

Peak Oil: A change in direction

Phil Hart

Petroleum Facilities Engineer

aspo@philhart.com

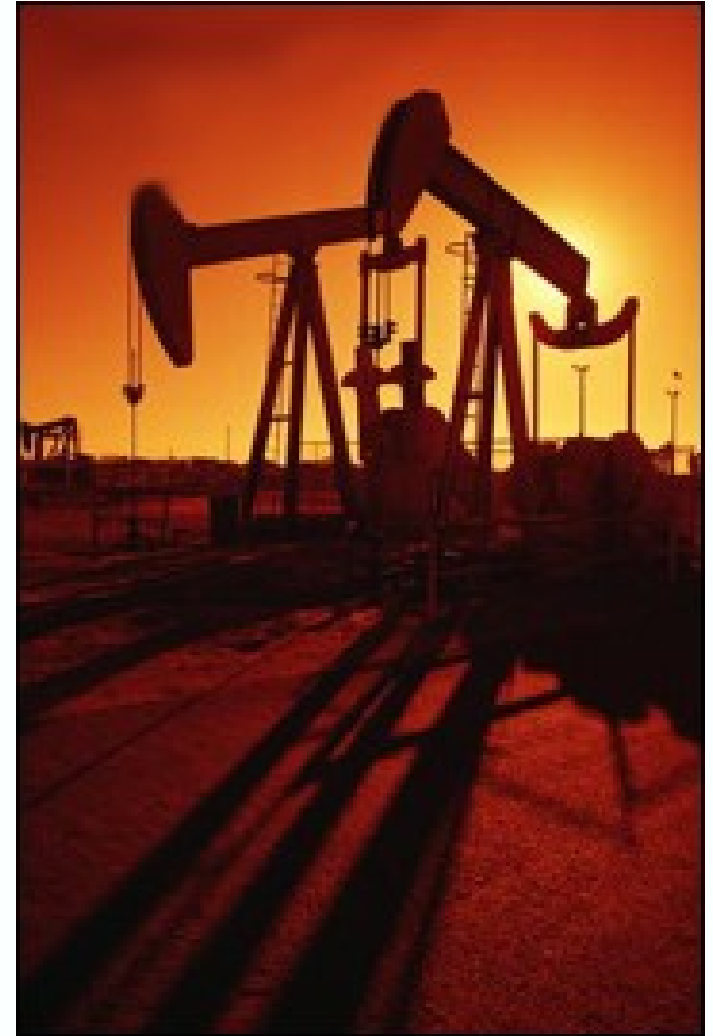


Peak Oil

We are not 'running out of oil'. But oil is a finite resource - supply cannot grow forever.

Production will peak, sooner rather than later. Each year we will have less than the year before.

- *Prices – high, or low?*
- *Discovery down, Reserves.. up?*
- *Giant oil fields are getting old*
- *Unconventional oil / Bio-fuels*
- *What Industry leaders are saying*
- *Oil Vulnerability*



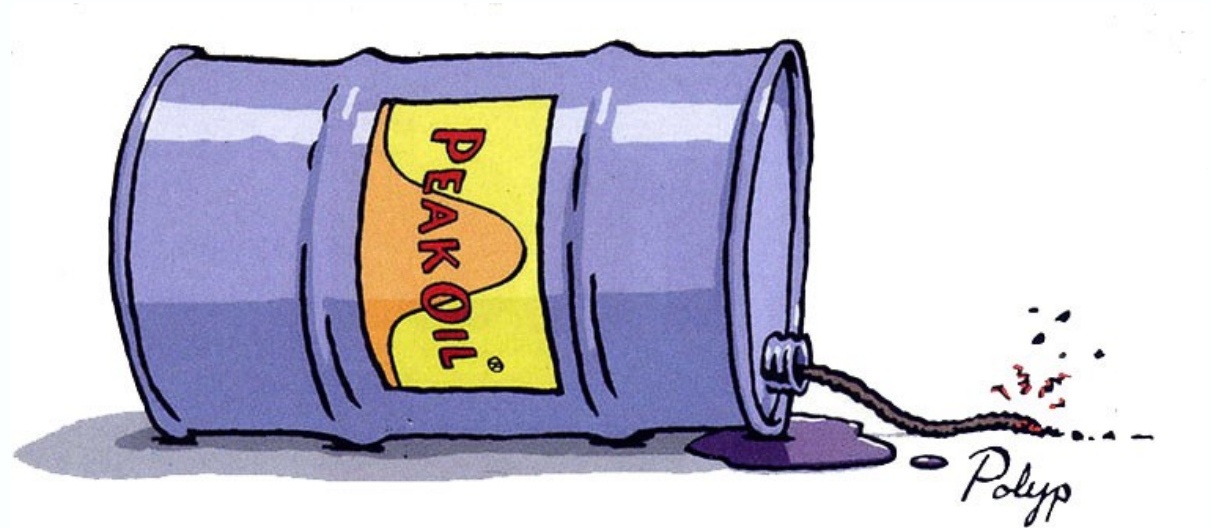
Why does it matter?

Collectively we are addicted to oil driven 'economic growth':

'Competitively priced and reliable energy is fundamental to Australia's continued economic growth and our modern lifestyle.'

Ian Macfarlane MP, Minister for Industry, Tourism and Resources.

ABARE, Energy in Australia 2005



Why are prices so high?

The 'market experts' said:

- Geopolitical tension
- Violence in Nigeria
- BP's corroded pipelines
- Hurricanes
- Protests in Venezuela

They never question the amount of oil in the ground.



There have always been supply disruptions, but in the past we had spare capacity. With no easy alternatives, we might be prepared to pay a lot more.



There is nothing else like oil



One litre of petrol stores 10kWh (35MJ) of energy.

On a typical sunny day, a rooftop solar system will generate about 5kWh.

