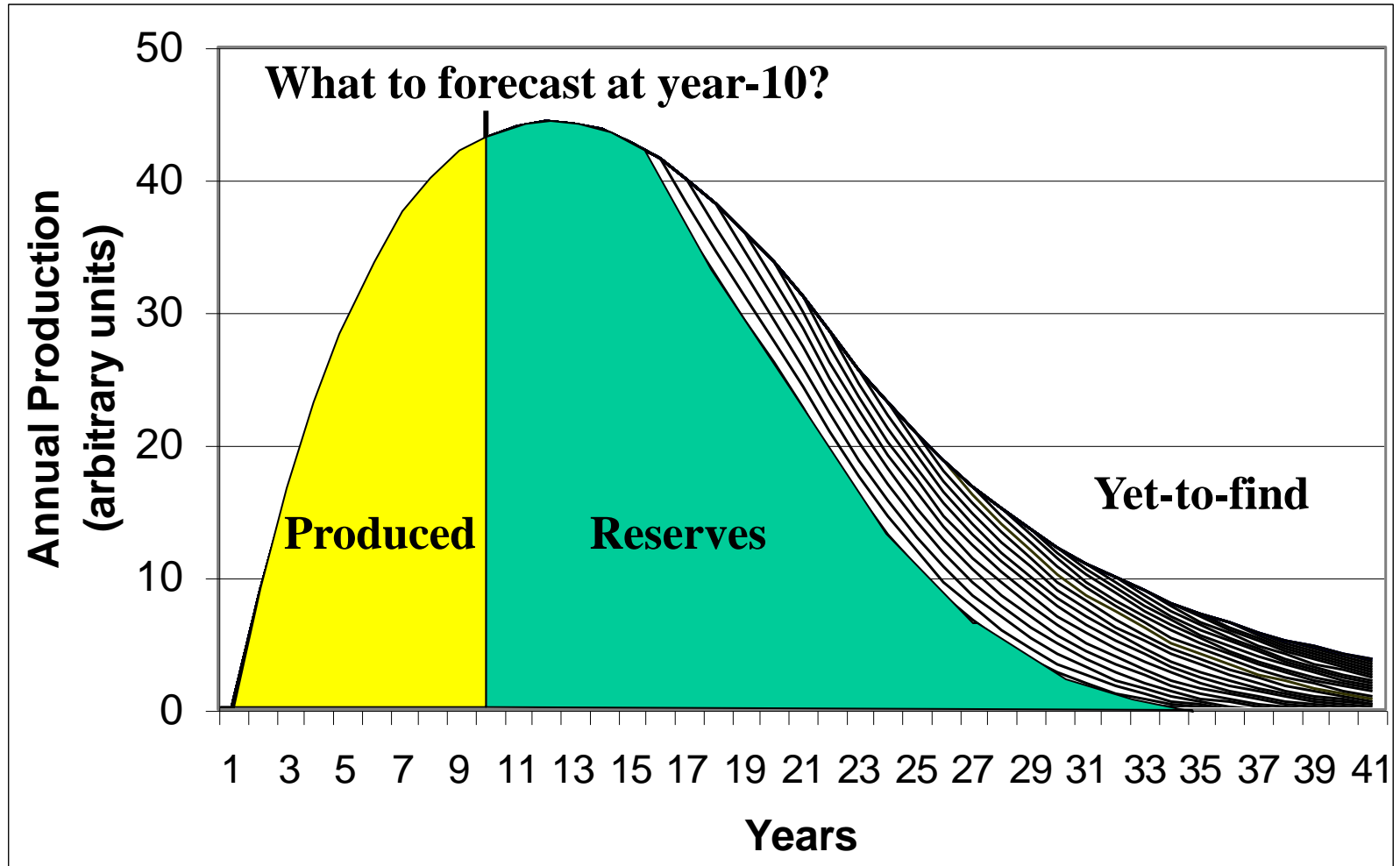
Affiliated: Dr. D. Fleming, independent economist.

- Until recently, the only UK academic group doing quantitative research on future global hydrocarbon supply.

