

Current Markets for Biomass and Biofuels

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The Current Market for Biomass Generation

- Biomass standalone
 - chicken litter
 - straw
 - wood
- Biomass - Co-firing
- Biomass and Waste advanced conversion*
 - gasification
 - pyrolysis
 - anaerobic digestion
- * qualifies waste for Renewables Obligation

Electricity Generation Market 2002 -2004

	No of Stations	Total MW	ROC's 2003	ROC's 2004	ROC's % 2004
ACT	2	1.8	173	7,115	0.10%
Biomass	13	158	608,094	809,746	10.73%
Co-firing	28	516	448,513	796,151	10.55%
Hydro >20 MW	112	416	498,572	1,270,337	16.83%
Landfill Gas	257	593	2,716,744	3,151,530	41.76%
Micro Hydro	34	11	40,920	33,972	0.45%
Off-shore Wind	3	64	2,347	43,812	0.58%
On-shore wind	101	625	1,089,894	1,241,034	16.44%
Sewage Gas	66	55	178,303	193,090	2.56%
Total	616	2,440	5,583,560	7,546,787	100%

Source OFGEM 2005

The Market Dynamics

- Overall market is showing year on year growth
- Target for compliance period 2002 -2003 was 9.3 TWhr
- Achievement was 5.57 TWhr's
- Target for compliance period 2003 -2004 13.3 TWhr
- Achievement was 7.35 TWhr's
- Both biomass standalone and co-firing showing consistent growth
- Contribution from biomass/waste ACT was negligible
- Achievement rates were 60% for 2002 -2003 and 55% for 2003 -2004

Comparative Costs of Competing technologies New Build

Technology	Current Cost (p/kwhr)
Large gas CHP	2
Micro gas CHP	2.5 -3.5
PV	70
Onshore wind	2.0 -3.0
Offshore wind	4.0 - 5.0
Biomass Electricity	6.0 - 8.0
Wave	9.0 - 12.0
Solar Thermal	8.0 -10.0
Biomass CHP	7.0 -8.0

Market Prices Achieved 2004

	Total Value	Value Achieved
	(p/Kwhr)	(p/kwhr)
Wholesale Price	.9 - 2.1	.9 - 2.1
Renewables Obligation (Buy Out)	3	2.55 -2.77
Renewables Obligation (Re-cycle)	up to 1.5	0 -1.2
Climate Change Levy	up to .43	.28 - .34
Total	5.83 - 7.03	3.73 - 6.41

Waste Wood Resources - Current Availability

Sector	Wood waste arisings (tonnes)	Tonnage reclaimed for reuse	Tonnage recycled or recovered	Current rate of reuse, recycling and recovery	Potential rate of reuse, recycling and recovery	Potential tonnage of reuse, recycling and recovery
Construction	1,053,000*	135,000	377,000	51%	83%	870,000
Demolition & refurbishment	1,033,000	133,000	240,000	36%	84%	868,000
EOL furniture**	2,050,000	212,500	24,500	9%	71%	1,447,000
Packaging	1,400,000	50,000***	767,000	58%	90%	1,267,000
Total	5,536,000	530,500	1,408,500	36%	80%	4,452,000
*Includes 26,000 tonnes for "other" uses **Furniture figures do not include production wood waste which is estimated at 482,000 tonnes p.a. (WRAP, 2003b) ***This figure only includes packaging wood waste reclaimed for reuse and excludes the weight of reusable packaging such as pallets which are reused each year						

Source - WRAP 2005

The Markets for Biofuels

- Two major fuels, bio-diesel and bio-ethanol
- Also biogas
- Current UK transport fuels markets
 - 21 million tonnes petrol, (bio-ethanol)
 - 16 million tonnes diesel, (bio-diesel)

