

Does the recent fall in oil prices disprove the concept of Peak Oil?

Dr Ian Chapman

IFLAS & Business School

University of Cumbria

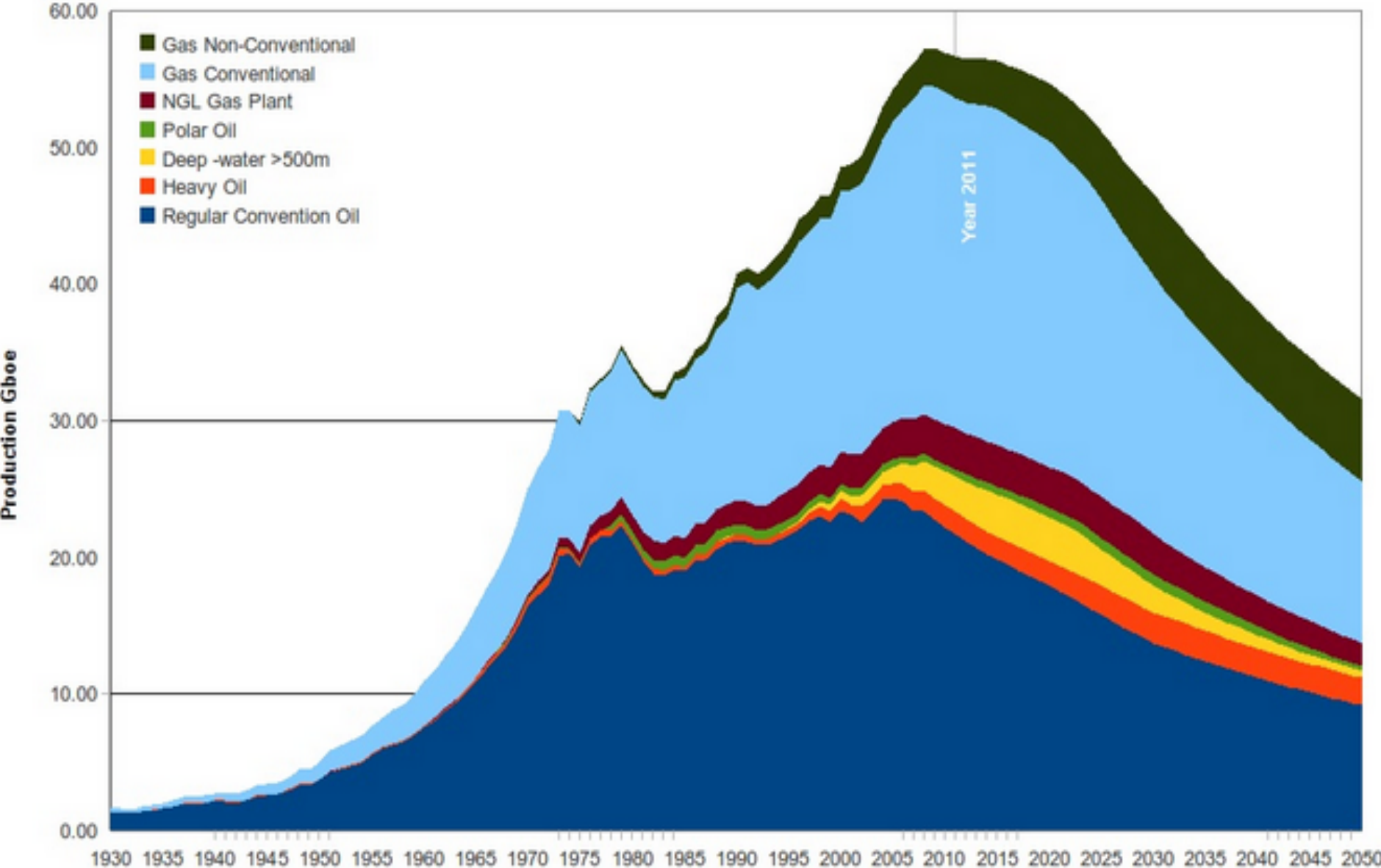
Peak Oil

- *Reserves have passed maximum yield and struggle to meet demand, reflected by rising oil prices.*
- *However recently prices have fallen to their lowest level since 2002.*
- *Technological improvements and new reserve finds have ended Peak Oil?*
- *Less to do with oil, and more about the current metanarrative and neoliberalism*

Definition

- **The point at which the global output of conventional oil reaches its maximum level and subsequently flow rates decrease (Bowden, 1985).**
- **When roughly half the world supply of oil has been produced and subsequent output falls**

Oil and Gas Production



Official position (BP, 2016)

- Global proved oil reserves in 2015 fell by 2.4 billion barrels (-0.1%) to 1697.6 billion barrels,
- Reserves have nonetheless increased by 24%, or 320 billion barrels, over the past decade;
- and are sufficient to meet 50.7 years of global production.
- Brazil recorded the largest decline, with proved reserves falling by 3.2 billion barrels, while Norwegian proved reserves grew by 1.5 billion barrels. OPEC countries continue to hold the largest share (71.4%) of global proved reserves.