1. Why does conventional oil prodn. in a region peak? Simple model: Discovery, then production - big fields first.



2. Conv. oil peak is *counter-intuitive*. It occurs when production is rising, reserves are large, new fields are being discovered, & technology is increasing recovery factors.

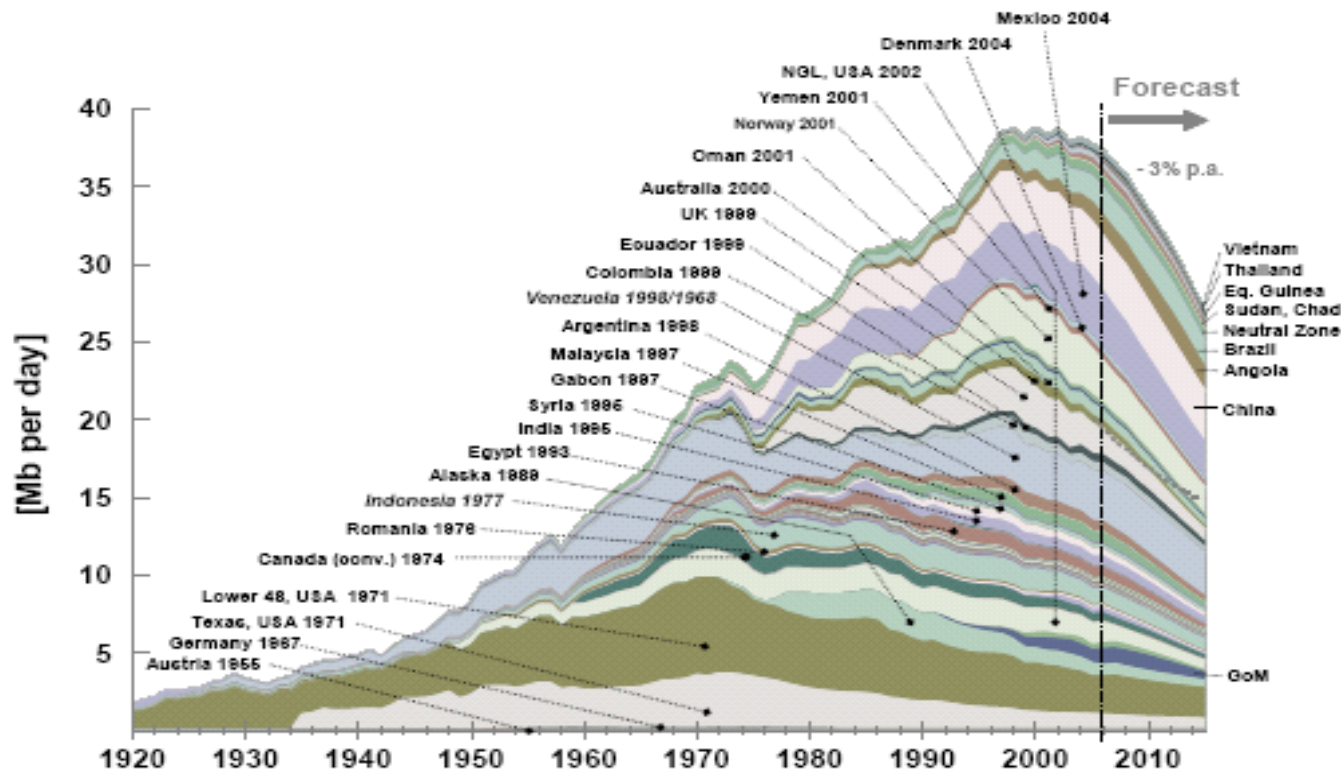


Validity of this model

This general model of peak is borne out by the ~60 countries now past their conventional oil peak.

(See R. Bentley: *An Explanation of Oil Peaking*.)

Figure 5: Oil producing countries ex OPEC and ex FSU



Ludwig-Bölkow-Systemtechnik GmbH, 2007
Source: IHS 2006; PEMEX, petrobras; NPD, DTI, ENS(Dk), NEB, RRC, US-EIA, January 2007
Forecast: LBST estimate, 25 January 2007

3. Past oil forecasts – Were they really wrong?

- So often said: “Can’t trust oil forecasts - thirty years ago we were told we had only 30 years’ of oil left; now we have 40 years’ left!”

