Any policy planning
is only as good as the data it is fed

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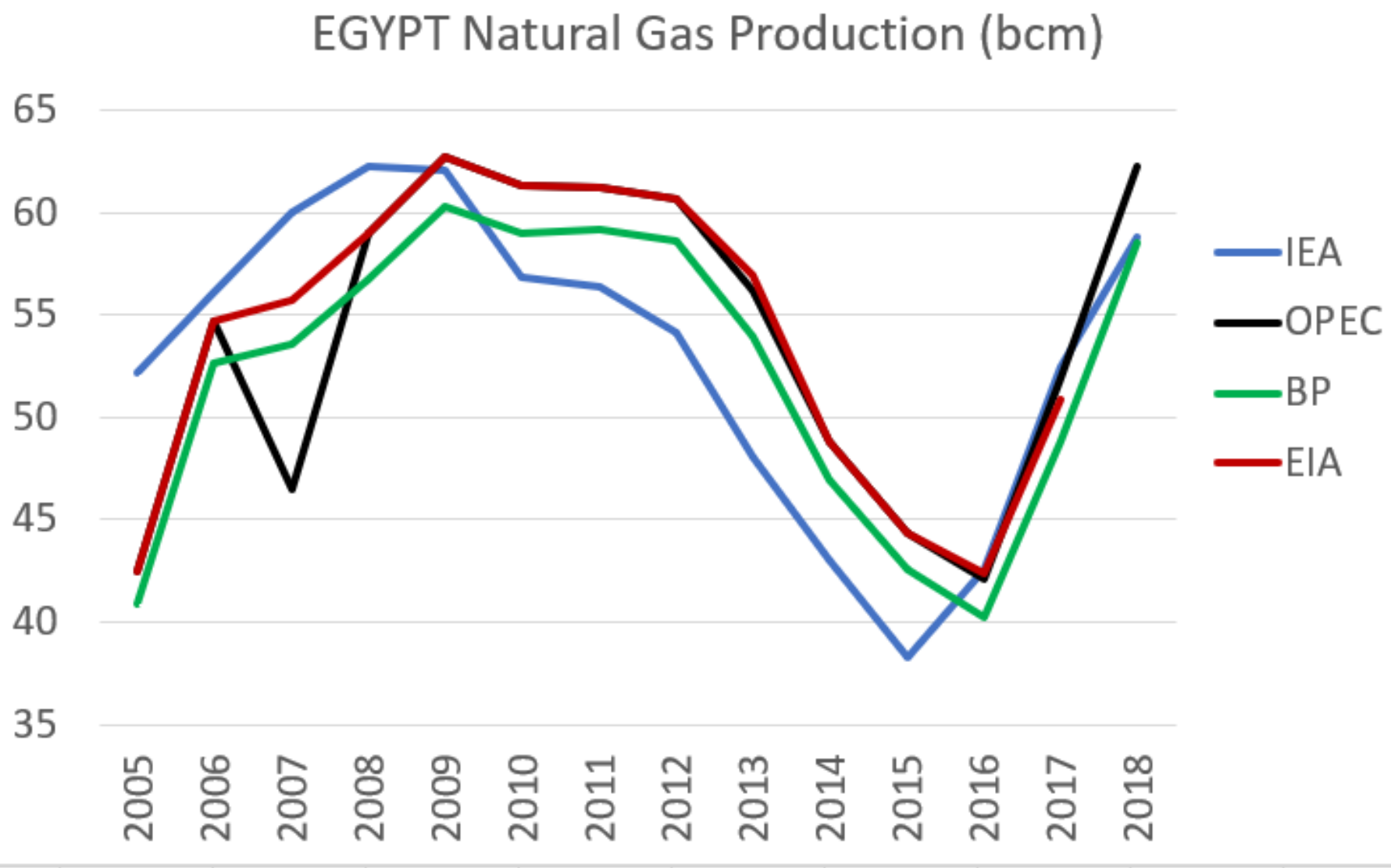
Data Quality Issues

- Reliability
- Timeliness
- Completeness
- Accuracy
- Comparability
- Trustworthiness

Which one to trust?



Which one is preferable: Bad data or no data?