History

- Shell Oil geologist M.King Hubbert predicted that US production would peak in 1970, closely matching actual peak production in 1971
- In 1974 he also suggested that global oil production would peak in 1995 which proved to be inaccurate (Demming, 2003).

Why the arguments?

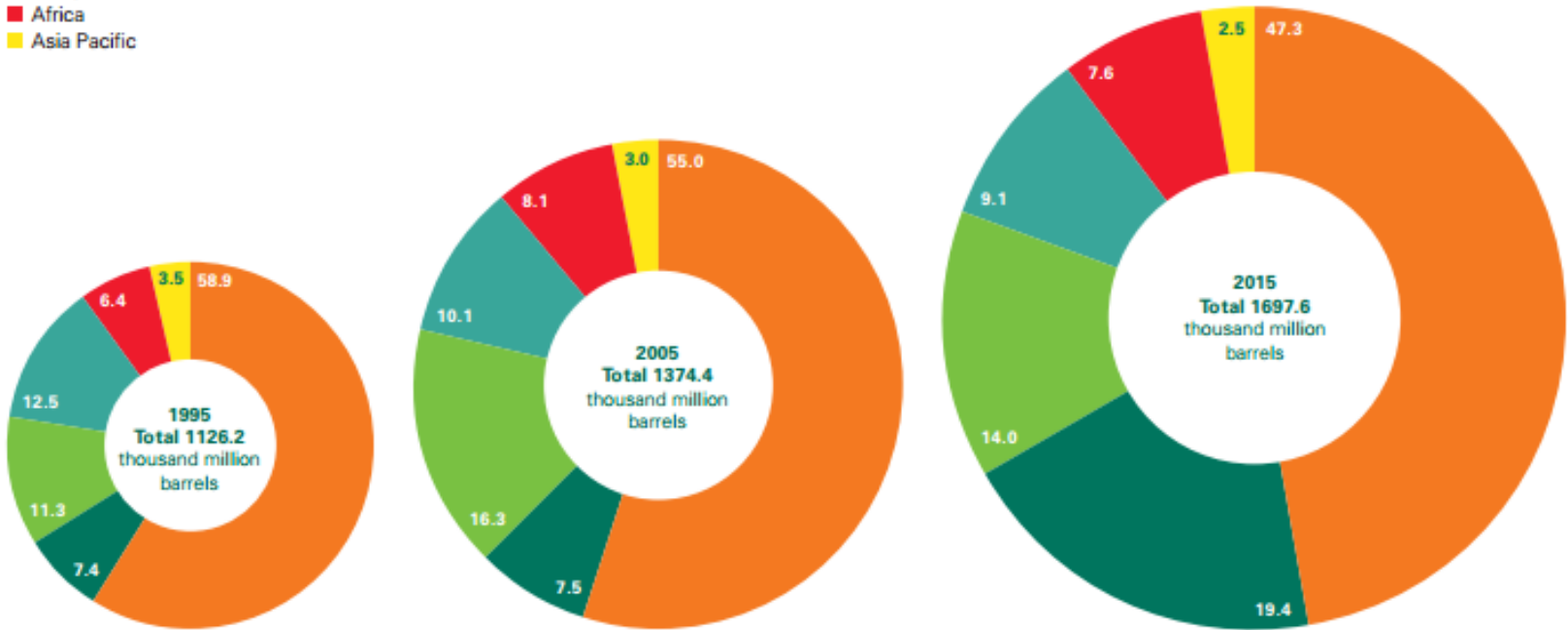
- Some suggest that oil has or soon will peak in output
- This will cause **price rises**, shortages and recession
- Others suggest there will be no peak in oil output due to a number of reasons
- The positions are quite entrenched
- **More about ideology than data**

BP data, 2016

Distribution of proved reserves in 1995, 2005 and 2015

Percentage

- Middle East
- S. & Cent. America
- North America
- Europe & Eurasia
- Africa
- Asia Pacific