But the ‘30 years’ of oil was only that in *proved* reserves.

This omitted the large amount of oil in *probable* reserves, and in ‘reserves growth’ due to technical improvement, and in the yet-to-be-discovered.

In the 1970s, calculating peak from this *total* expected amount of oil put the global *production peak* (not *global exhaustion*) around the year 2000.

Demand reduction due to ‘73 & ‘78 oil shocks moved this peak to ~2010.

Note: Oil Reserves - Good data & bad data

Public-domain *proved* reserves ('1P')

Atrocious data: under-reported, over-reported, not reported.

Industry *proved plus probable* reserves ('2P')

Data: from oil field owners & operators; also IHS Energy & Wood Mackenzie, PFC Energy, Data Monitor (was Energy Files), etc.; also IFP, BGR.

Must use 2P data to assess future production

(See R.W. Bentley, S.A. Mannan, and S.J. Wheeler. *Assessing the date of the global oil peak: The need to use 2P reserves*. Energy Policy, vol. 35, pp 6364–6382, Elsevier, 2007).

Estimates for date of World peak, 1956 - 1981

Date/Author	Methodology	Ult. (Gb)	Peak Yr.	Mb/d
'56 Hubbert	Ult. from Weeks (mod.); hand-drawn curve	1250	~2000	35
'69 Hubbert	Logistic curve	1350	1990	65
	ditto	2100	2000	100
'72 ESSO	? * “increasingly scarce from ~ yr. 2000”	2100	*	
'72 Ward & Dubois	? [Report to the UN.]	2500	~2000	
'76 UK DoE	?		~2000	
'77 Ehrlich	?	1900	2000	
'77 Hubbert	Ult. from Nehring: Logistic (unconstrn'd.)	2000	1996	100
	Demand flat from 1974	ditto	2035	
	[Actual demand between these two cases.]			
'79 Shell	? ** “plateau within next 25 years”		**	
'79 BP	? Non-communist world, ex NGLs.	?	1985	
	[Actual demand fell, Ult. about right.]			
'81 World Bank	? *** “plateau from around turn of century”	1900	***	

? = Not known; probably mid-point peaking.