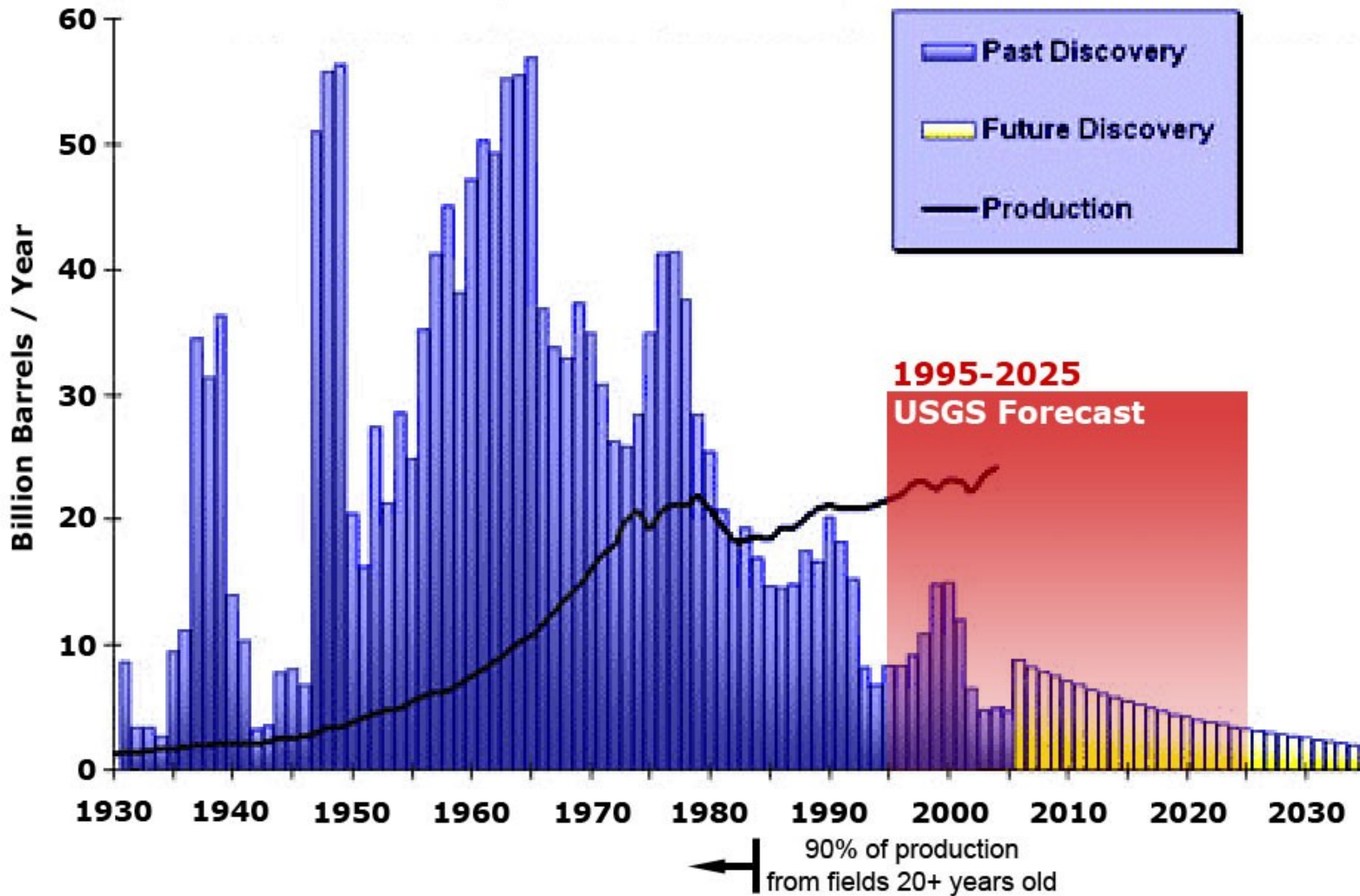
So, it takes two days to generate the equivalent of one litre of fuel for your car.

And more than three months to fill your fifty litre tank.

Does it **only** cost \$1.40/litre?



Oil Discovery



OPEC Oil Reserves

	UAE	Iran	Iraq	Kuwait	Saudi Arabia	Venezuela	Neutral Zone
1983	32.3	55.3	65.0	67.0	168.8	25.9	5.7
1984	32.5	58.9	65.0	92.7	171.7	28.0	5.6
1985	33.0	59.0	65.0	92.5	171.5	54.5	5.4
1986	97.2	92.9	72.0	94.5	169.7	55.5	5.4
1987	98.1	92.9	100.0	94.5	169.6	58.1	5.3
1988	98.1	92.9	100.0	94.5	255.0	58.5	5.2
1989	98.1	92.9	100.0	97.1	260.1	59.0	5.2
1990	98.1	92.9	100.0	97.0	260.3	60.1	5.0
1991	98.1	92.9	100.0	96.5	260.9	62.6	5.0
1992	98.1	92.9	100.0	96.5	251.2	63.3	5.0
1993	98.1	92.9	100.0	96.5	261.4	64.4	5.0
1994	98.1	94.3	100.0	96.5	261.4	64.9	5.0
1995	98.1	93.7	100.0	96.5	261.5	66.3	5.0
1996	97.8	92.6	112.0	96.5	261.4	72.7	5.0
2005	97.8	136.3	115.0	101.5	264.2	80.0	5.0

“The hike in OPEC countries’ estimates of their reserves was driven by negotiations at that time over production quotas, and had little to do with the actual discovery of new reserves.”

IEA World Energy Outlook 2004



Giant fields are getting old

- 20% of global production comes from just 14 giant fields.
- Half our production comes from ~120 of the largest fields.
- The other half comes from over 4000 smaller fields.
- All but one of those 14 giant fields are very old and probably in decline.
- In any region, once the large early discoveries begin to decline, total production starts to fall.