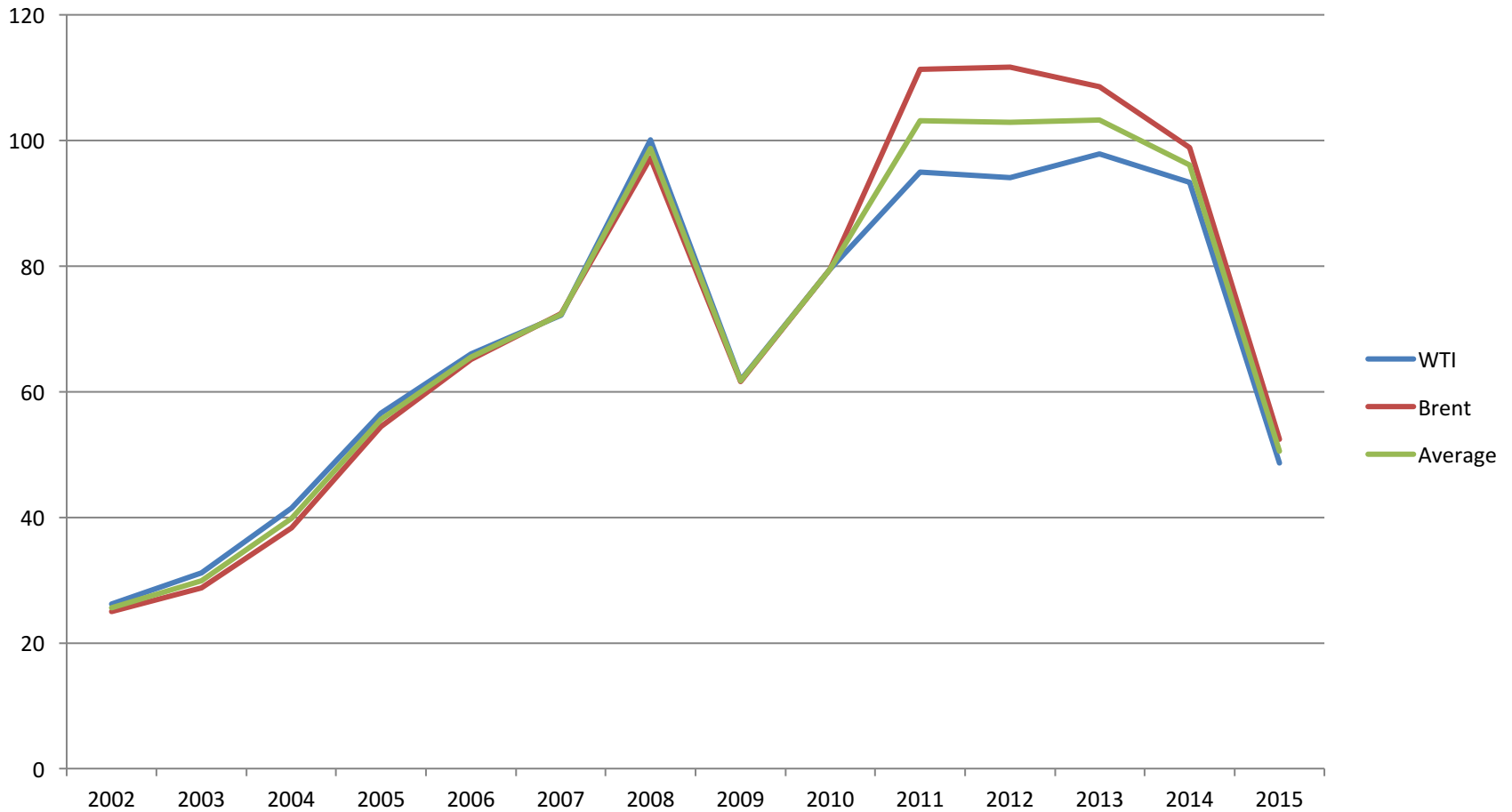


Oil prices (EIA*, 2016)

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
WTI \$/bbl	31.1	41.5	56.6	66.0	72.2	100.1	61.9	79.5	95.0	94.1	97.9	93.3	48.7
Brent \$/bbl	28.8	38.27	54.5	65.1	72.39	97.26	61.67	79.5	111.3	111.7	108.6	98.9	52.4
Average \$/bbl	30.0	39.9	55.6	65.6	72.3	98.7	61.8	79.5	103.1	102.9	103.3	96.1	50.55