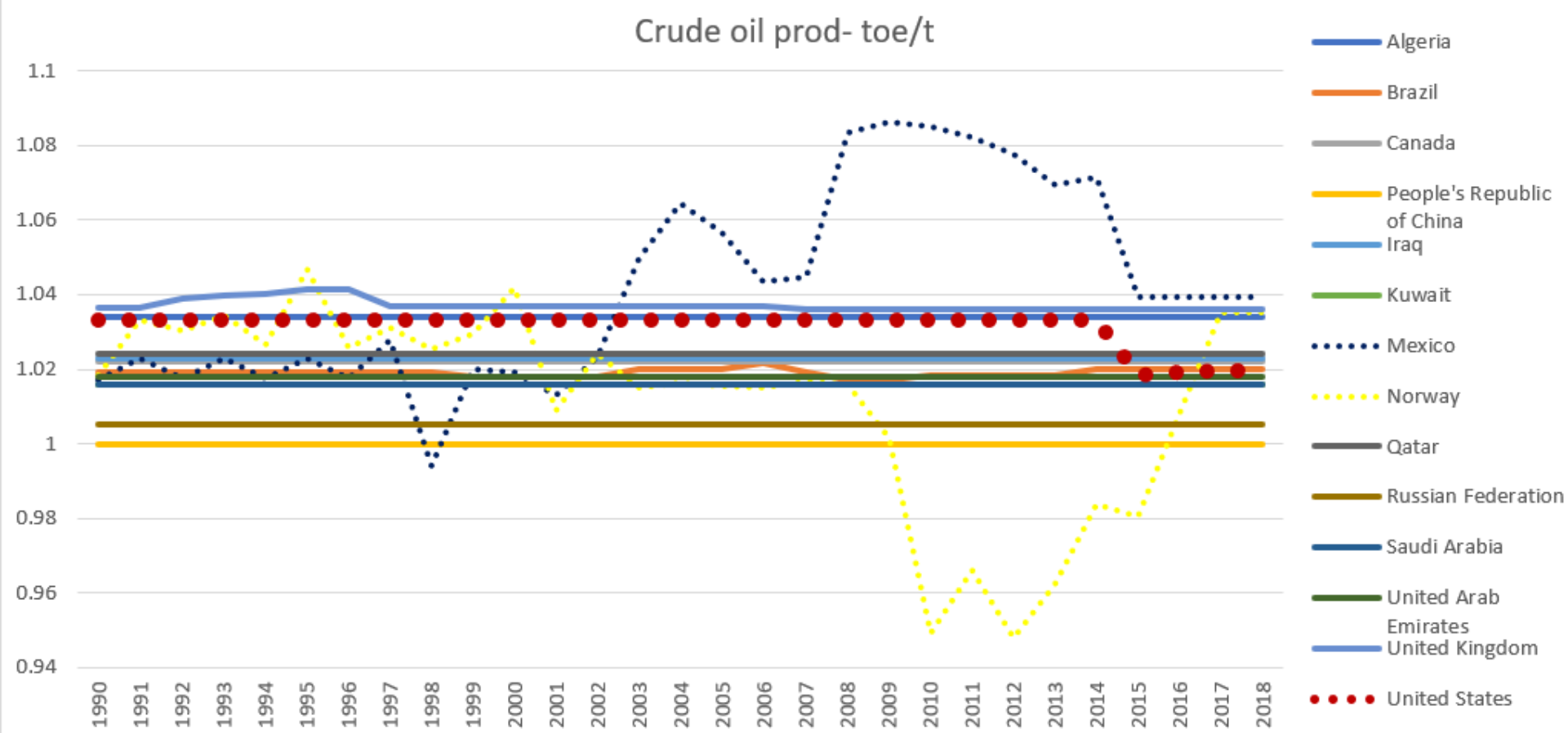
Natural Gas: Proved reserves

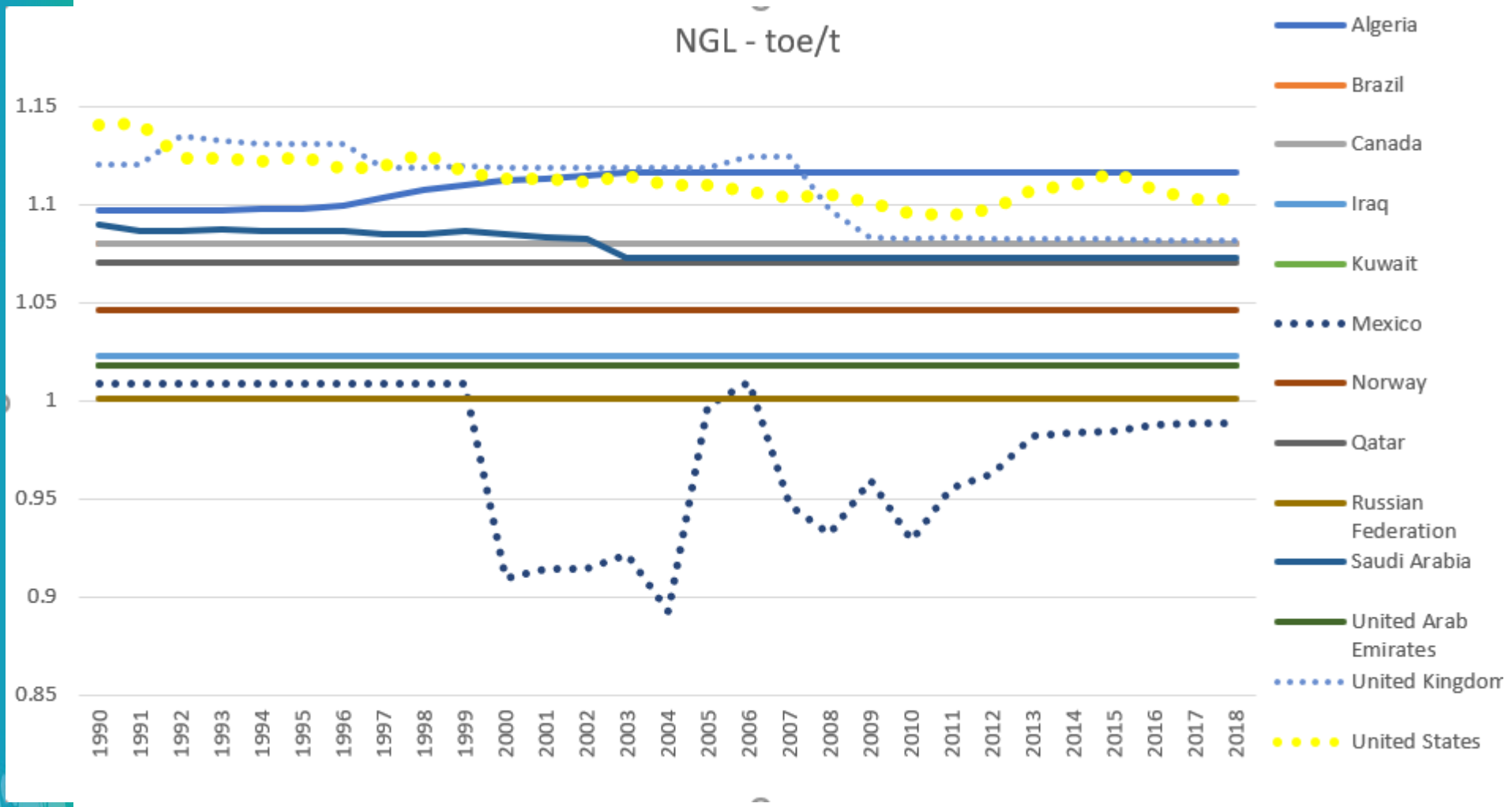
Trillion cubic metres	2004	2005	2009	2010	2011	2012	2013	2014	2015	2016	2017	**2018**	Share 2018
USSR	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	**n/a**	n/a
Uzbekistan	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	**1.2**	0.6%
Other CIS	^	^	^	^	^	^	^	^	^	^	^	**^**	♦
Total CIS	**39.9**	**40.1**	**45.8**	**49.0**	**57.6**	**57.4**	**57.8**	**58.2**	**58.1**	**57.9**	**62.0**	**62.8**	**31.9%**
Bahrain	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	**0.2**	0.1%
Iran	26.0	26.0	28.0	31.3	31.8	31.9	32.1	32.1	31.6	31.8	31.9	**31.9**	16.2%
Iraq	3.0	3.0	3.0	3.0	3.4	3.0	3.0	3.0	3.0	3.6	3.6	**3.6**	1.8%
Israel	^	^	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.5	**0.4**	0.2%
Kuwait	1.5	1.5	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	**1.7**	0.9%