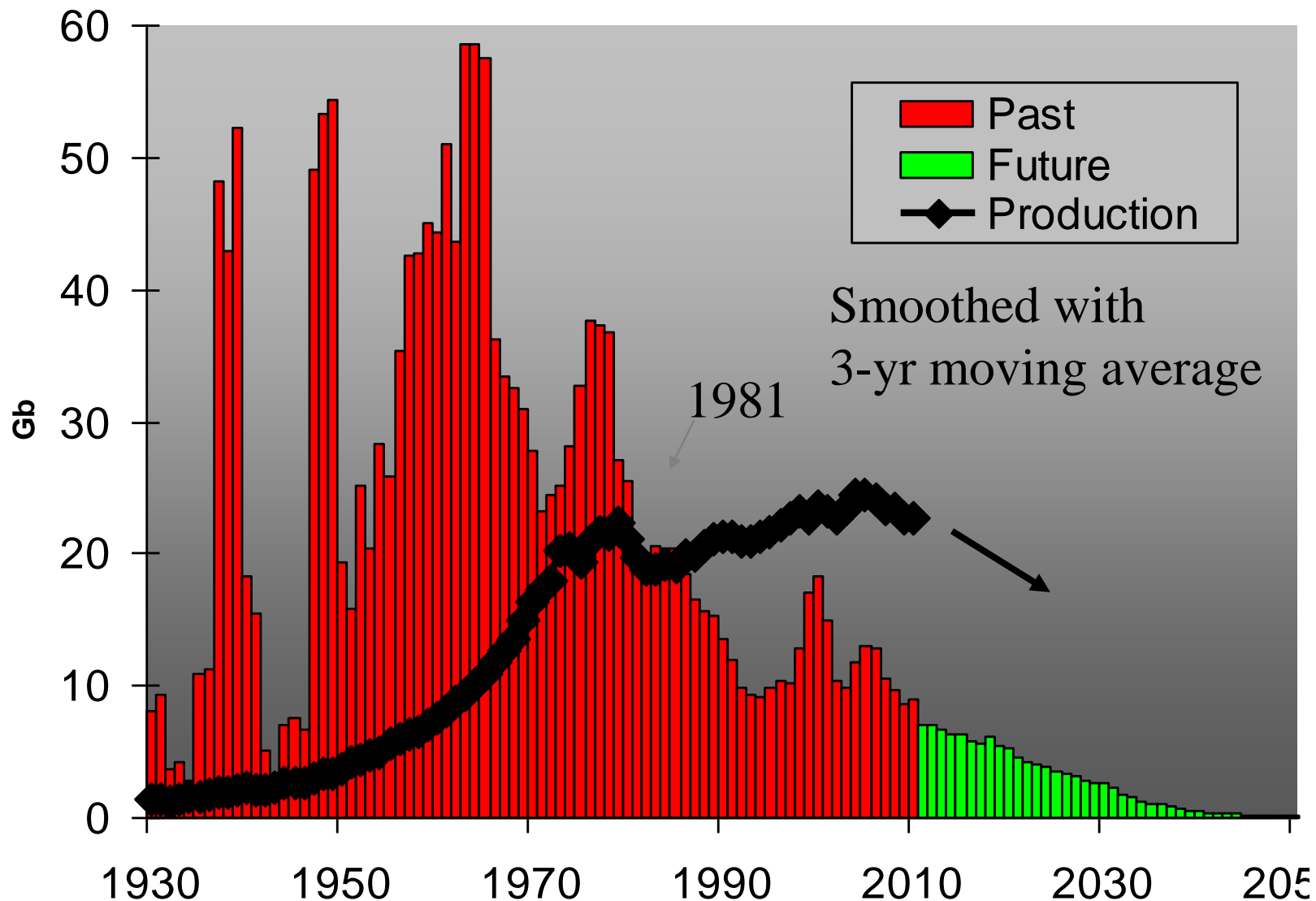
Others gave estimates for oil ‘ultimate’, but did not carry through to a peak date:
 SPRU, UK: 1800-2480Gb; WEC/IFP: 1803 Gb; D. Meadows *et al.*: 1800-2500 Gb.

So: Past oil forecasts – Were they really wrong?

- No, we have had plenty of warning from well-recognised bodies since the 1950's that the peak in global conventional oil production is expected around 2000 - 2010.

(See R.W. Bentley and G.A. Boyle. *Global oil production: forecasts and methodologies*. Environment and Planning B: Planning and Design, vol. 35, pp 609-626, 2008.)

The oil peak: World '2P' discovery peaked in 1964 - delivering peak production 20 years later – Regular oil, Campbell



4. UKERC *Global Oil Depletion* report, Oct. 2009.

UK Energy Research Centre

- Technology and Policy Assessment report.

Authors: Steve Sorrell, Jamie Speirs, Adam Brandt,
Richard Miller, Roger Bentley.

“What evidence is there to support the proposition that global demand for conventional oil will be constrained by physical depletion before 2030?” *

**Conventional oil:* crude oil, condensate and natural gas liquids (NGLs)

Aims

- Clarify concepts, definitions and methods.
- Establish state of knowledge and associated uncertainties regarding key issues.
- Identify strengths and weaknesses of different approaches to estimating resource size and forecasting future supply.
- Summarise and compare different global supply forecasts and identify reasons for the different conclusions.
- Identify research and data gaps.
- Draw conclusions on the risk of near-term physical constraints on global oil supply.