The Markets for Biofuels

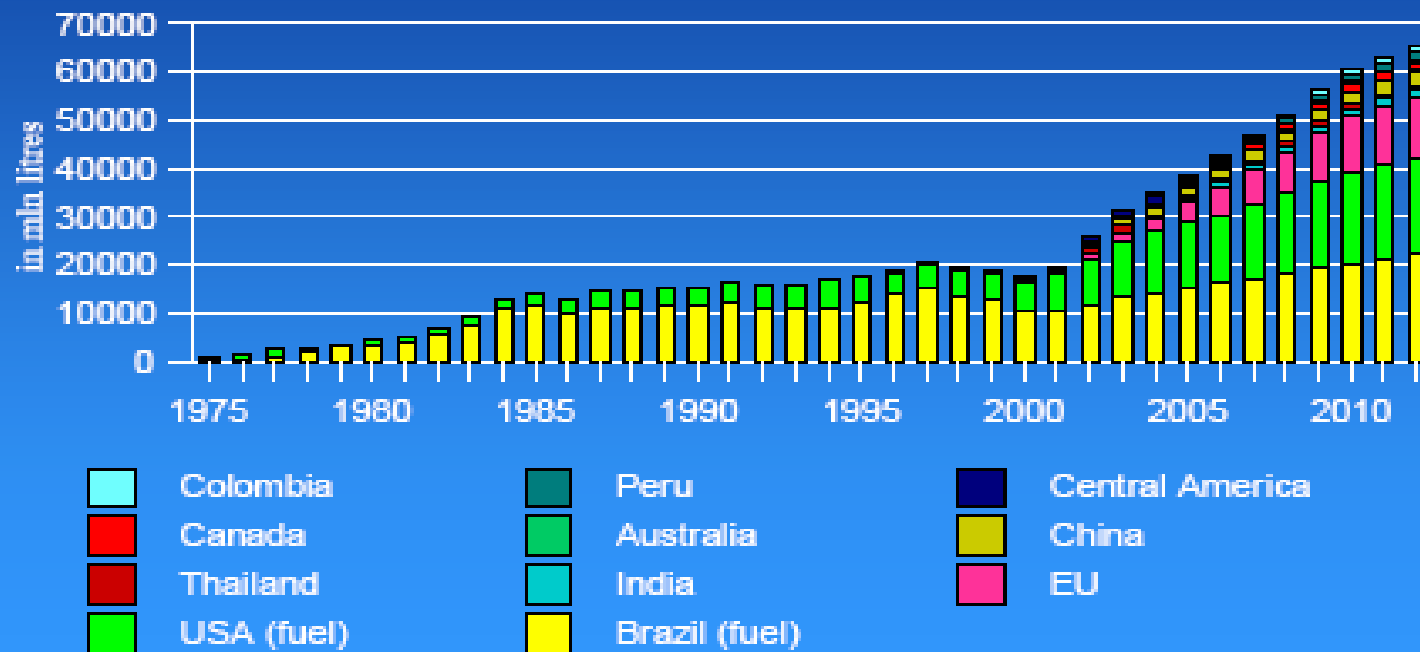
- Indicative target under the EU biofuels directive would result in a market of
 - 1.2 million tonnes bio-ethanol
 - 920,000 tonnes bio-diesel
 - UK currently conducting feasibility for RTFO

The Markets for Biofuels

- However market is already developing
 - esp bio-ethanol which is now cheaper than global gasoline
 - European markets for bio-diesel and bio-ethanol
 - Climate change cars

World Ethanol 2003

World production



Extract from F O Licht Commodity Analysis - Christoph Berg Nov 2003



Why ?

- Success in more developed European Markets
- Biofuels deliver real Climate Change benefits
- Cost to manufacturer is less than £60
- Now two manufacturers competing

Technology Choices and Environmental Benefits

	Well to Tank'	Tailpipe	Well to Wheels	Nox	Particulates
Bio-diesel	(80) to (90)	155	60	Poor	Poor
Bio-ethanol	(40) to (135)	180	45 to 140	Very Good	Good
LPG	15	145	160	Good	Very Good
CNG	30	135	165	Good	Very Good
Hydrogen	250	5	255	Very Good	Very Good
Gasoline	30	190	220	OK	OK
Diesel	20	145	165	Poor	Very Poor
Full Hybrid	20	130	150	Very Good	Very Good

Source European Council for Automotive R&D

The Heat Market

- At all scales
- Industrial CHP to Domestic Heating
- Very difficult to Quantify
- Encouraging DTI / DEFRA to develop statistics
- Estimate about 1 million households use wood for some or all of their heating needs

Market Prospects

- Transition from legislative to economic drivers
- Key Questions
- Cost/ Availability of fossil fuels ?
- When will the consumer engage with Climate Change ?