Oman	0.9	0.9	0.5	0.5	0.5	0.5	0.7	0.6	0.7	0.7	0.7	**0.7**	0.3%
Qatar	26.2	26.5	26.2	25.9	25.9	25.8	25.5	25.4	25.1	24.9	24.7	**24.7**	12.5%
Saudi Arabia	6.4	6.5	7.4	7.5	7.6	7.7	7.8	7.9	8.0	8.0	5.7	**5.9**	3.0%
Syria	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	**0.3**	0.1%
United Arab Emirates	5.9	6.0	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	**5.9**	3.0%
Yemen	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	**0.3**	0.1%
Other Middle East	^	^	^	^	^	^	^	^	^	^	^	**^**	♦
Total Middle East	**70.9**	**71.3**	**73.6**	**76.8**	**77.8**	**77.4**	**77.7**	**77.6**	**77.0**	**77.6**	**75.3**	**75.5**	**38.4%**
Algeria	4.4	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	**4.3**	2.2%
Egypt	1.8	1.8	2.1	2.1	2.1	2.0	1.8	2.1	2.0	2.1	2.1	**2.1**	1.1%
Libya	1.4	1.3	1.5	1.4	1.5	1.5	1.4	1.4	1.4	1.4	1.4	**1.4**	0.7%
Nigeria	5.0	4.9	5.0	4.9	4.9	4.9	4.9	5.1	5.0	5.2	5.3	**5.3**	2.7%