Approach

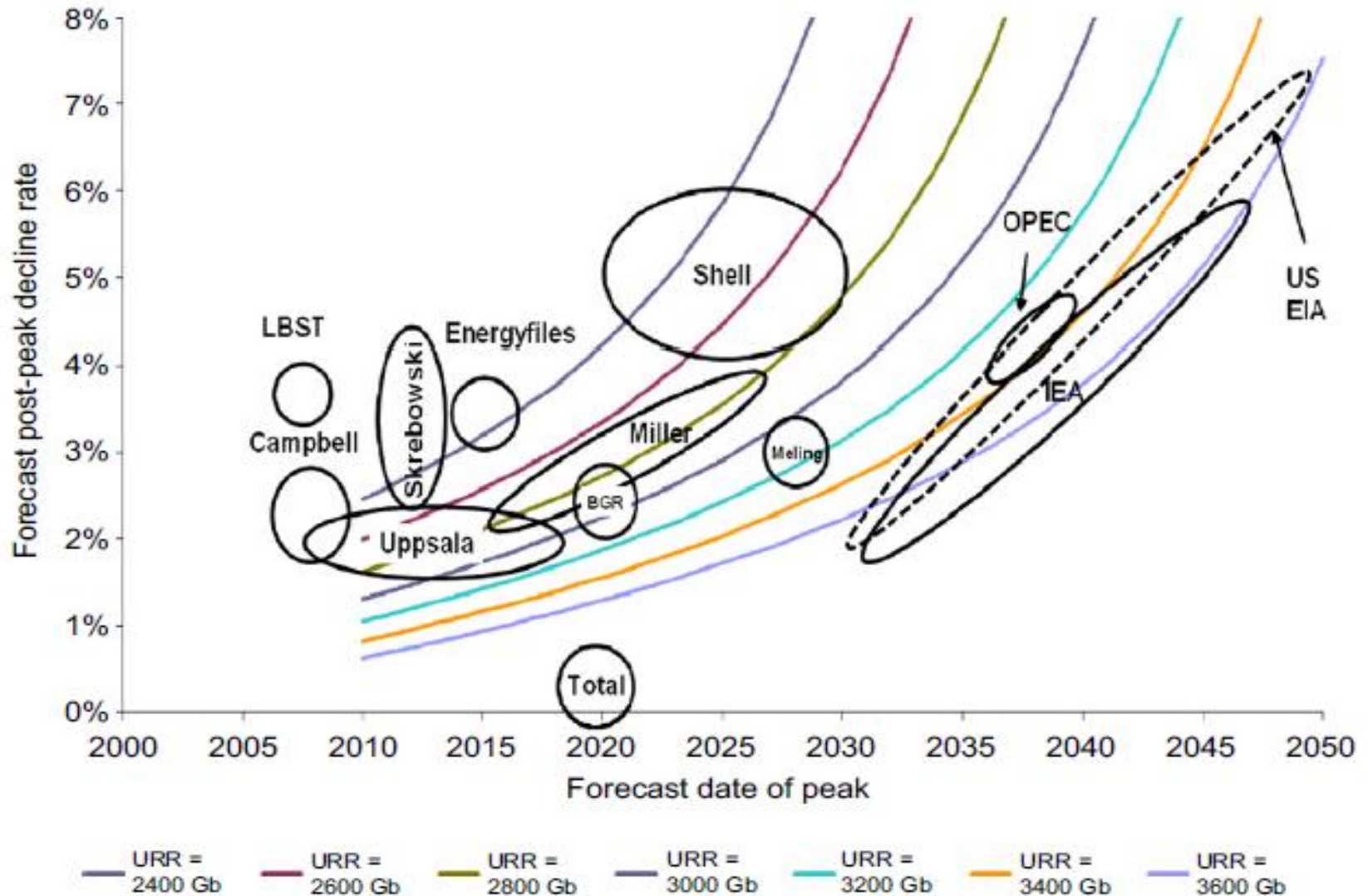
Systematic review of evidence: >500 studies reviewed.

Supplementary data analysis; meetings with modelling teams.

Outputs: Seven technical reports, and peer-reviewed synthesis report.