Everyone agrees oil will run out.

There are two views of when: 1

Late Toppers:

- Topping Point (peak of depletion) in 2030s
 - “Forty years supply at least” (Lord Browne, 2004)
- Believers:
 - all the oil companies and OPEC
 - almost all financial analysts & journalists
 - all governments and agencies, e.g. IEA
- Implications:
 - economies will be OK in principle
 - there will be time to develop alternatives

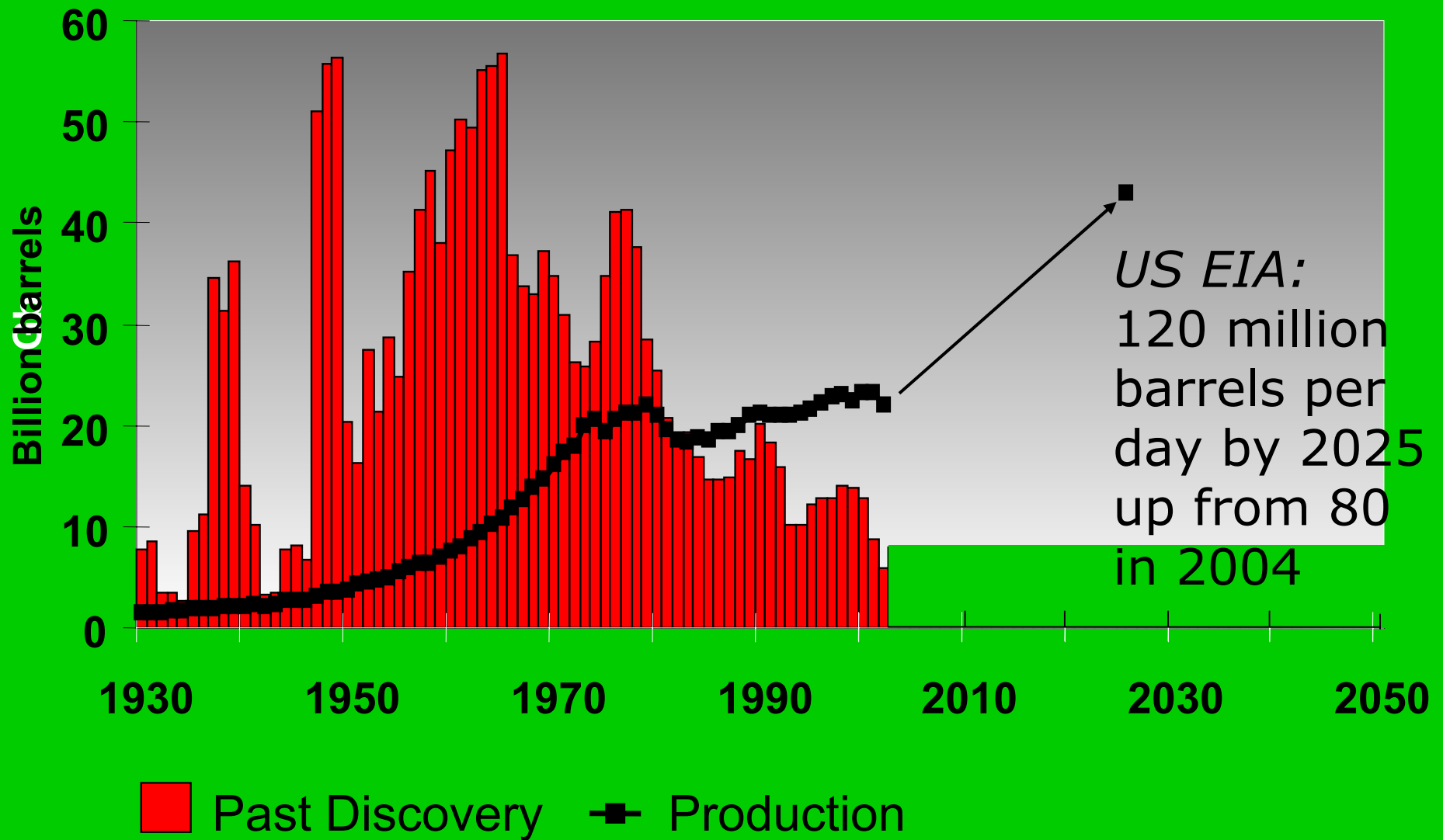
Everyone agrees oil will run out.