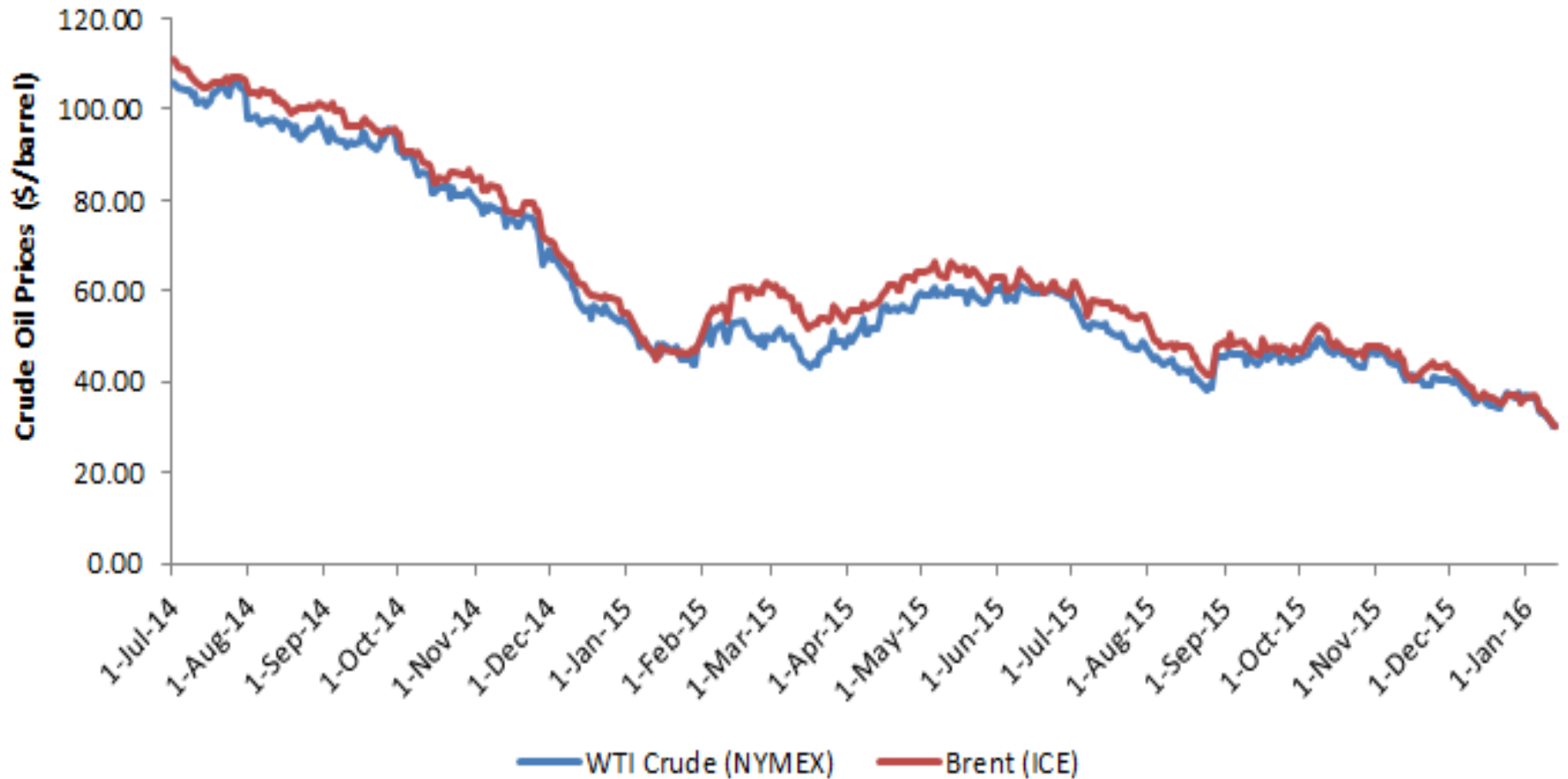
*US Energy Information Administration

Oil Prices \$ per barrel



Source: EIA, 2016

WTI & Brent Oil Price Movement Over The Last 18 Months



Source: Bloomberg, 2017

Late peak advocate 'Late Peakers'

Early peak advocates 'Early Peakers'

WHAT ARE THE POSITIONS?

Late Peakers

Peak Oil date	Source and Date of forecast
Not before 2017	CERA (2008)
After 2020	Hayward, T., BP (Macalister, 2010)
After 2020	CERA (Jackson and Esser, 2004)
2020 or beyond 2035	IEA (2010)
2020 (for oil and gas)	Shell (2011)
2025 or later	Davis (2003)
2035	CERA (Jackson, 2006)
Not before 2035	EIA (2010)
No visible peak	Maugeri (2012)
No peak but 54.2 years of global production	BP (2012)
‘Peak oil theories have been abandoned’ ‘Oil demand ...reaching a long plateau in the 2040s’	Mountains Scenario Oceans Scenario Shell (2013)

Early Peakers

<i>Peak Oil date</i>	Source and Date of forecast
<i>2005</i>	Deffeyes (2010) Hallock (2013)
<i>2006–2007</i>	Bakhtiari (2004)
<i>2006 on</i>	Simmons (2006)
<i>After 2007</i>	Skrebowski (2004)
<i>Soon after 2007</i>	World Energy Council (2007)
<i>2009-2031</i>	Sorrell et al (2009)
<i>Before 2010</i>	Goodstein (2004)
<i>Around 2010</i>	Campbell (2005)
<i>Possibly 2010</i>	Klare (2004)
<i>2010</i>	Aleklett et al (2010)
<i>After 2010</i>	Skrebowski (2005)
<i>2006-2017</i>	Hiro (2007)
<i>Soon after 2010</i>	De Margerie, C., Total S.A. (Walt, 2010)
<i>2008-2012</i>	De Almeida and Silva (2009)
<i>2012-2017</i>	Koppelaar (2005 and 2006)
<i>2008–2018</i>	Robelius (2007)
<i>2014</i>	Sami Nashawi, I., Malallah, A. and Al-Bisharah M. (2010)
<i>2015</i>	Shell (2008)

Why is it so unclear?