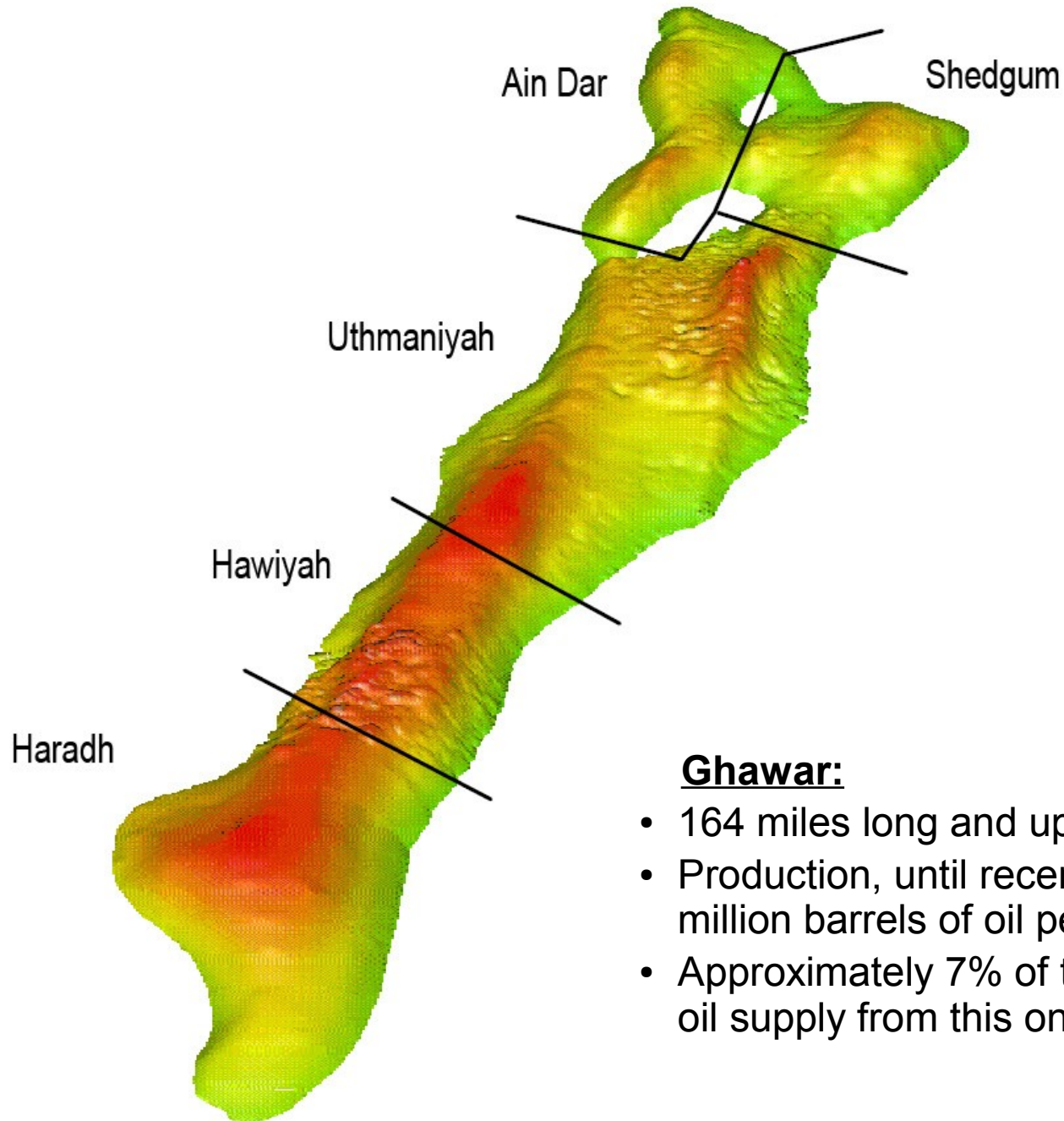
14
Giant Oil Fields

100+
Really Big Fields

4000+
Smaller Fields



Ghawar – The World's Giant Oil Field

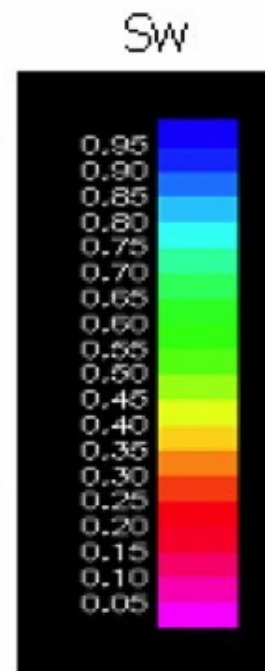
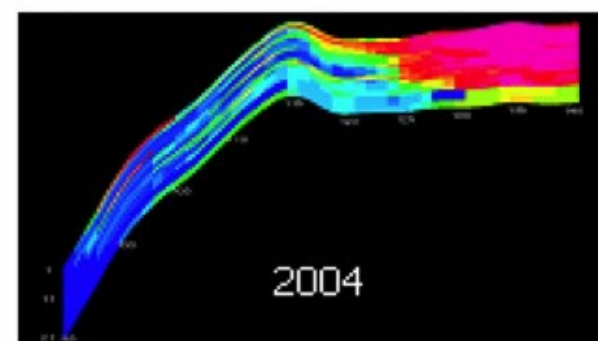
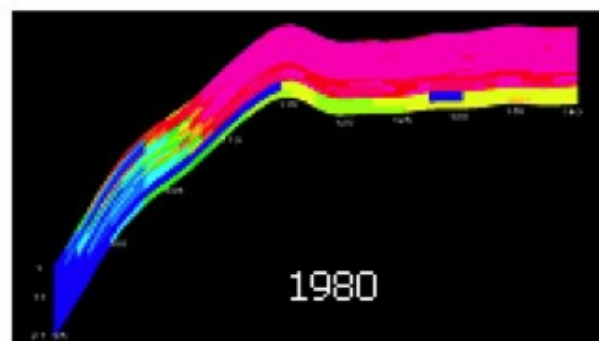
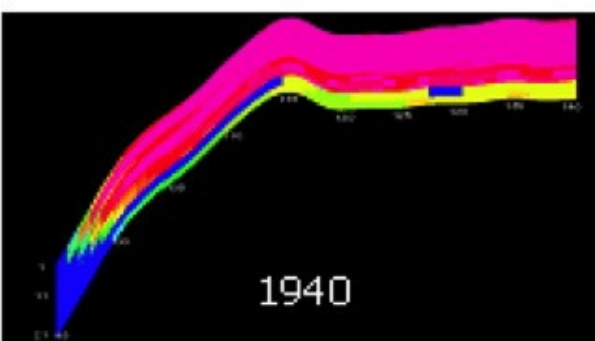


Ghawar:

- 164 miles long and up to 16 miles wide
- Production, until recently, was up to 5 million barrels of oil per day.
- Approximately 7% of the world's crude oil supply from this one giant field.



Ghawar – The World's Giant Oil Field

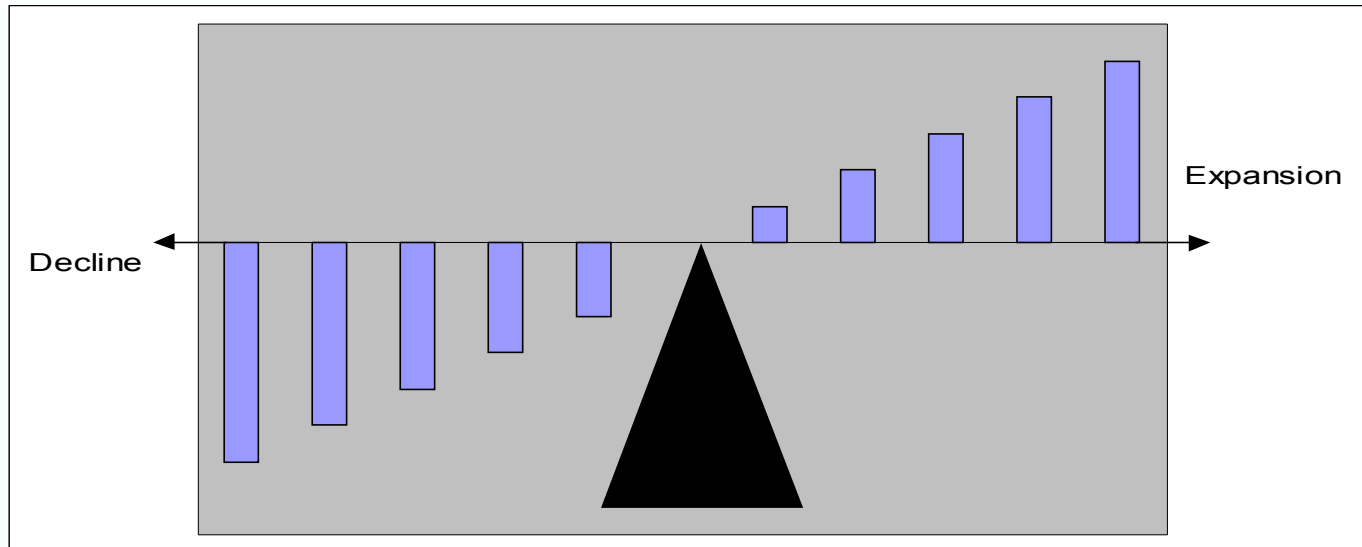


Mearns 2007, Ghawar Base Case (revision 1)
europe.theoildrum.com

	Ain Dar	Shedgum	Uthmaniyah	Hawiyah	Haradh
Initial Reserves (Billion Barrels)	22	11	37	14	13
2006 Reserves (Billion Barrels)	1.7	3.7	4.3	10.3	7.1
Depletion	92%	67%	88%	25%	47%
Maximum Production (Million Barrels per Day)	1.0	1.0	1.5	0.6	0.9