There are two views of when: 2

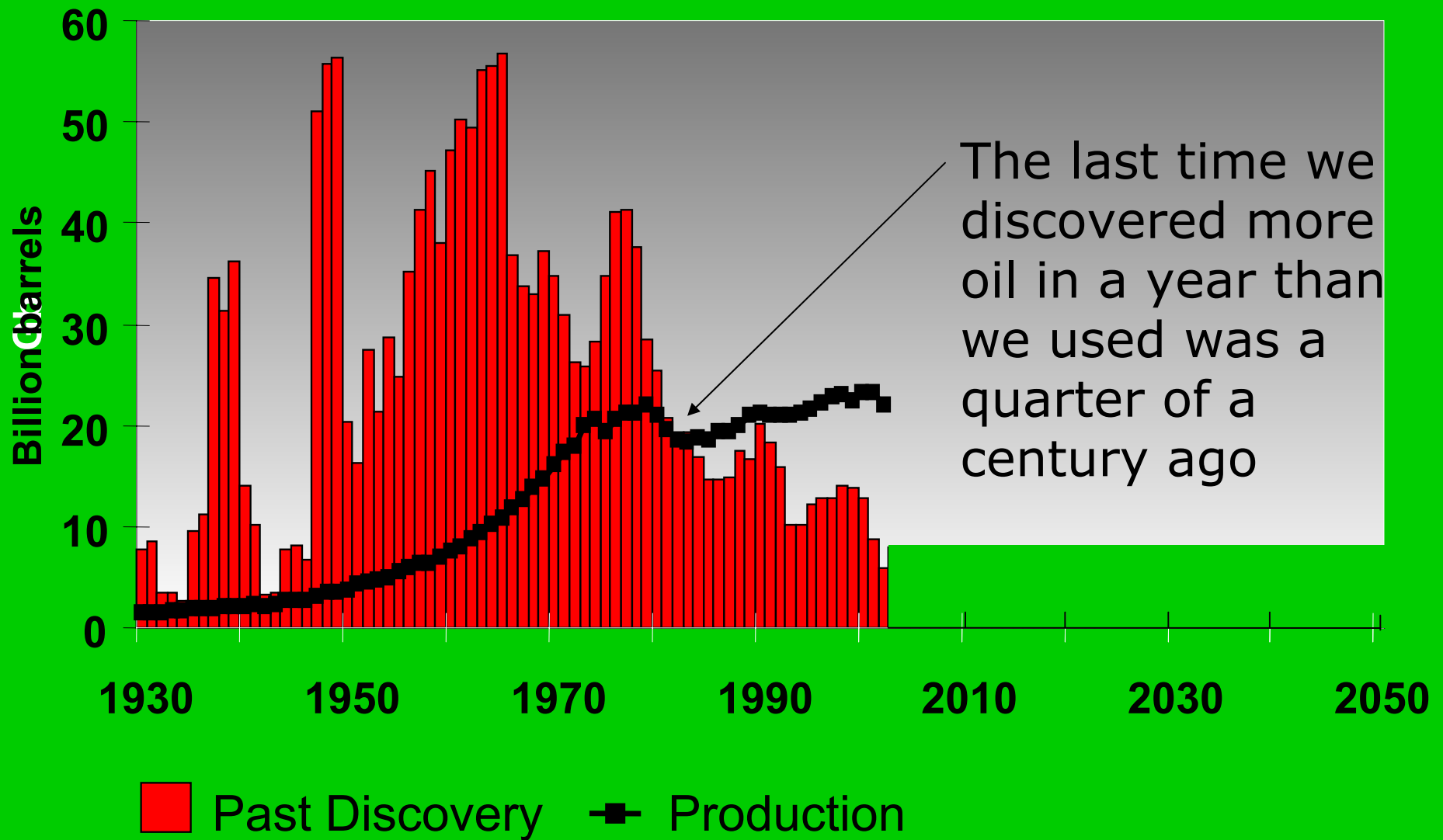
Early Toppers:

- Topping Point (peak of depletion) lies in the window 2006 – 2010 (and maybe even 2004)
 - the market will wake up to this soon
- Believers:
 - a growing number of dissident *experts*
.....mostly oil company geologists
 - some financial analysts & journalists
 - some futures traders
- Implications:
 - economies will be dislocated
 - there will be no time to develop alternatives

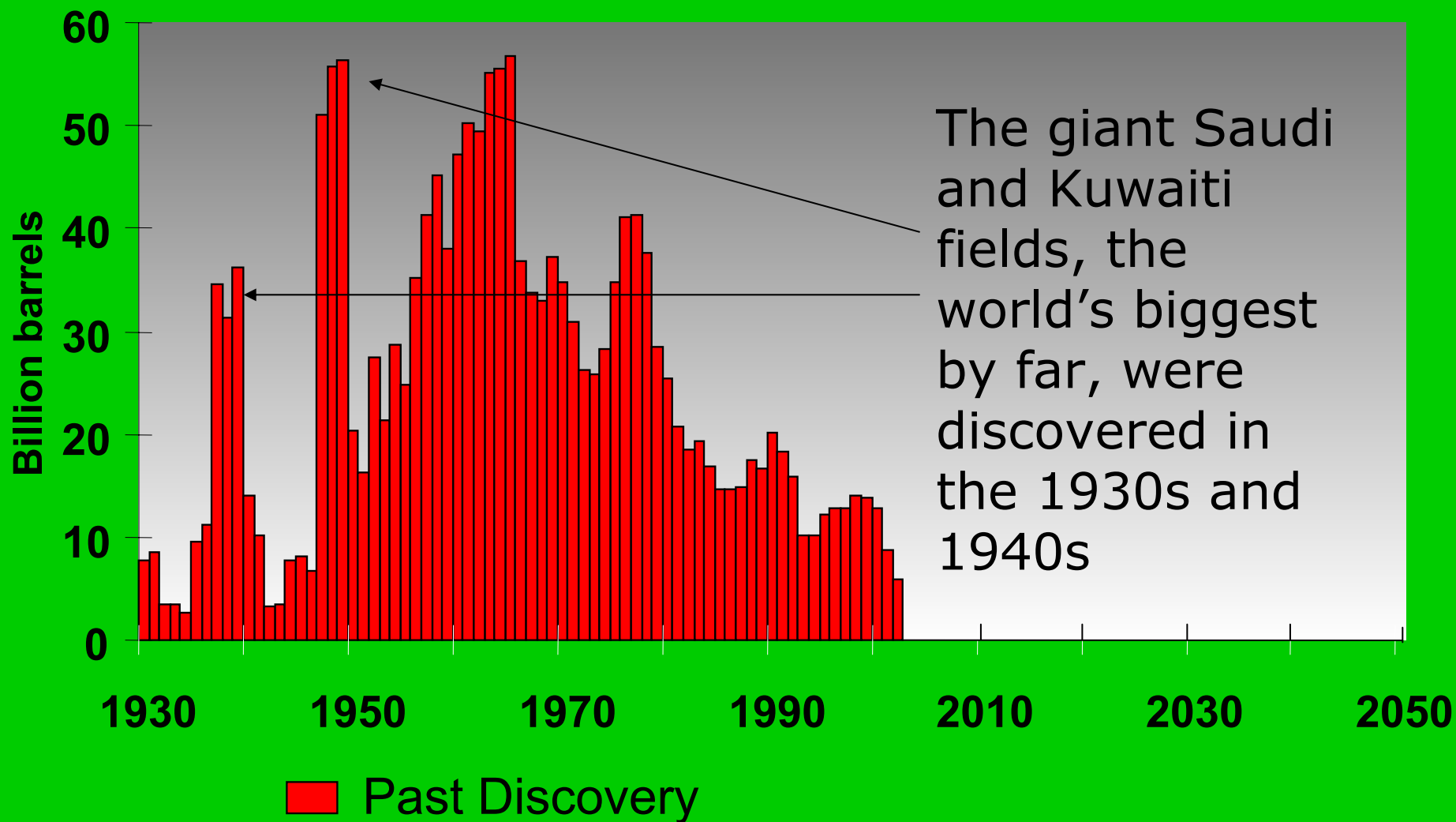
How much addition do we need?