1. Questions of reserve measures
2. Reserve sizes
3. Near oils and gas to replace conventional oil
4. Alternative energy
5. Demand and prices
6. Motivation

Technical and confusing

RESERVE MEASURES

Reserve Measures

- **Proved, Probable and Possible** classifications
- **Proved** reserves (1P) 90% probability
- **Probable**: not yet proven but have over 50% chance of being developable,
- sometimes being called P50 reserves When combined with proved they are known as proved plus probable or 2P.
- **Possible** reserves are generally those with a 10 percent certainty of being developed
- 3P measures, indicating proved plus probable plus possible reserves
- **Observers can look at the same fields using different definitions**

The magic pudding

RESERVE SIZES

Proven OPEC reserves 1984 and 2015 (71.4% of total)

OPEC member	1984 (billion barrels)	2015 (billion barrels)	% OPEC 2015 reserves
Algeria	9.0	12.2	1.0
Angola	2.1	12.7	1.0
Ecuador	1.1	8.0	0.7
Iran	58.9	157.8	13.0
Iraq	65	143.1	11.8
Kuwait	92.7	101.5	8.4
Libya	21.4	48.4	4.0
Nigeria	16.7	37.1	3.1
Qatar	4.5	25.7	2.1
Saudi Arabia	171.7	266.6	22.0
UAE	32.5	97.8	8.1
Venezuela*	28	300.9	24.8
<i>*Orinoco belt extra-heavy oil</i>	-	(222.3)	18.3
Total	503.6	1 211.8	100

Middle East Oil Reserves: 47% of global total (billion barrels)

	1984	2006	2007	2008	2009	2011	2015	Change Since 1984 (%)
IR Iran	58.9	138.4	136.2	137.6	137.0	154.6	157.8	167.9
Iraq	65.0	115.0	115.0	115.0	115.0	141.4	143.1	120.2
Kuwait	92.7	101.5	101.5	101.5	101.5	101.5	101.5	9.5
Qatar	4.5	26.2	25.1	25.4	25.4	25.4	25.7	471.1
Saudi Arabia	171.7	264.3	264.2	264.1	264.5	265.4	266.6	55.9
UAE	32.5	97.8	97.8	97.8	97.8	97.8	97.8	200.9
Total	425.3	478.9	739.8	741.4	741.2	786.1	792.5	86.3

Middle East oil reserves

- Have grown since 1984
- Over 80% increase
- Big increase after the eighties
- Have plateaued since then
- **No drop despite continuous output**
- Now nearly 400 billion barrels more than 1984

Output from the Middle East

	2005 Million barrels per day	2009 Million barrels per day	2015 Million barrels per day	2015 Million barrels per <u>year</u>
Iran	4.2	4.2	3.92	1430
Iraq	1.83	2.45	4.03	1470
Kuwait	2.66	2.51	3.10	1130
Qatar	1.15	1.42	1.89	692
Saudi Arabia	10.93	9.66	12.0	4320
UAE	2.91	2.72	3.90	1424
Total Middle East	25.5	24.7	30.1	10986 (11 Billion)

Significant non-OPEC Reserves

Country	1991 billion barrels	2001 billion barrels	2010 billion barrels	2015 billion barrels	Share of global Total 2015
US	32.1	30.4	30.9	55	3.2
Canada*	(40.1)	(180.9)	(175.2)	(172.2)	10.1
<i>*Of which oil-tar sands</i>	<i>32.4</i>	<i>174.7</i>	<i>169.2</i>	<i>166.2</i>	<i>9.8</i>
Mexico	50.9	18.8	11.7	10.8	0.6
Brazil	4.8	8.5	14.2	13.0	0.8
Azerbaijan	n/a	1.2	7.0	7.0	0.4
Kazakhstan	n/a	5.4	30.0	30.0	1.8
Norway	8.8	11.6	6.8	8.0	0.5
Russian Federation	n/a	73.0	105	102.4	6.0
Oman	4.3	5.9	5.5	5.3	0.3
China	15.5	15.4	14.8	18.5	1.1
India	6.1	5.5	5.8	5.7	0.3
Total non-OPEC	204.7	330.4	329.4	486.0	

When is an oil, not an oil?

NEAR OIL

More complex fossil fuels: near oil

- Improved technology will provide better extraction of present fields
- Allow new hydrocarbon fuel sources to be efficiently accessed, counterbalancing declining stocks.
- High oil prices will encourage 'the use of enhanced oil recovery technologies to increase production of conventional resources' US Energy Information Administration
- Increases in market prices may promote the economical development of these and unconventional resources
- **Near oils and gas are seen as a likely source of future fuel by BP**

False Hope?

- Unconventional sources are now regarded as optimistic (Kling, 2013),
- **Thermodynamic inefficiencies in the processes, relying on high energy inputs**
- Generally, the slow refinement rate for many unconventional sources prevents them being rapidly deployed to make up shortfalls in conventional oil and limits usefulness (De Almedia and Silva, 2009).
- World Energy Council ‘time is running out to prove that newly discovered fields and new technology can more than compensate for flagging production from the rapidly aging fields beyond OPEC’ (WEC, 2011, p18).

Clean and abundant?

GAS

Gas to the rescue?