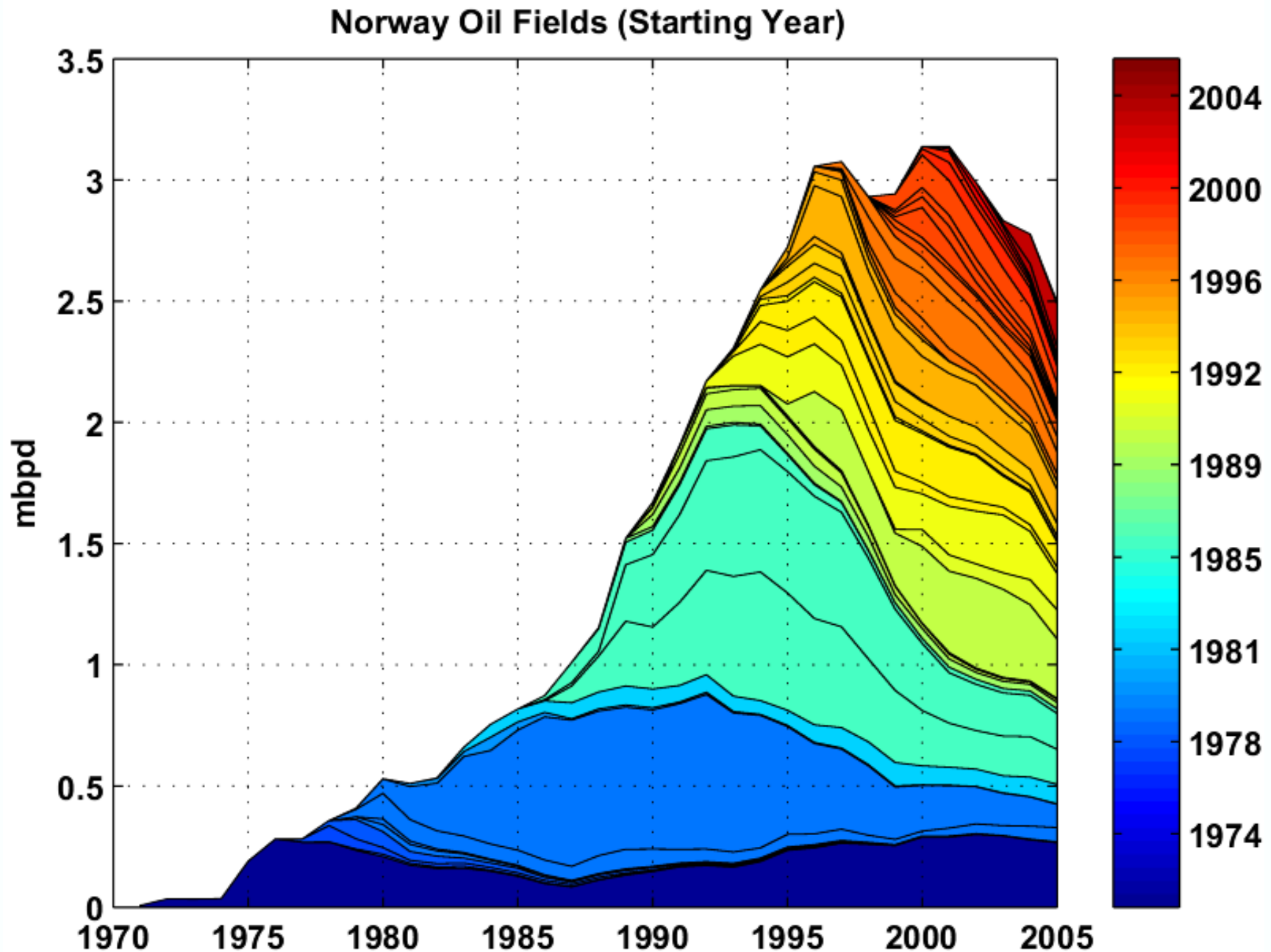


Peak oil will arrive before we expect it



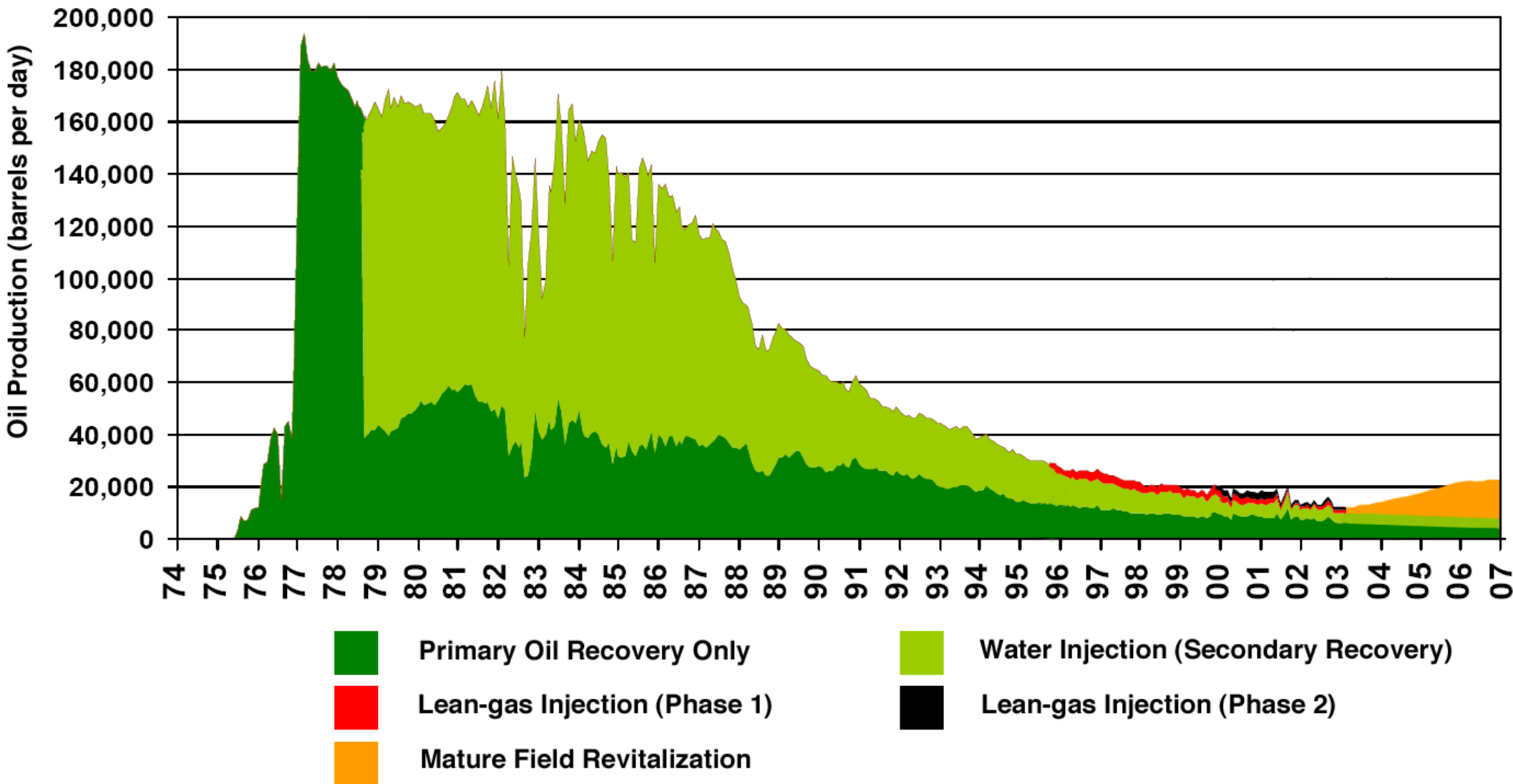
- Maximum production will occur when loss of output from areas in decline exceeds gains in output from those areas that are expanding.
- Even after peak oil, production in many countries will still be expanding, so there will be no shortage of positive news.
- Our perception is biased by our focus on the expanding areas.