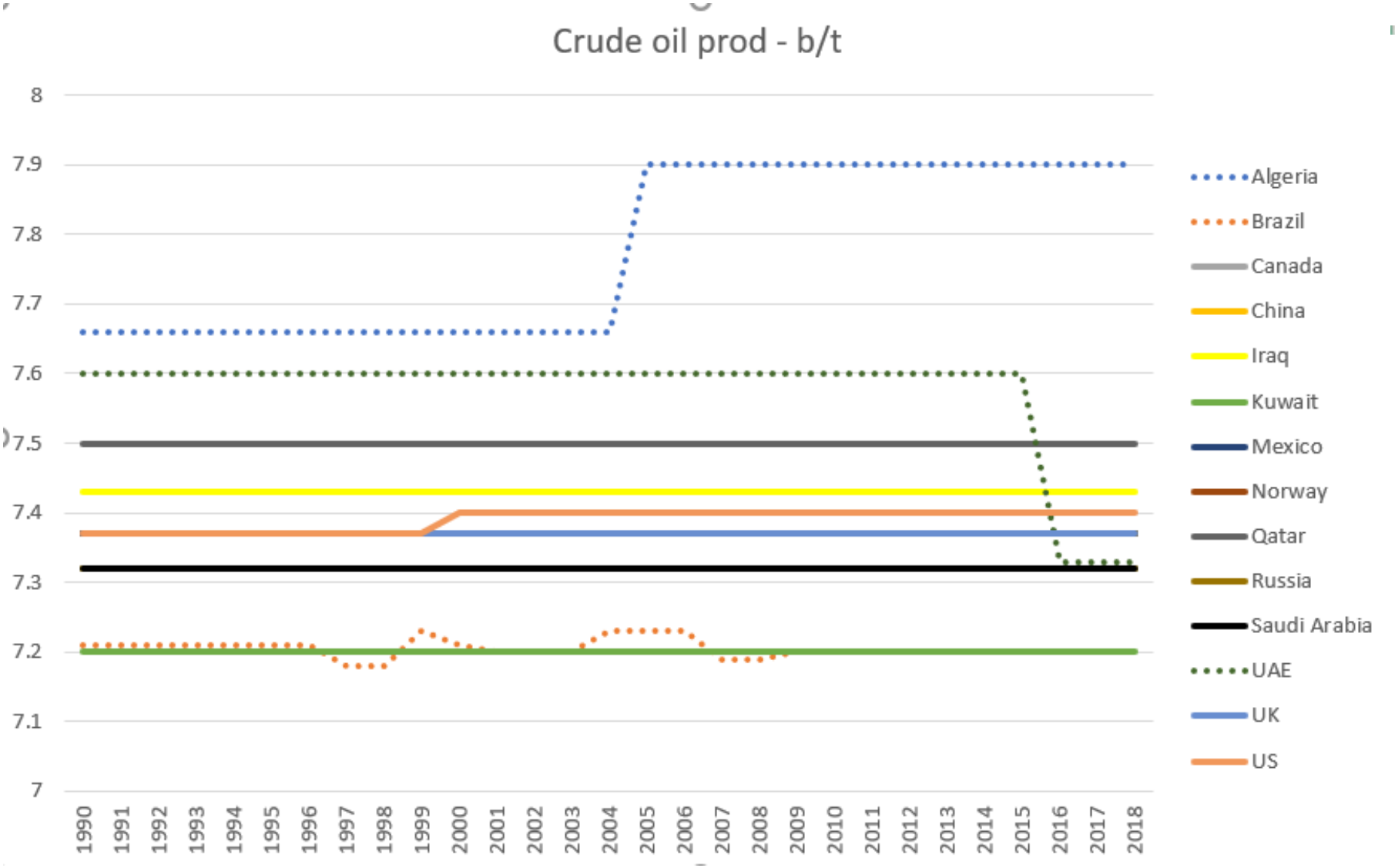
Data Quality Issues – common problems

- Definitions
- Units with appropriate measurement
- Revisions
- Reconciling monthly/annual data
- Missing data
- Appropriate CF (calorific values, volume/mass)

Ex: What was the world oil production in 2018?


Crude oil prod- toe/t
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
0.94
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
Algeria
Brazil
Canada
People's Republic of China
Iraq
Kuwait
Mexico
Norway
Qatar
Russian Federation
Saudi Arabia
United Arab Emirates
United Kingdom
United States


NGL - toe/t
1.15
1.1
1.05
1
0.95
0.9
0.85
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
Algeria
Brazil
Canada
Iraq
Kuwait
Mexico
Norway
Qatar
Russian Federation
Saudi Arabia
United Arab Emirates
United Kingdom
United States


Crude oil prod - b/t
8
7.9
7.8
7.7
7.6
7.5
7.4
7.3
7.2
7.1
7
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
Algeria
Brazil
Canada
China
Iraq
Kuwait
Mexico
Norway
Qatar
Russia
Saudi Arabia
UAE
UK
US

b/t conversion factor – Crude oil

	IEA	JODI		
	2018	2018	DIFF	D(kbd)
Algeria	7.90	8.13	-2.8%	-30
Brazil	7.20	7.18	0.3%	7
Canada	7.37	7.18	2.6%	100
China	7.32	7.32	0.0%	0
Iraq	7.43	7.43	0.0%	0
Kuwait	7.20	7.25	-0.7%	-19
Mexico	7.37	7.08	4.1%	73
Norway	7.37	7.49	-1.6%	-24
Qatar	7.50	7.50	0.0%	0
Russia	7.37	7.36	0.2%	20
Saudi Arabia	7.32	7.32	0.0%	-4
UAE	7.33	7.60	-3.5%	-123
UK	7.37	7.56	-2.5%	-26
USA	7.40	7.40	0.0%	0

World Conversion Factors

UNIT: Barrels/tonne | PRODUCT: Natural gas liquids | FLOW: Volume to mass ratio

TIME / COUNTRY	2011	2012	2013	2014	2015	2016	2017	2018
Russian Federation	10.300	10.300	10.300	10.300	10.300	10.300	10.300	10.300
Saudi Arabia	11.510	11.590	11.550	11.510	11.470	11.620	11.670	11.670
United States	10.300	10.300	10.300	10.300	10.300	10.300	10.300	10.300