- Proved natural gas reserves in 2015 fell slightly, (by 0.1 trillion cubic metres (tcm), or -0.1%) to 186.9 tcm, sufficient to meet **52.8 years of current production**.
- Small declines in Russian and Norwegian reserves drove the decline. Reserves have increased by 29.6 tcm over the past decade. The Middle East region holds the largest proved reserves (80 tcm, 42.8% of the global total)
- BP, 2016

Green, clean and free forever

ALTERNATIVES

Global Energy Consumption, 2009, 2010 and 2015

	2009 Million Tonnes Oil Equivalent	%	2010 Million Tonnes Oil Equivalent	%	2015 Million Tonnes Oil Equivalent	%
Oil	3908.7	34.4	4028.1	33.6	4331.1	32.9
NG	2661.4	23.4	2858.1	23.8	3135.2	23.8
Coal	3305.6	29.1	3555.8	29.6	3839.9	29.2
Nuclear	614	5.4	626.2	5.2	583.1	4.4
Hydroelectric	736.3	6.5	775.6	6.5	892.9	6.8
Renewables	137.4	1.2	158.6	1.3	364.9	2.8
Total	11363.2		12002.4		13147.3	

Renewables

- Hydroelectric and other renewables reached record **shares of global primary energy consumption (6.8% and 2.8%, respectively).**
- **BP, 2016**
 - 1 coal fired power station = approx. 5000 wind turbines (in Scotland*)
 - Or 135 biomass plants
 - There are around 70 large power stations in the UK
 - Need at least 350 000 turbines for electricity?
 - Twice this for oil?
 - And gas?
 - Potentially over 1.5 billion wind turbines needed
 - Or 580 biomass plans

Source: www.sesg.strath.ac.uk

*assuming 50% capacity factor

Refute Renewables

- Government support and measures to improve cost-effectiveness are needed for the anticipated growth in renewables
- Even Shell's detailed analysis, the result of complex scenarios built on earlier pioneering work has a positive bias towards the renewables uptake.
- Therefore the evidence is that **none of these technologies are being developed or invested in with sufficient enthusiasm to quickly replace even a reasonable portion of the energy supplied by oil**

Nuclear

- Poor economic performance against coal or natural gas
- On-going concerns about the disposal of waste
- Worries about weapon development
- 2011 earthquake in Japan highlighted the implications of incidents
- Long-running question of safety and causing the cancellation of many programmes
- Some countries abandoning this form of energy all together

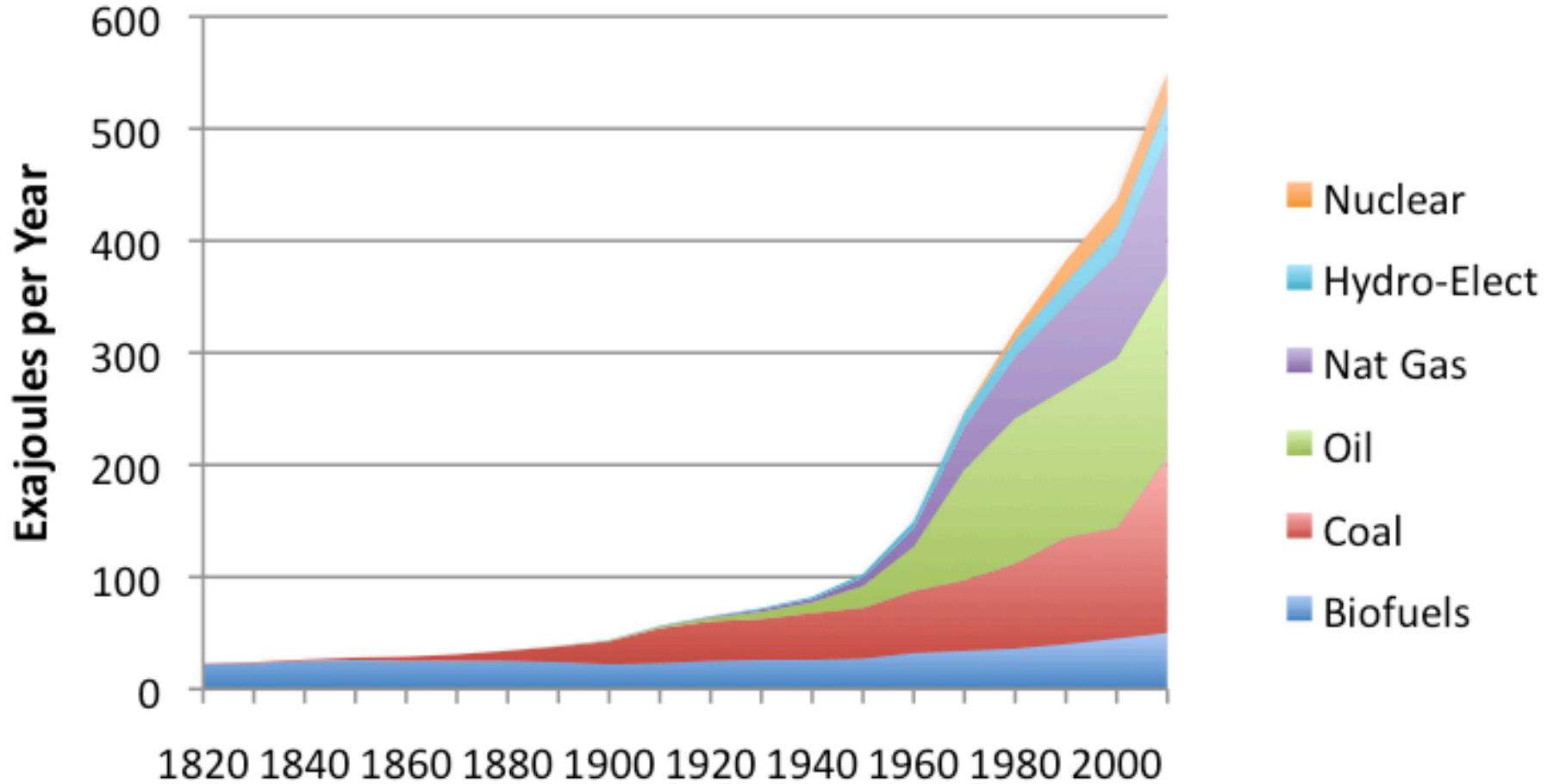
Increasing demand let falling prices?