Depletion and Decline - Norway



How Technology Increases Oil Production

HANDIL OIL PRODUCTION HISTORY

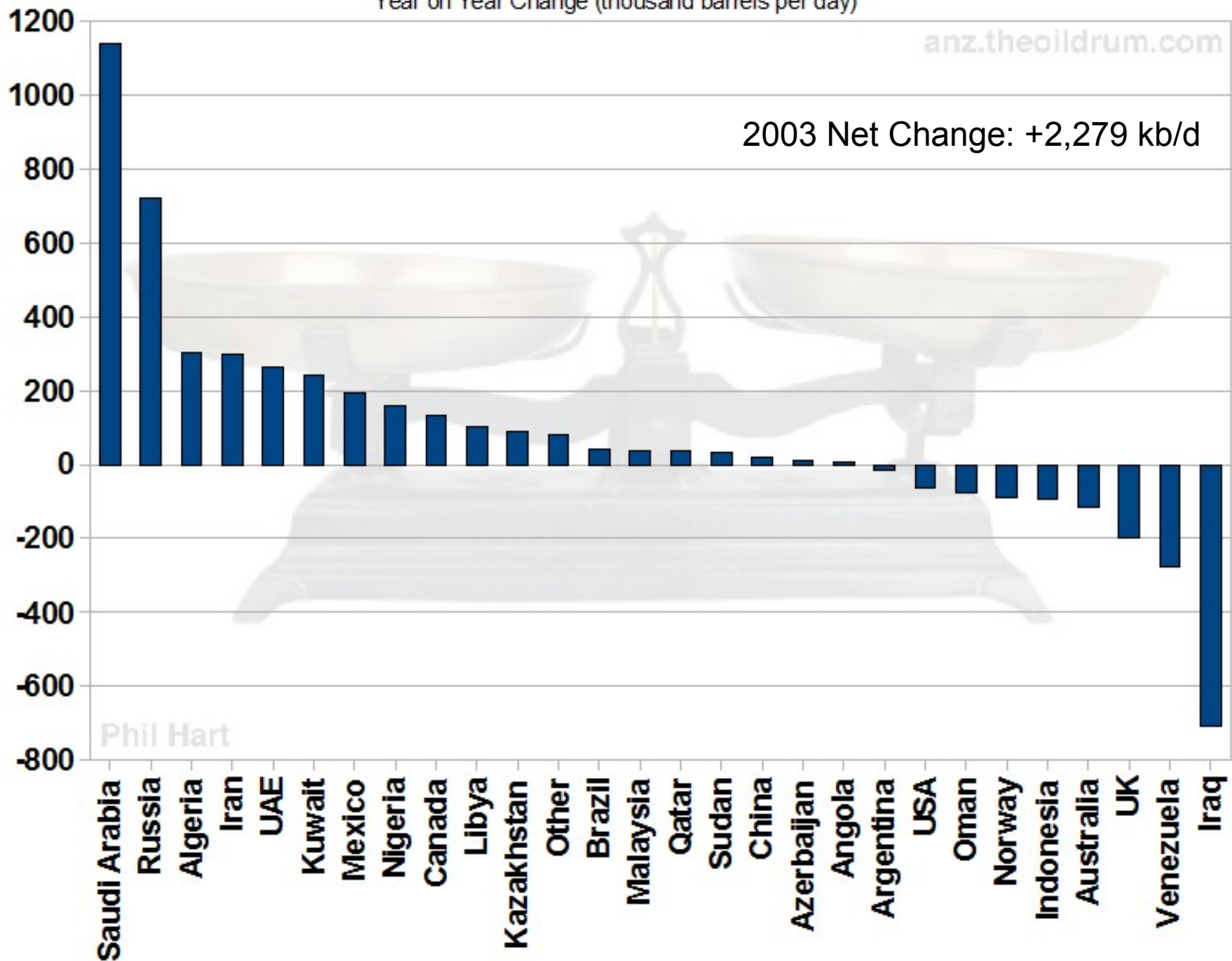


2003 Oil Production Balance

Year on Year Change (thousand barrels per day)

anz.theoildrum.com

2003 Net Change: +2,279 kb/d



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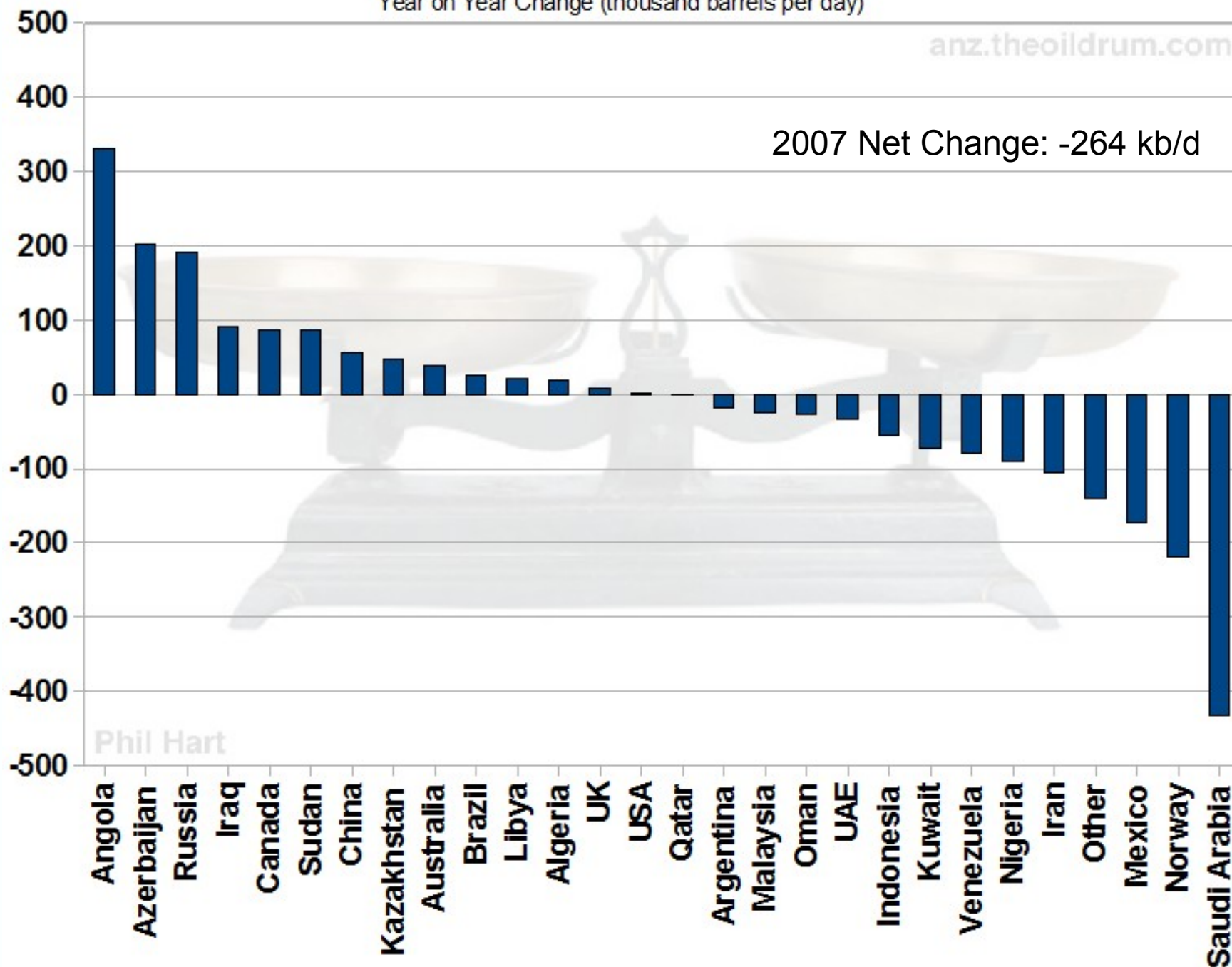
ASPO Australia
Australian Association for the Study of Peak Oil and Gas