The curve of discovery versus production



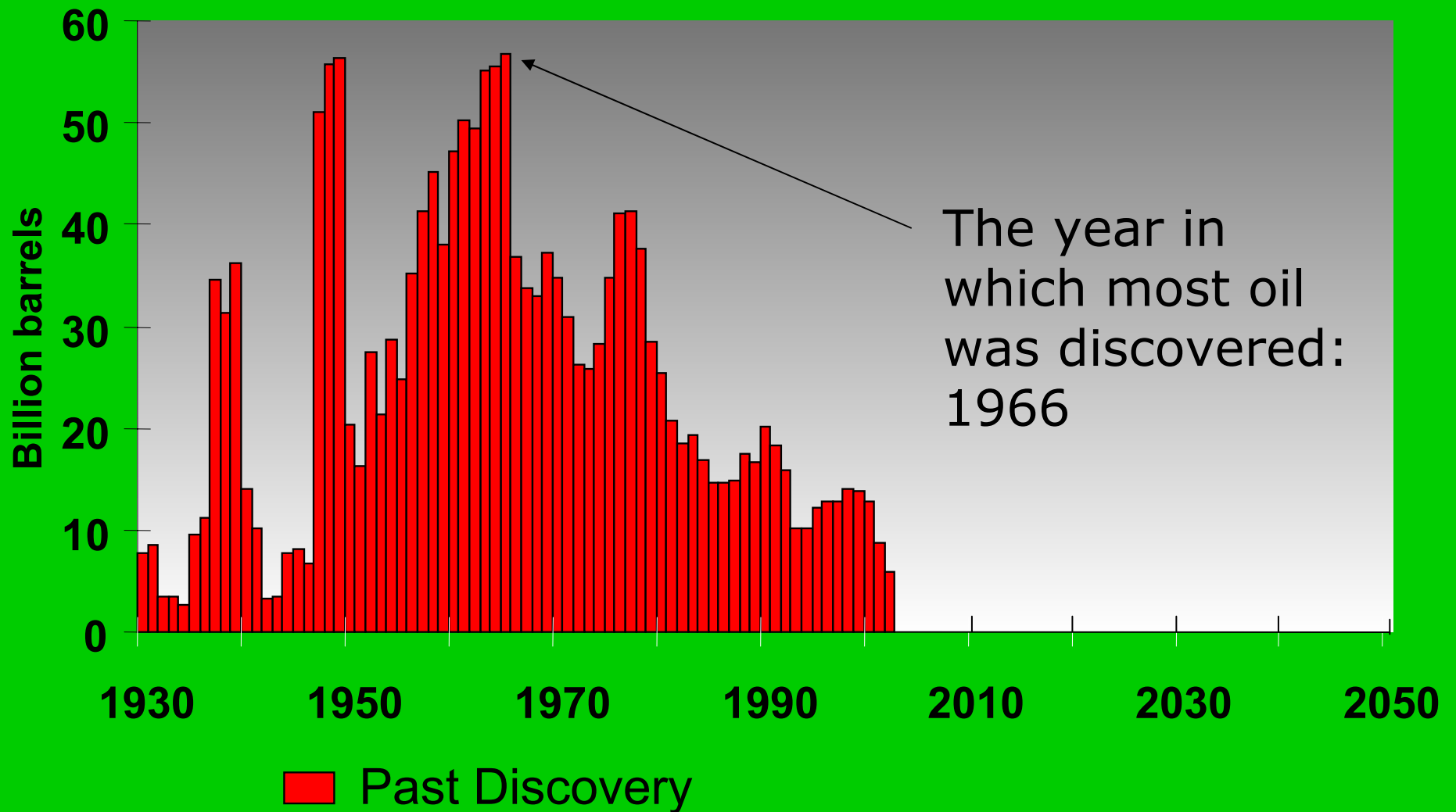
The pattern of global oil discovery



■ Past Discovery

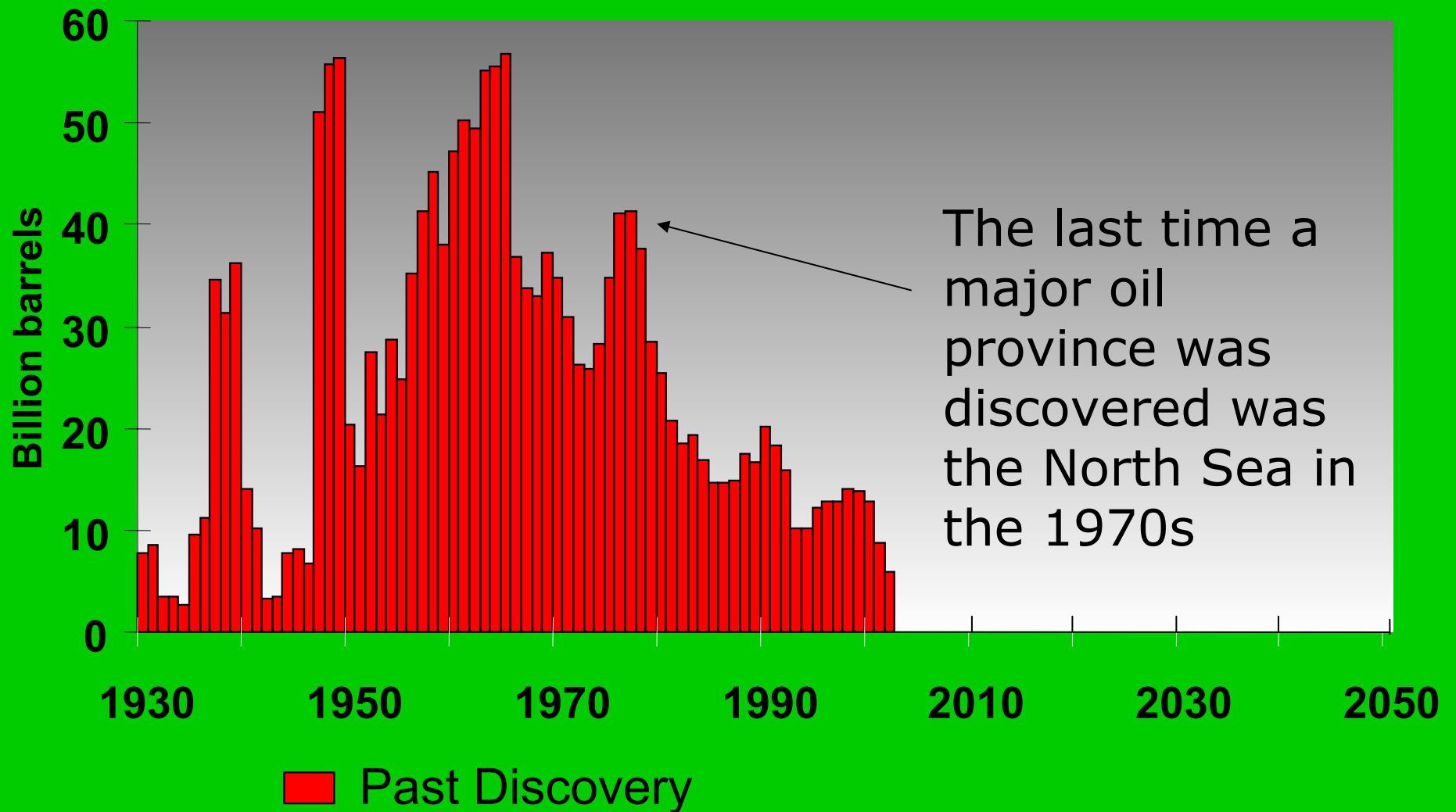
Source: Exxon

The pattern of global oil discovery



Source: Exxon

The pattern of global oil discovery



■ Past Discovery

Source: Exxon

The world assumes *growing* supplies of *cheap* oil



A sports utility vehicle on sale at the Shanghai Motor Show ...1 mpg when driven at speed