DEMAND AND PRICES

Oil Consumption

- 2011 global demand was 88 million barrels per day (32 132 million barrels per year)
- **2015 global demand 95 million barrels per day** (34 678 million barrels per year) which was an increase of around 16% over the 2000 figure
- Around a third comes from the Middle East
- Around 1,000 barrels per second
- (BP, 2016)

World Energy Consumption

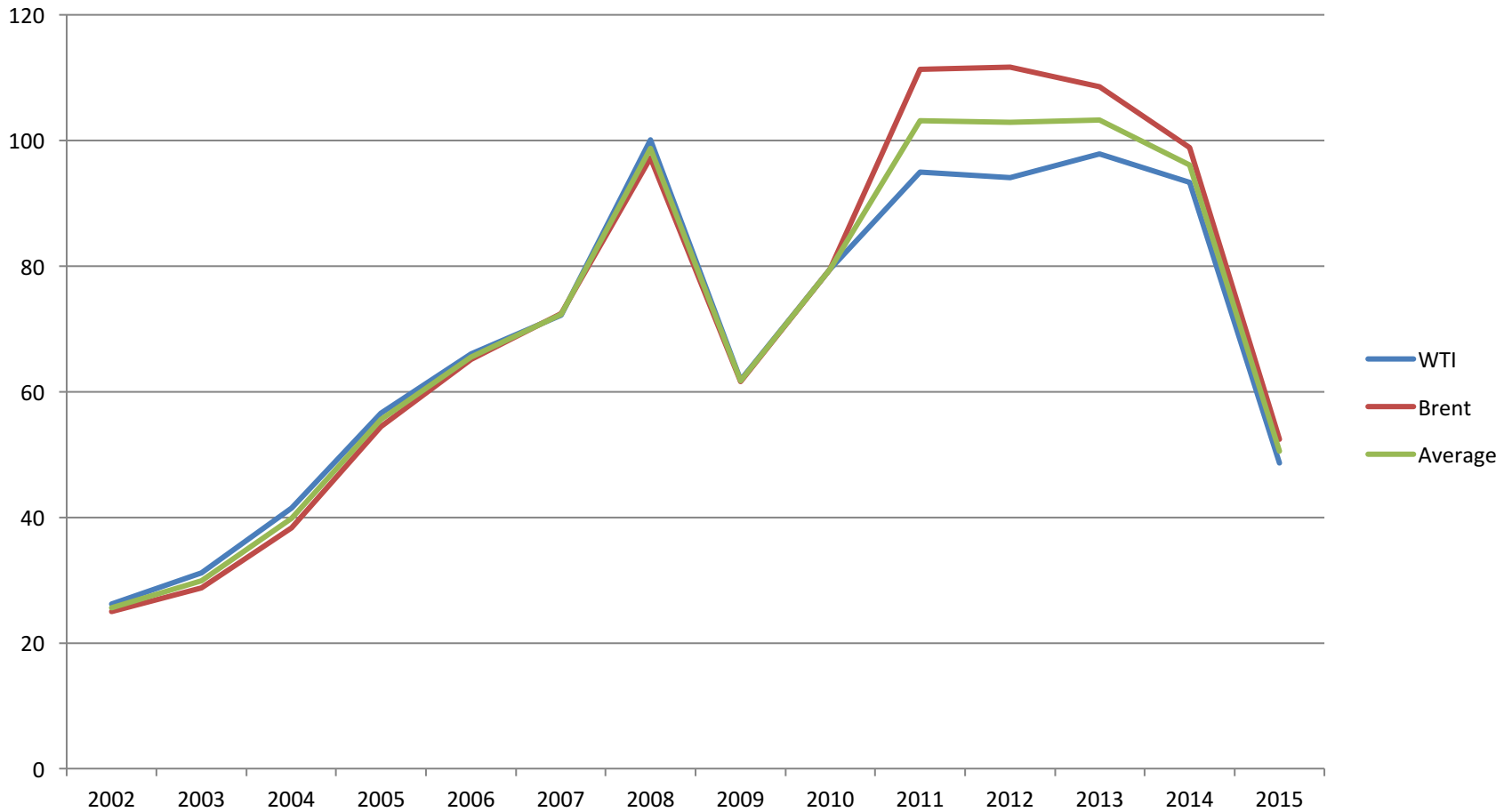


Sources: Smil, V., (2010) *Energy Transitions: History, Requirements and Prospects* and BP, 1965, 2005

Why low prices?

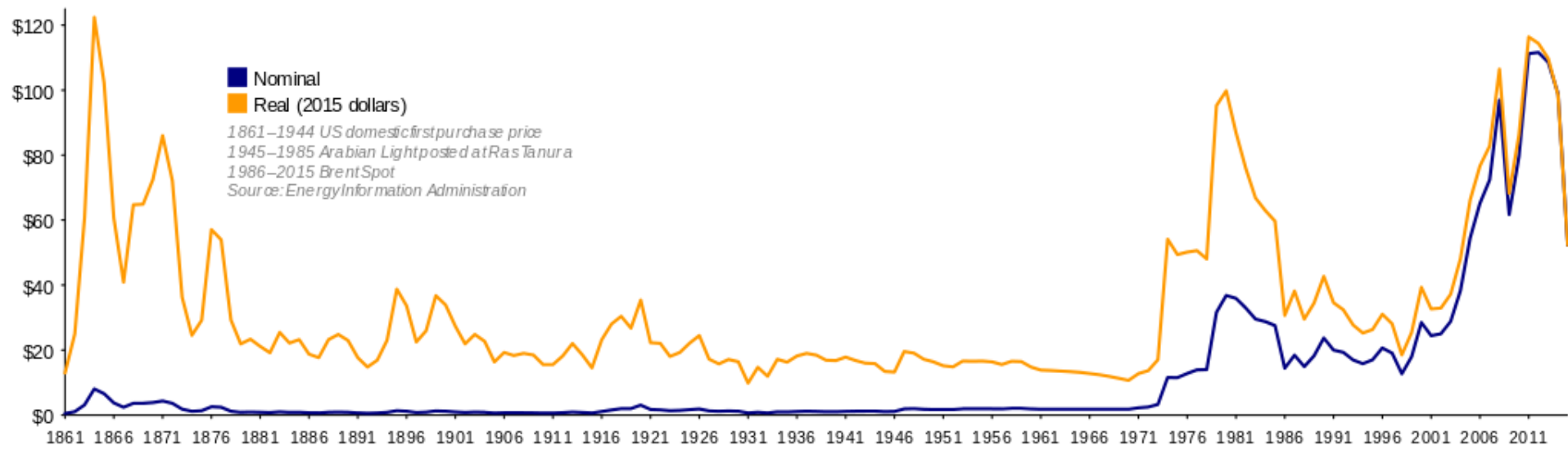
- Output higher than expected
- Saudi Arabia maintaining market share
- Global growth slow
- US output up
- Market expectations

Oil Prices \$ per barrel



Historic Oil prices

1861-2015



Source: EIA, 2016

Why the confusion?

- Neoliberalism:
- Current economic paradigm sees the market as the only solution
- Excessive liquidity due to QE
- Financial crisis has further reduced state control of energy policy
- Low oil prices suggest Peak Oil has gone – more due to irrational markets
- Talk of energy crises is bad for markets
- Therefore best avoided?
- *Absolute Capitalism* (Berardi, 2015)

Neoliberalism

- ‘Neoliberalism is a programme of resolving problems of, and developing, human society by means of competitive markets...
- Competitive markets are assumed to be efficient and just and to maximise freedom of choice...
- Posit[s] competitive markets as superior in terms of efficiency, justice or freedom, or a combination of them.’
- (Patomaki, 2009)
- A form of *Cultural Hegemony* (Gramsci, 1971)
- Reinforced at every level through *Ideological State Apparatuses* (Althusser, 2014)
- As proposed by Hayek (1944) and Friedman (1962)

Concluding thoughts

- Conventional oil probably has peaked
- OPEC are producing beyond expected levels
- Gas is being used to fill the gaps
- Fracking is a short-term solution
- Numerous distractions (EU vote; Party Politics; Sport events) to serious economic crises:
- debt, energy shortages, global conflict, inequality, climate change

Final Points

- Oil prices will peak – once Saudi Arabia is honest
- Markets may overreact
- Recession likely
- Financial crisis likely
- Need communities with low-energy solutions
- Local resilience critical