2007 Oil Production Balance

Year on Year Change (thousand barrels per day)

anz.theoildrum.com

2007 Net Change: -264 kb/d



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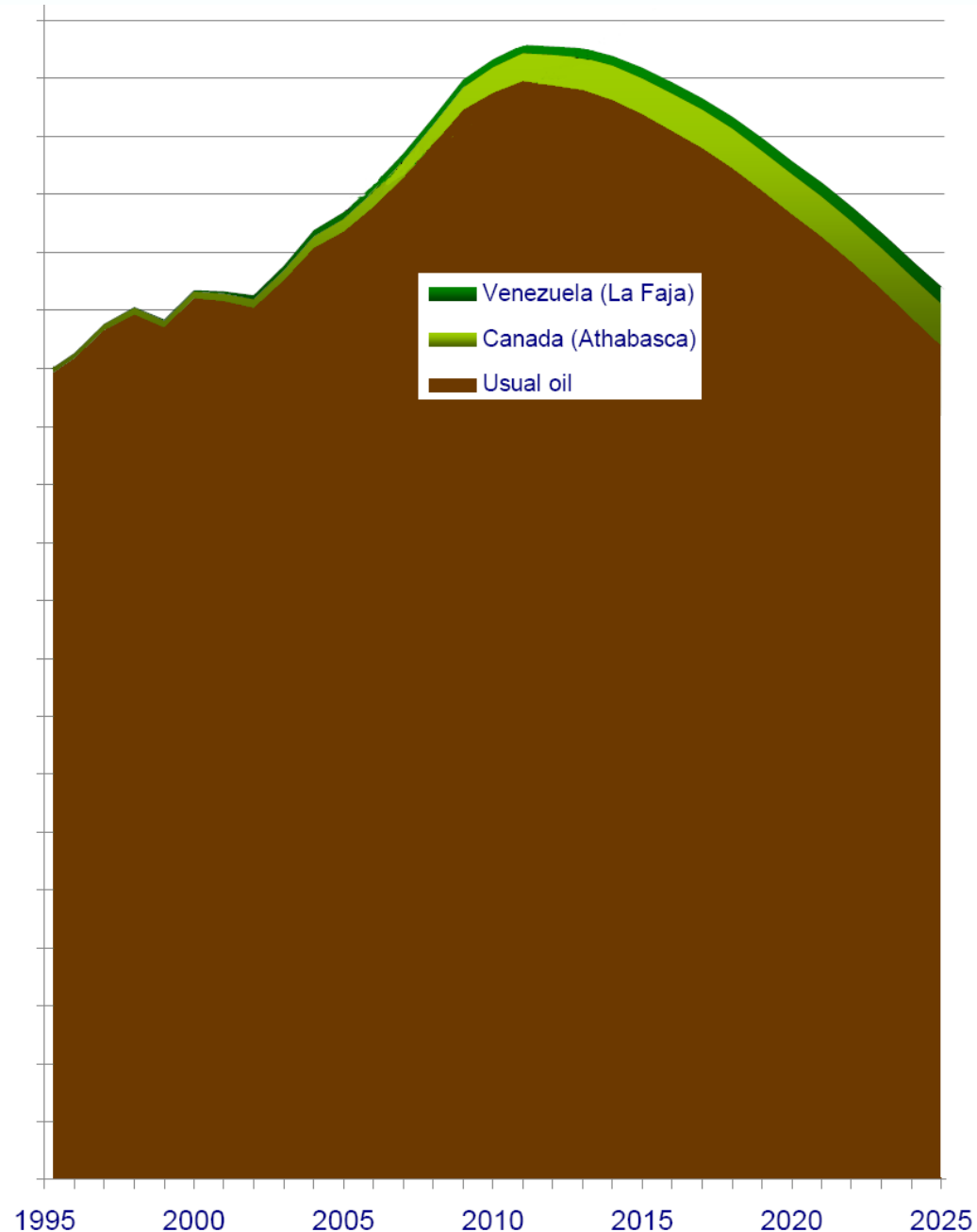
Unconventional oil

Global production from Alberta tar sands, Orinoco heavy oil, bio-fuels, shale oil and gas and coal-to-liquids is estimated to increase 2.8 million b/d by 2015.

Oxford Institute of Energy Studies

“Each barrel of oil requires two to five barrels of water, carves up four tons of earth, uses enough natural gas to heat a home for one to five days, and adds to the greenhouse gases slowly cooking the planet, according to the industry's own calculations.”

Washington Post



Bio-fuels

If all of Australia's current wheat production were converted to ethanol, it would provide less than 10% of our fuel needs.

Most countries with less land and more people would achieve much less.

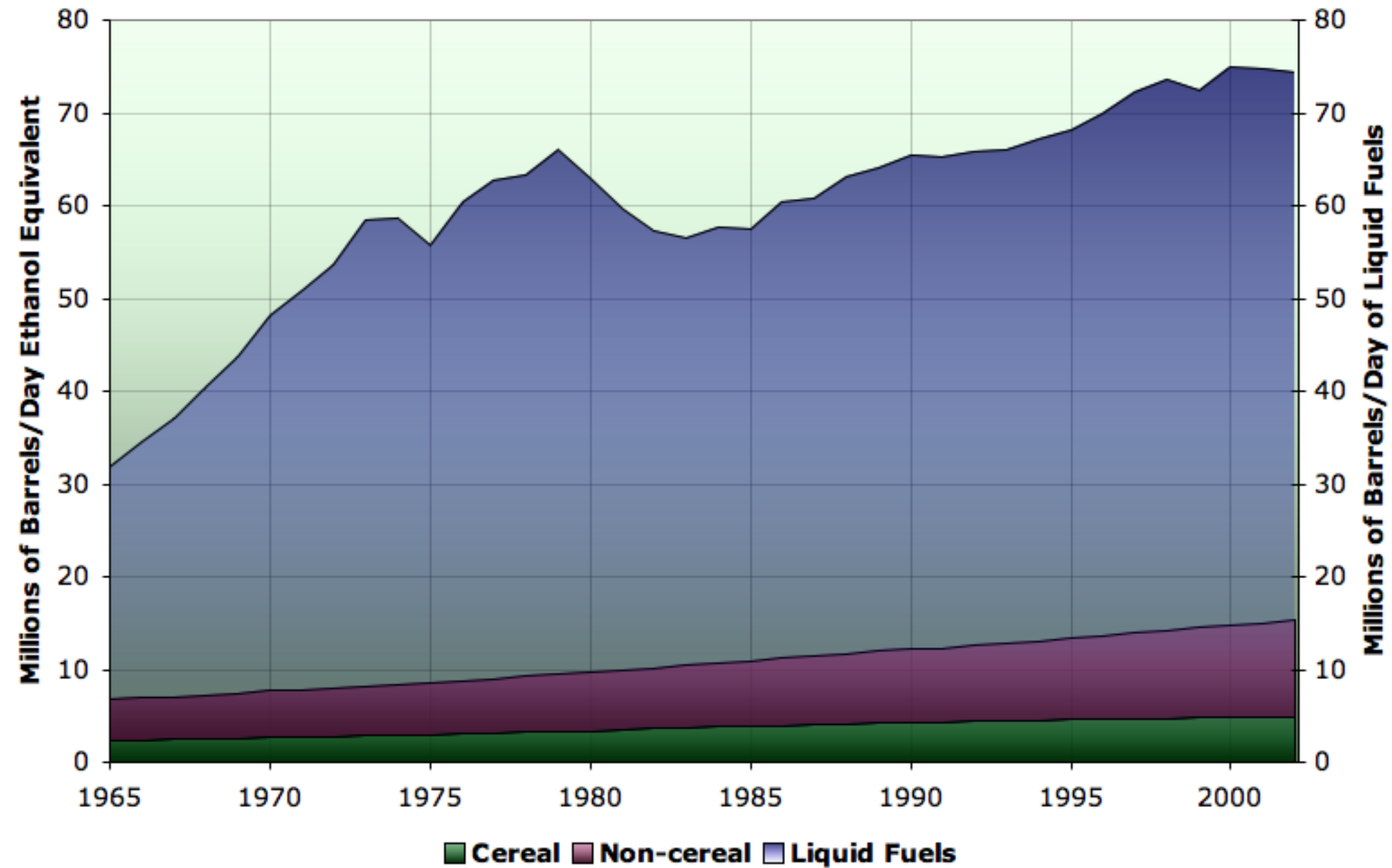
Bio-fuels depend on oil for their production, refining and distribution.