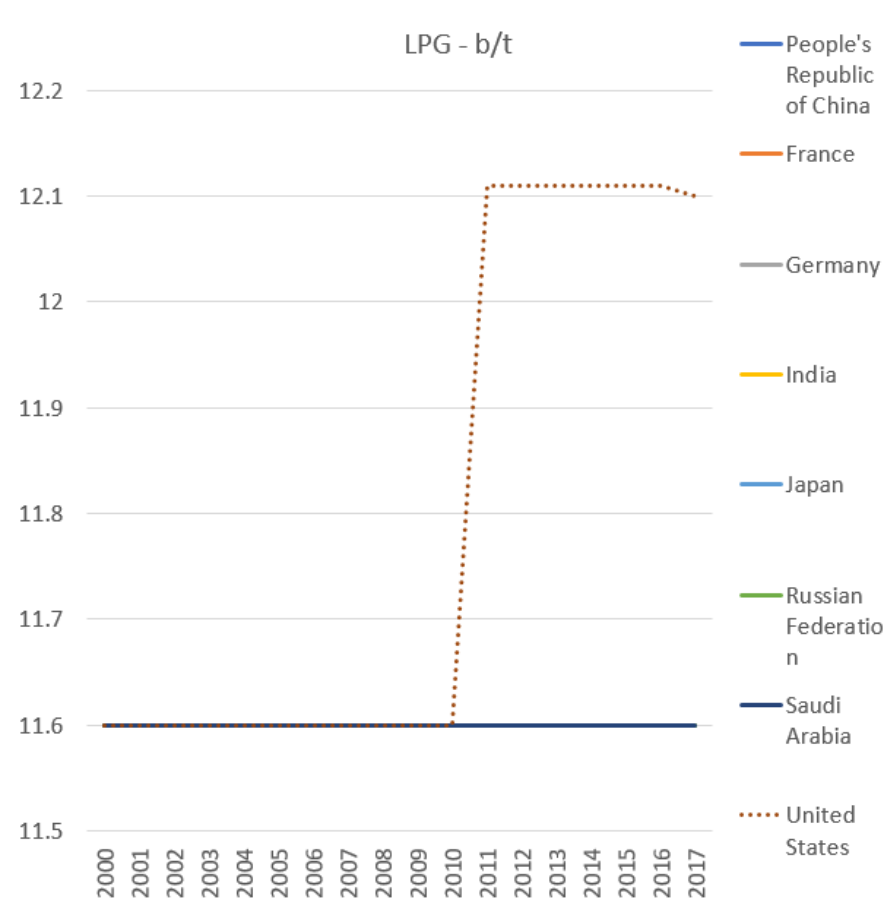
Joint Organisations Data Initiative (Read-only)

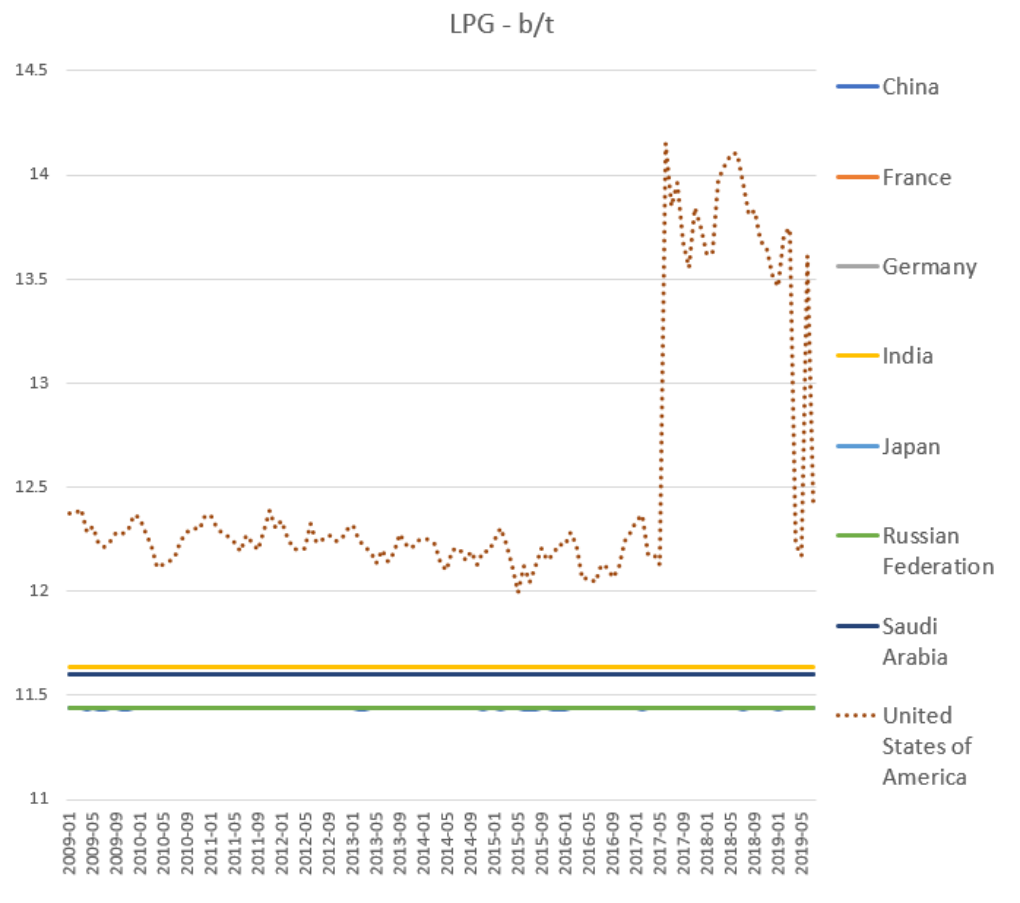
nit: Conversion factor barrels/ktons | Product: NGL | BALANCE: Production