Comparison of Oil Forecasts – The ‘Miller’ plot

Date of peak vs. post-peak decline and ult. recoverable resource

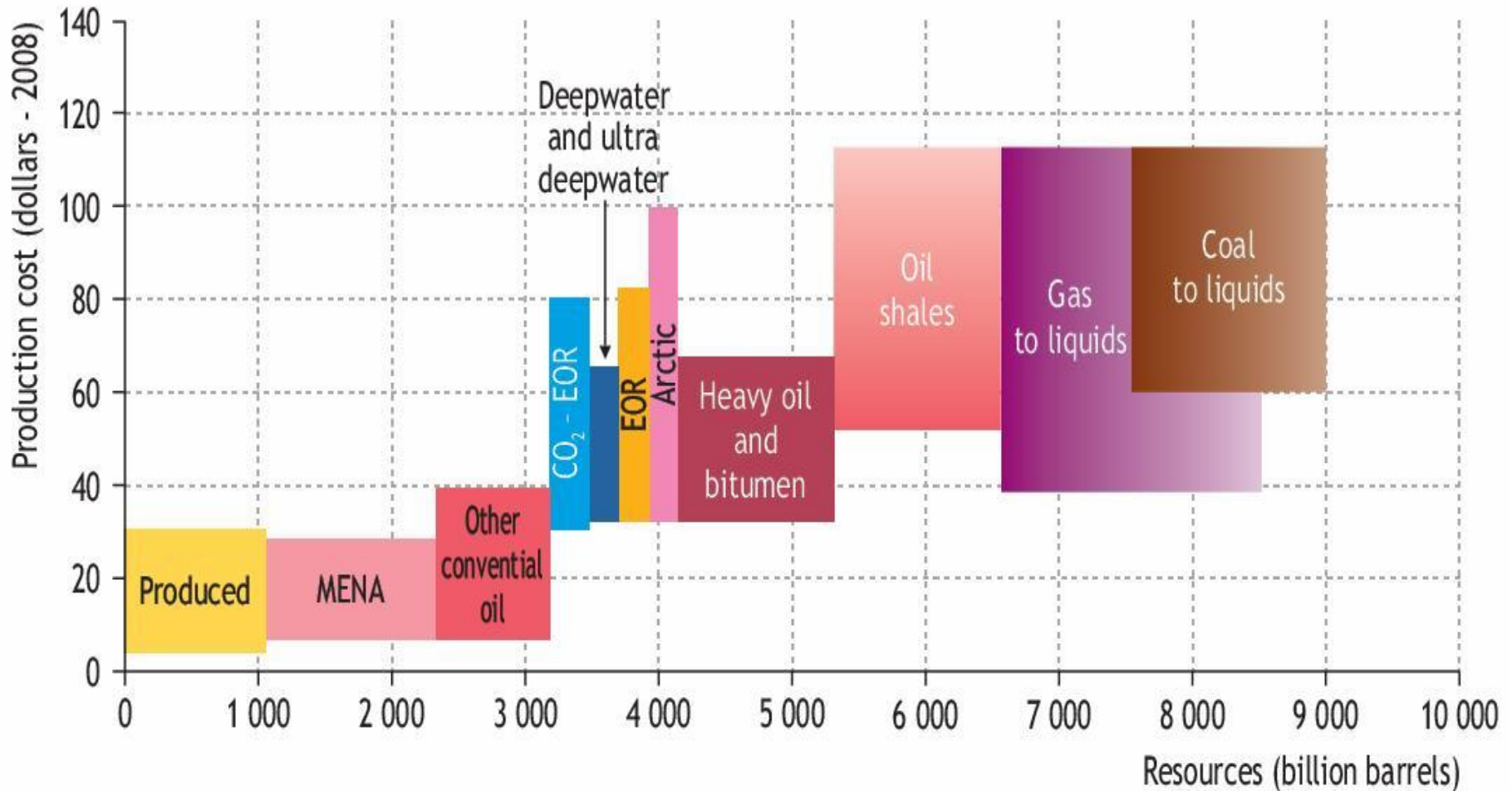


Main Findings

- Global oil depletion is well understood, well advanced, and imposing increasing constraints on future global oil supply.
- Despite data uncertainties, the risk of a peak in global oil production can be adequately assessed.
- Knowledge is improving in key areas such as decline rates and reserves growth.
- Available methods for resource estimation and supply forecasting have major limitations that are insufficiently acknowledged.
- Large resources may be available, but are unlikely to be accessed quickly and may make little difference to the timing of the global peak.
- **A global peak is likely before 2030 and there is a significant risk of a peak before 2020.**