What would we eat?



Bio-fuels

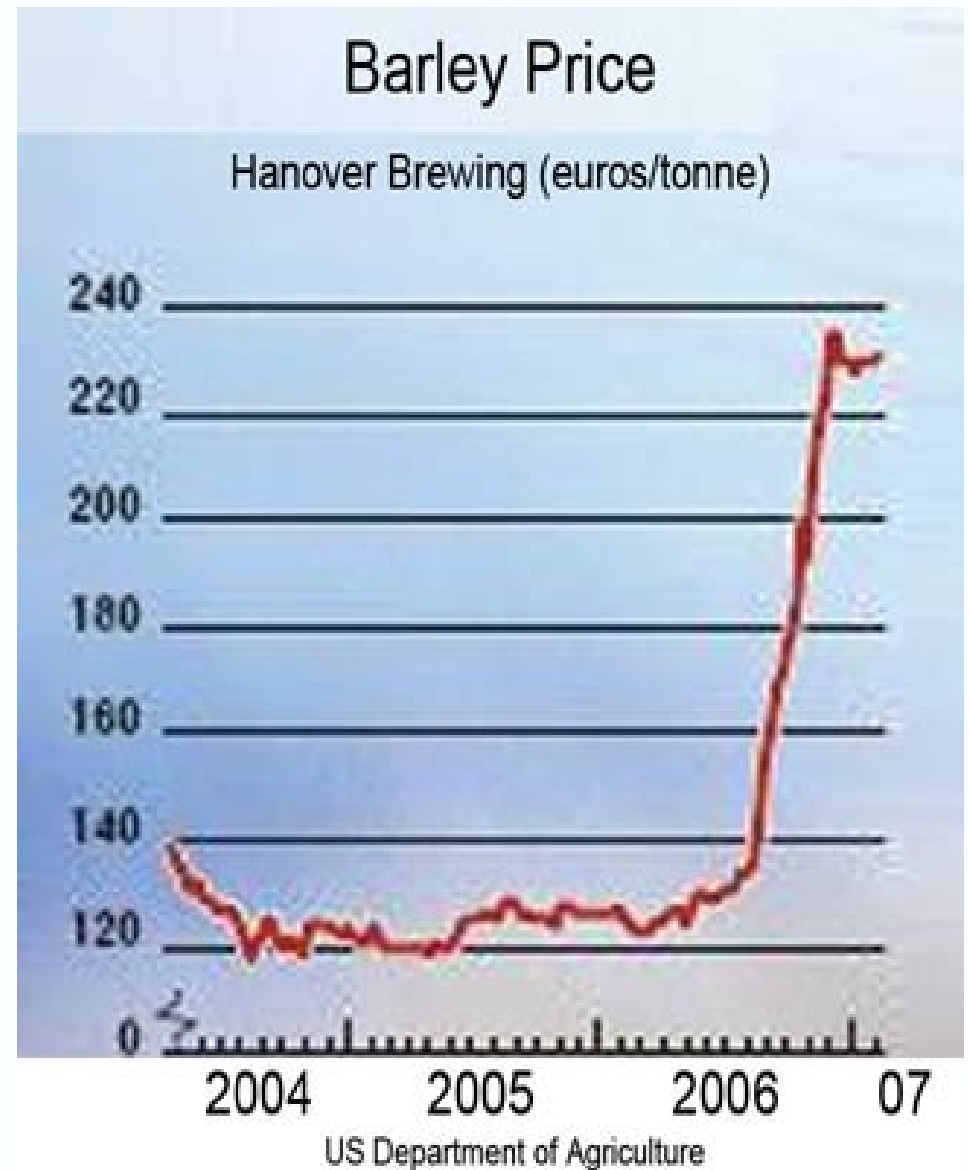
Energy in Global Food Supply (1965 - 2003)



Bio-fuels: Price Impacts

How to convince your friends it's getting serious..

Beer prices might be going up.



Bio-fuels: Price Impacts



The Age, Tuesday 15th April 2008: World's new crisis: soaring food prices



Who believes in Peak Oil?

- Jeroen van der Veer, Shell Chief Executive:

"After 2015 supplies of easy-to-access oil and gas will no longer keep up with demand"

25th January 2008

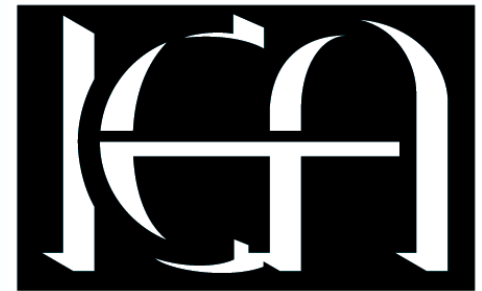
- International Energy Agency:

"Despite four years of high oil prices, this report sees increasing market tightness beyond 2010"

"Oil looks extremely tight in five years time"

"It is possible that the supply crunch could be deferred – but not by much"

July 2007



Who believes in Peak Oil?

- Christophe de Margerie, TOTAL CEO:

“100m barrels per day is now in my view an optimistic case... It is not my view: it is the industry view, or the view of those who like to speak clearly, honestly”

“We have been, all of us, too optimistic about the geology.”

30-31 October 2007



- Andris Piebalgs, EU Energy Commissioner:

Has drawn attention to the “overlooked” issue of dwindling oil reserves coupled with rapidly growing and unprecedented global demand

The EU cannot “hang on” to its “old, fossil energy system”

18th January 2008



Who believes in Peak Oil?

- Dr Jim Buckee, retired president and chief executive of Talisman Energy:

"It's obviously unsustainable and the world is increasingly drawing on the bigger, older fields. You couple that notion with the irreversibility of decline and you've got a very alarming picture."

"Peak oil is either here, or very close."