Time / ountry	Apr2019	May2019	Jun2019	Jul2019	Aug2019
Russian Federation	8,797	8,797	8,797	8,797	8,797
Saudi Arabia	11,800	11,800	11,800	11,800	11,800
United States of America	13,080	13,080	13,080	13,080	10,300

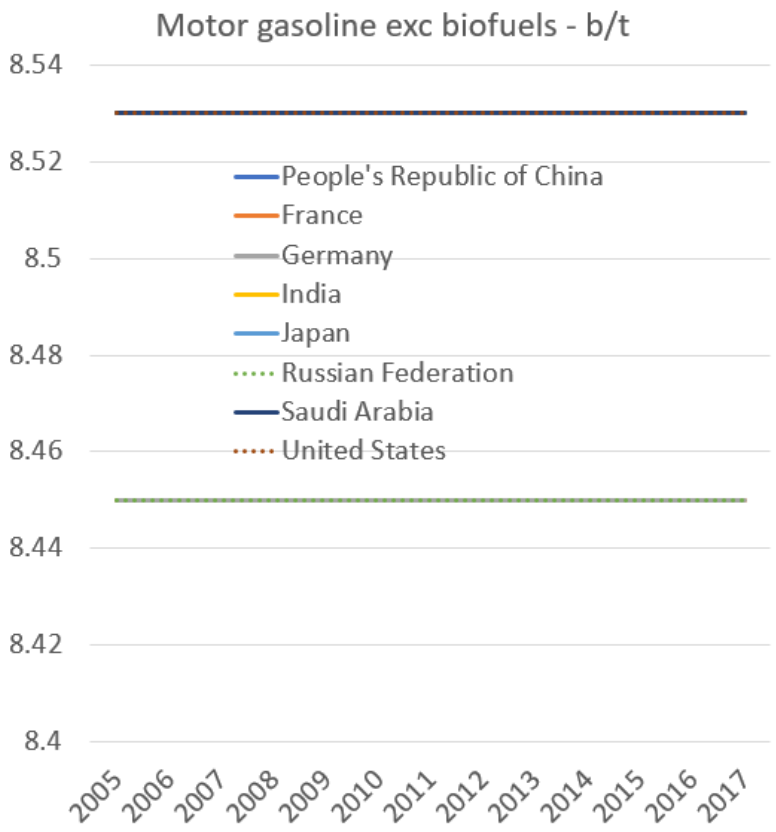
NGL CF b/t

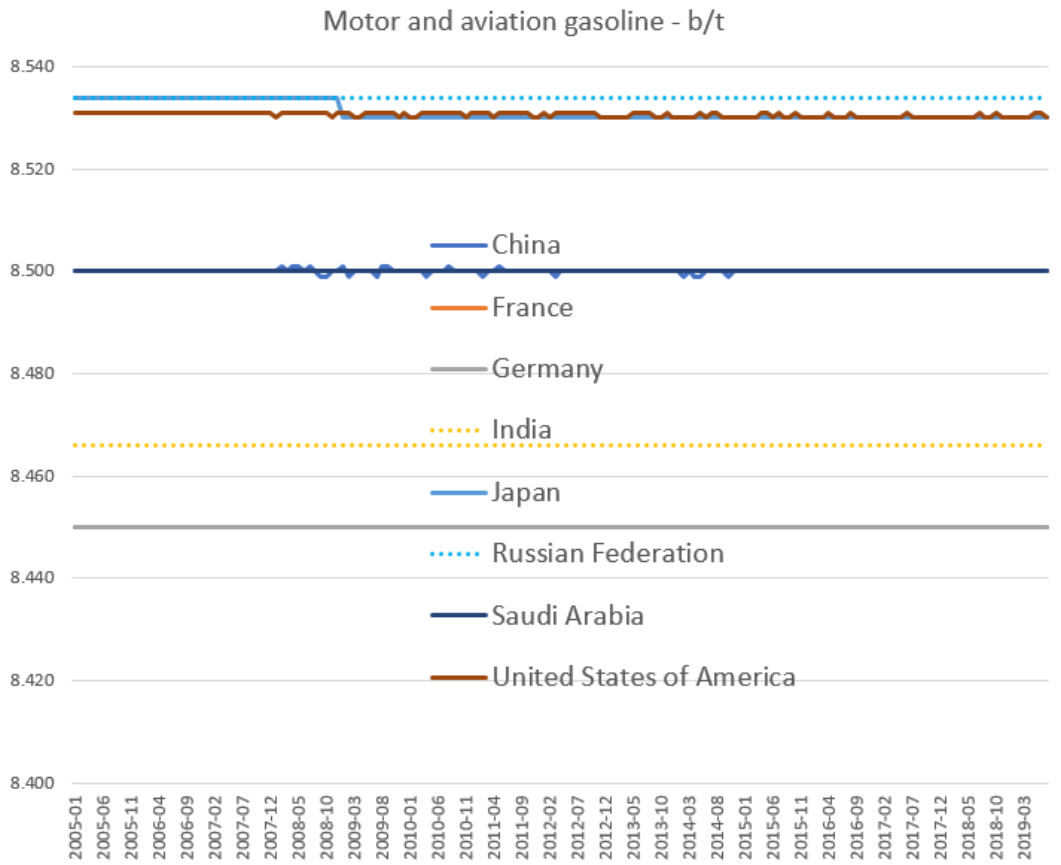
	IEA	JODI	
RUSSIA	10.3	8.797	17.1%
S ARABIA	11.51	11.8	-2.5%
US	10.3	13.08	-21.3%