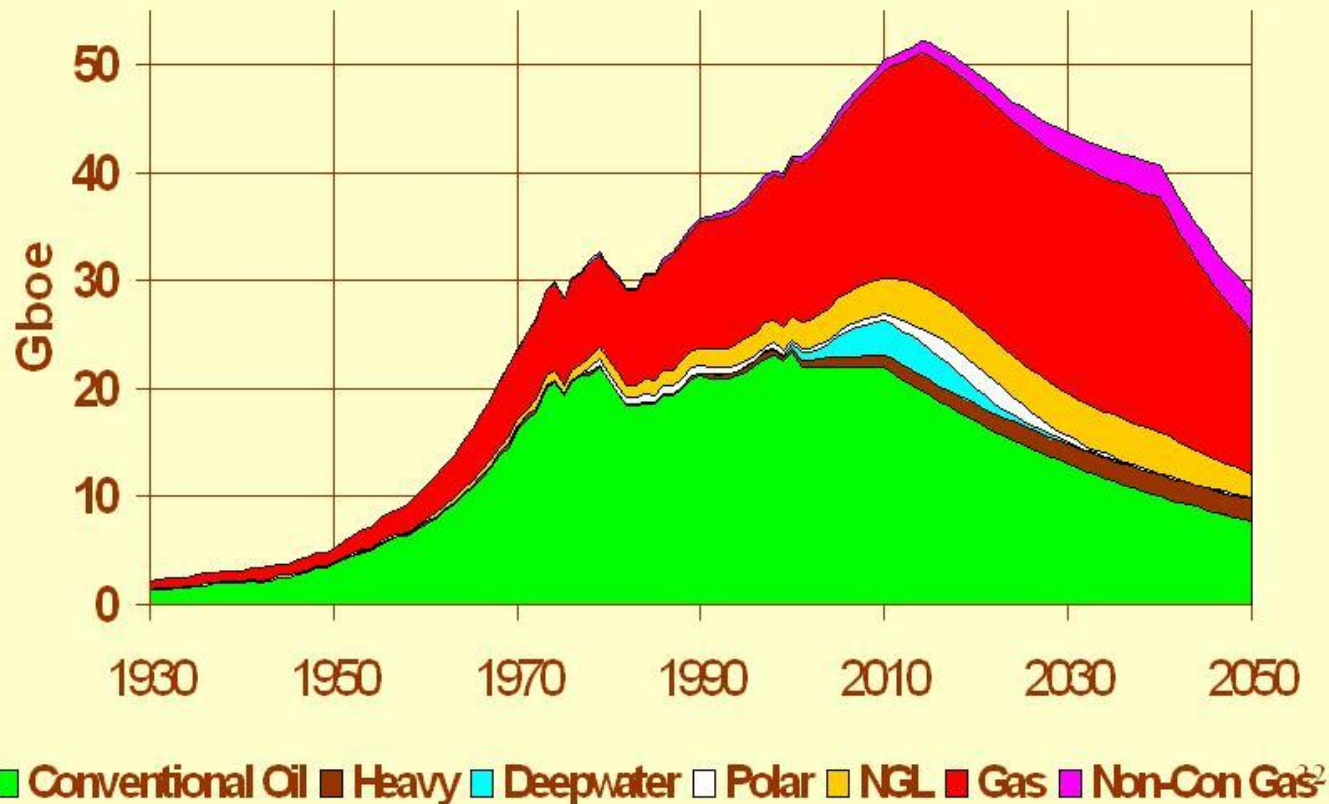
5. There is a lot of oil & 'nearly-oil' - Source: IEA

Long-term oil-supply cost curve



6. But the conventional oil peak is likely to dominate

Uppsala/Campbell Production Forecast 2002 Base Case Scenario



Thank you for your attention