ABC News, 30th January 2008



- Sadad al-Huseini, former head of exploration and production for Saudi Aramco:

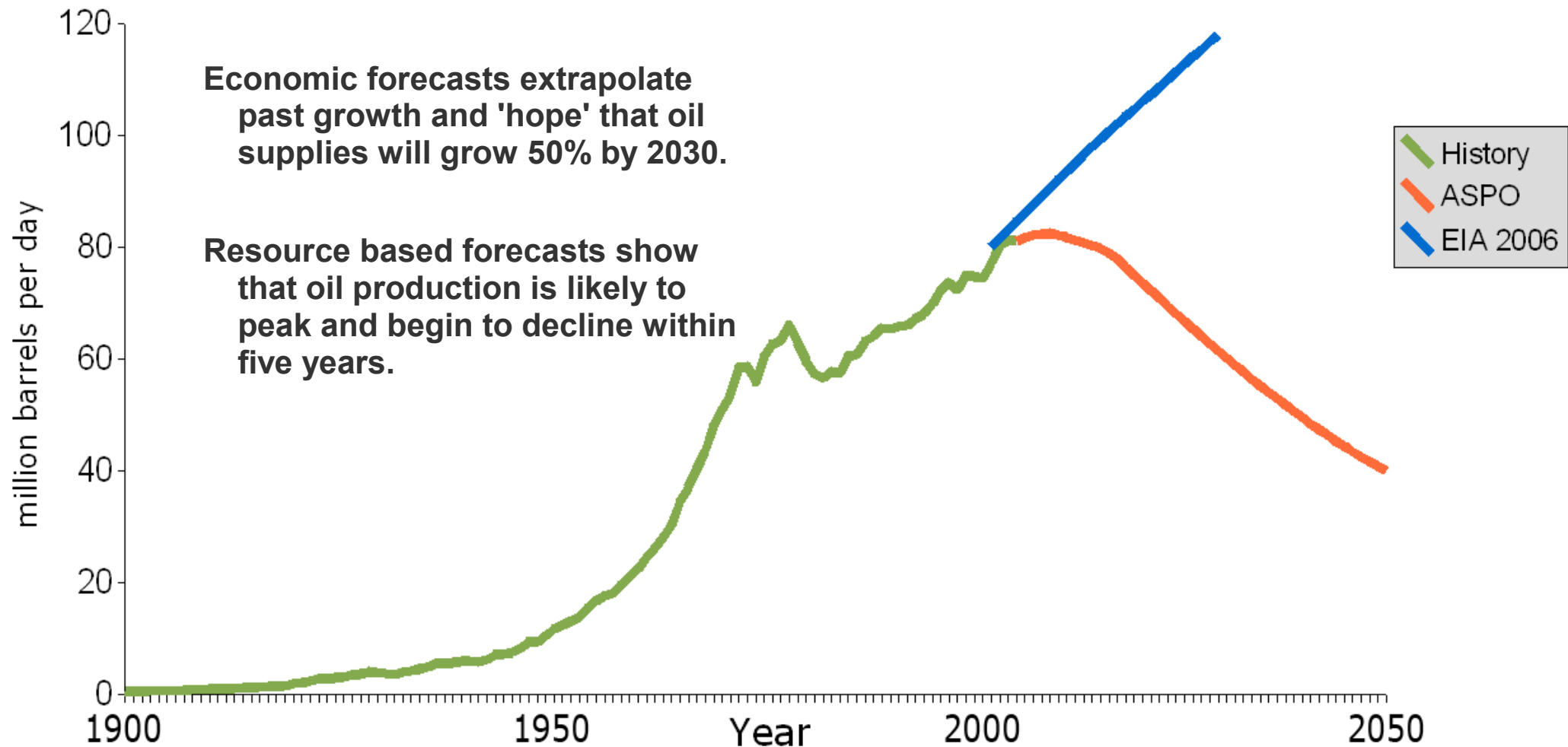
"Reserves are confused and in fact inflated."

Presented an analysis showing that global oil production has already hit a plateau and would scarcely rise above current levels.

At the Oil & Money Conference, London 31st October 2007



World Oil Production - History and Forecast



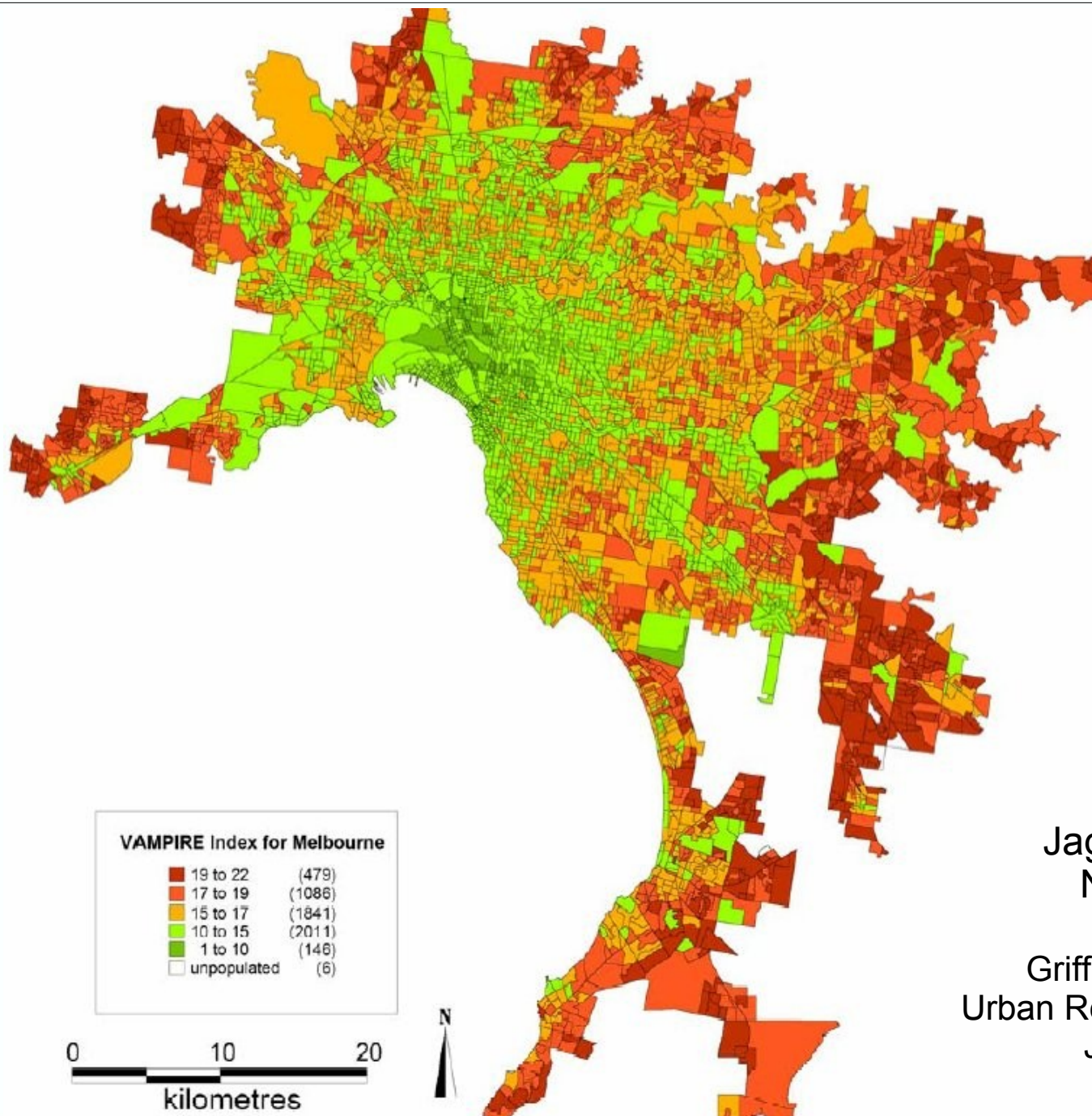
Will we make those reductions without fighting over resources?

Can our financial systems cope with the end of growth in energy supplies?

What if desperate economies turn to coal instead?



Oil Vulnerability



Jago Dodson
Neil Sipe

Griffith University
Urban Research Program
July 2006



ASPO Australia
Australian Association for the Study of Peak Oil and Gas

Oil Prices 2002-2008