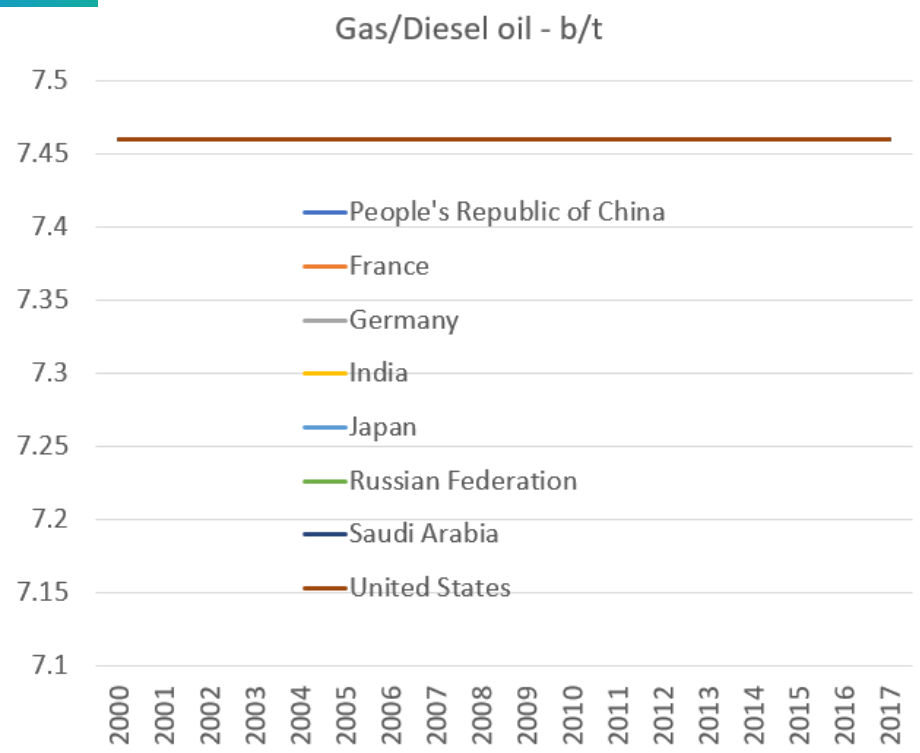


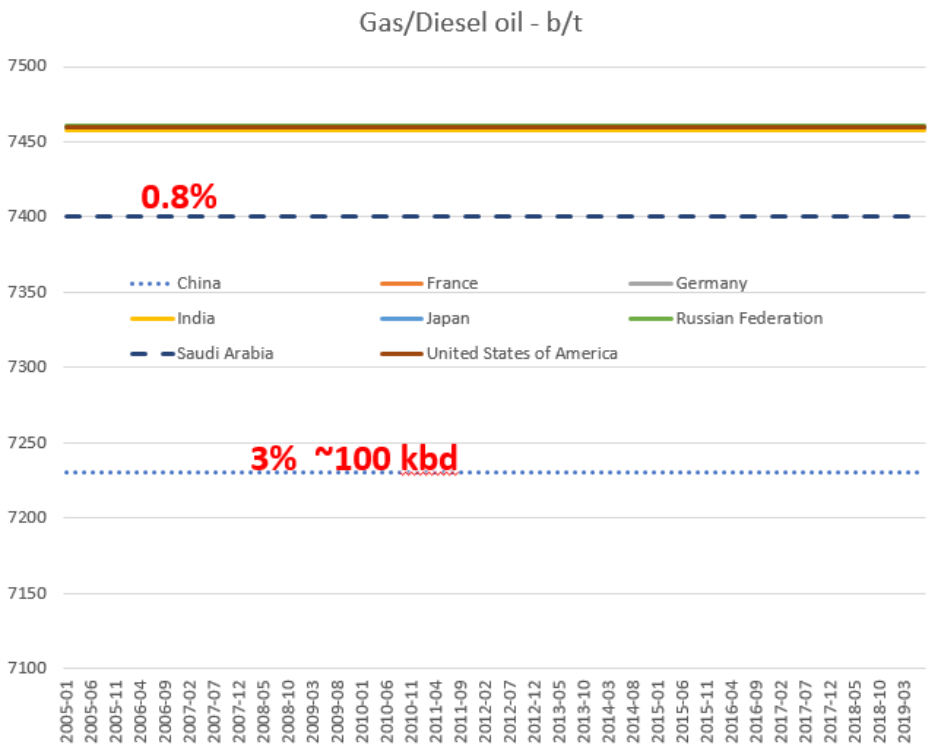


JODI ~> 6% IEA ~100kbd


Motor gasoline exc biofuels - b/t
8.54
8.52
8.5
8.48
8.46
8.44
8.42
8.4
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
People's Republic of China
France
Germany
India
Japan
Russian Federation
Saudi Arabia
United States


Motor and aviation gasoline - b/t
8.540
8.520
8.500
8.480
8.460
8.440
8.420
8.400
China
France
Germany
India
Japan
Russian Federation
Saudi Arabia
United States of America


Gas/Diesel oil - b/t
7.5
7.45
7.4
7.35
7.3
7.25
7.2
7.15
7.1
People's Republic of China
France
Germany
India
Japan
Russian Federation
Saudi Arabia
United States
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017


Gas/Diesel oil - b/t
7500
7450
7400
7350
7300
7250
7200
7150
7100
0.8%
3% ~100 kbd
China
France
Germany
India
Japan
Russian Federation
Saudi Arabia
United States of America
2005-01
2005-06
2005-11
2006-04
2006-09
2007-02
2007-07
2007-12
2008-05
2008-10
2009-03
2009-08
2010-01
2010-06
2010-11
2011-04
2011-09
2012-02
2012-07
2012-12
2013-05
2013-10
2014-03
2014-08
2015-01
2015-06
2015-11
2016-04
2016-09
2017-02
2017-07
2017-12
2018-05
2018-10
2019-03

Conversion factors from mass or volume to heat (Gross calorific value)

	LNG[2]		GAS									
			Norway		Netherlands		Russia		Algeria		Qatar	
To:	MJ	Btu	MJ	Btu	MJ	Btu	MJ	Btu	MJ	Btu	MJ	Btu
From:	multiply by:											
cm[1]	40.00	37 913	40.00	37 913	33.32	31 581	38.23	36 235	39.19	37 145	41.17	39 018
Kg	54.25	51 417	52.22	49 495	42.07	39 875	55.25	52 363	52.46	49 726	54.98	52 107

1. At 15°C and 760 mm Hg
2. In gaseous state – average OECD imports

Does this make sense??

Natural Gas: Production*																			
Mtoe/bcm	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	**2018**
Azerbaijan	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Kazakhstan	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Russian Federation	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Turkmenistan	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Uzbekistan	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Other CIS	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Total CIS	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Bahrain	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Iran	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Iraq	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Kuwait	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Oman	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Qatar	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Saudi Arabia	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Syria	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
United Arab Emirates	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Yemen										0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Other Middle East	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Total Middle East	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Algeria	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Egypt	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Libya	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Nigeria	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Other Africa	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Total Africa	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Australia	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86

Natural Gas: Production*

Contents

Billion cubic feet per day	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Nigeria	^	^	^	^	^	^	0.1	0.1	0.1	0.1	0.2	0.2	0.2
Other Africa	^	^	^	0.1	0.1	0.1	^	0.1	0.1	0.1	0.1	0.1	0.1
Total Africa	**0.3**	**0.4**	**0.6**	**1.0**	**1.0**	**1.1**	**1.3**	**1.4**	**1.8**	**2.7**	**2.4**	**2.6**	**3.1**
Australia	0.2	0.2	0.4	0.5	0.5	0.6	0.7	0.8	0.8	0.9	1.1	1.2	1.1
Bangladesh	-	-	^	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
Brunei	^	^	^	0.2	0.4	0.5	0.7	0.8	0.8	0.8	0.8	0.8	0.8
China	0.3	0.4	0.5	0.6	0.7	0.9	1.0	1.2	1.3	1.4	1.4	1.2	1.2
India	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.2	0.3
Indonesia	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.6	1.1	1.5	1.8	1.8	1.9
Malaysia	-	^	^	^	^	^	^	^	0.2	0.3	0.3	0.2	0.3
Myanmar	^	^	^	^	^	^	^	^	^	^	^	^	^
Pakistan	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.5	0.6	0.6	0.7
Thailand	-	-	-	-	-	-	-	-	-	-	-	^	0.1
Vietnam	-	-	-	-	-	-	-	-	-	-	-	^	^
Other Asia Pacific	0.5	0.6	0.6	0.7	0.7	0.7	0.8	0.9	0.8	0.7	0.7	0.7	0.8
Total Asia Pacific	**1.5**	**1.7**	**2.0**	**2.5**	**3.0**	**3.4**	**4.0**	**4.8**	**5.7**	**6.5**	**6.9**	**7.0**	**7.3**
Total World	**94.3**	**100.8**	**105.5**	**110.9**	**113.3**	**113.7**	**118.3**	**123.6**	**127.8**	**136.4**	**137.8**	**140.6**	**141.3**
of which: OECD	69.8	74.0	77.0	79.5	78.9	75.7	76.3	77.7	78.1	81.2	80.1	79.3	75.2
Non-OECD	24.5	26.8	28.5	31.4	34.4	38.0	42.0	45.8	49.6	55.2	57.7	61.3	66.1
European Union #	9.9	12.1	14.6	16.5	18.4	19.2	20.4	20.8	20.1	20.2	19.4	19.1	18.1

* Excludes gas flared or recycled. Includes natural gas produced for Gas-to-Liquids transformation.

^ Less than 0.05.

• Less than 0.05%

n/a not available.

USSR includes Georgia, Ukraine and the Baltic States.

Excludes Estonia, Latvia and Lithuania prior to 1985 and Croatia and Slovenia prior to 1990.

Notes: As the data above are derived from tonnes oil equivalent using average conversion factors, they do not necessarily equate with gas volumes expressed in specific national terms.

Annual changes and shares of total are calculated using billion cubic feet per day figures.

Concluding remarks

- World O&G Stats are often far from perfect
- Poor data can easily lead to misguided conclusions regarding the state to market fundamentals
- Any policy planning is only as good as the data it is fed
- Data collection & stats departments in national & Int'l institutions need more resources

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Thank you.

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