

Submission to the Cabinet Office *Energy Review*

by

The Oil Depletion Analysis Centre

Abstract

The world faces severe hydrocarbon supply difficulties:

- Global oil supply is currently at *political* risk. This is because the sum of conventional oil production from all countries in the world, except the five main Middle-East suppliers, is more-or-less at the maximum set by physical resource limits.
- World oil supply will soon be at *physical* risk. This is because the Middle-East countries have themselves little spare operational capacity, and this will be increasingly called upon as oil production declines elsewhere.
- Large investments in Middle-East production, if they occur, could raise output, but only to a limited extent. The main exception is Iraq, but even here there would be significant delays before prospects are confirmed, and infrastructure put in place.
- In any event, global output of conventional oil will soon decline. The date of the peak depends on the size of Middle East reserves, which are poorly known, and unreliably reported. Best estimates put the global conventional oil peak between five and ten years away.
- The world contains large quantities of non-conventional oil and various oil substitutes, but the rapid decline in the output of conventional oil makes it unlikely that non-conventional sources could come on-stream fast enough to compensate.
- For conventional gas, the world's original endowment is probably about the same, in energy terms, as its endowment of conventional oil. Since less gas has been used so far compared to oil, the world will turn increasingly to gas as oil declines. But the global peak in conventional gas production is already in sight, in perhaps 20 years, and hence the global peak of all-hydrocarbons (oil plus gas) is likely to be in about 10 years.

The above assessments are based on extensive geological knowledge, statistical approaches to assessing the yet-to-find, and access to the standard industry oil and gas resource database. Given the seriousness of these findings, we would encourage the Energy Review to carry out, or commission, the relatively straightforward work of checking these calculations.

1. World Oil Supply

1.1 The current situation

The US went over its resource-limited peak in oil production in 1971, and US oil output has been declining since.

The peak in US production had global consequences. At that date, world oil supply came almost entirely from the US, OPEC and Russia. With US supply in decline, and Russian oil largely confined to the communist world, the marginal barrel had to be supplied by OPEC. Thus the world's oil supply was at the mercy of political decisions within OPEC, with the Yom Kippur war triggering the first oil shock and the Iranian

revolution the second. The combined effect of these shocks pushed the world into a long and deep recession, and led to a wide range of other effects.

The present situation has important similarities. Now it is oil supply from all countries of the world, except the five Middle-East members of OPEC, that is more-or-less at its resource-limited peak. It is this limit to non-OPEC supply that allows the current OPEC quotas to be effective. Once again, as in the 1970's, the marginal barrel has to be supplied by OPEC, and the world's oil supply is at political risk.

This time, however, the Middle-East producers are themselves severely constrained. They have significant domestic budgets, so have an incentive to sell their oil, but they also, this time, face resource constraints of their own. There is currently little Middle-East spare operational capacity, and this will be eaten into as conventional oil elsewhere declines. Saudi Arabia, for example is already working hard to maintain output from its old large fields. Increased investment, if thought justified by the countries concerned, would certainly boost production for a while; but it is probably largely only in Iraq that significant prospects, identified before sequestration, exist to be brought on stream

Thus the purely 'political-risk' phase does not last for long, and is replaced by physical shortages if large investments in Middle East production are not made. And even if these investments are made, underlying resource limits mean that total world supply of *conventional* oil, including that from the Middle-East producers, goes into decline fairly soon. The date of this decline depends critically on how much oil there is in the Middle-East countries, a quantity that is not well known. On our estimates, the date for this decline is about 5 years away; others assume more optimistic values for the Middle-East oil endowment, and put the global decline up to 15 years away.

The effects of a decline in conventional oil supply are complicated by uncertainties about the rate that oil recovery factors can improve (giving 'enhanced recovery' oil); and the amount of supplies that may become available from non-conventional oils (heavy oils, tar sands and shale oils), and from other non-conventional liquids (gas-to-gasolines, oil from coal, biofuels etc.).

But the rate of decline of conventional oil will be steep, a fall of the order of 2 million barrels per day (Mb/d) each year. And, if current world demand is to be satisfied, an annual increase in the supply of petroleum liquids of roughly the same magnitude is required. That is, the combined output from enhanced recovery and the non-conventionals must increase by something like 4 Mb/d each year if the existing demand trend is to be satisfied.

This size of annual increase looks very unlikely. Various studies indicate that the amount of extra oil that can be made available by enhanced oil recovery, certainly within any timescale that affects global peaking, will be rather small. And on the non-conventionals, though more analysis is required, it would seem that the driving factors (including technological readiness, energy content, investment limits, water requirement, and emissions of CO₂ and other pollutants), all act to limit the rate these will come on-stream.

1.2. Modelling world oil supply

The 1971 US peak had been predicted by US geologist M. King Hubbert by combining estimates for the total amount of US (lower-48) oil with the resource 'logistic' curve. (The latter indicates that supply peaks when about half the recoverable resource has been extracted). Though applied to the lower-48 states, this approach correctly captured the all-US peak, despite the US having made its biggest single find, Prudhoe Bay, only just before the peak; and despite the current finds in the deepwater Gulf of Mexico. The success of this approach is not surprising when one considers that production has to largely mirror the original discovery trend (see, e.g., recent work by Laherrère [1]), and that the peak in the US discovery trend was back in the 1930's.

This forecasting technique was applied by a range of competent authorities, at various dates during the 1970's and early 1980's, to calculate the date for the peak in the world conventional production. These authorities included the UK Dept. of Energy, Esso, Shell and the World Bank. All used estimates for the world's original endowment of conventional oil lying somewhere in the region of 2,000 billion barrels (Gb), and hence calculated that the world conventional oil peak would occur around the year 2000.

If *statistical* methods are used to estimate this original endowment of conventional oil, such estimates have changed little over the last 30 or 40 years, and still stand today at about 2,000 Gb, once NGL's are taken out; see for example [2]. So the same calculation done today gives essentially the same prediction, but with the date of peak shifted to compensate for the reduction in global demand following the 1970's oil shocks.

A group of petroleum geologists, engineers and physicists at the University of Reading (including the author of this submission) examined this oil forecasting technique in some depth. We concluded that it is reasonably accurate and robust to uncertainties; see references [3] to [6]. (Note that the Energy Review's questioning of the credibility of oil past forecasts [Ref. 7] needs to be set against these findings; in assessing past forecast one needs to understand both the assumptions that were made, and the data that were used.)

Unfortunately, the 'logistic curve' method of modelling the future of oil supply got largely forgotten during the later 1980's and 1990's.

In this period, the IEA, the EU, the US EIA, and many in industry, fell into the trap of looking at the global oil 'reserves-to-production' ratio (R/P ratio) to provide a measure of the security of oil supply. Since this ratio indicates that current oil reserves are enough to provide 40 years' of supply, and since more oil will certainly be found, this naïve analysis seems to push any risk of oil supply difficulties out to 50 or more years in the future.

This 'R/P view' of the world's oil still largely dominates. Recently, however, a few bodies, such as the IEA, and more recently still, the US' EIA and the EU, have begun to understand the need to use the logistic curve for modelling future oil supply.

But, essentially because of inexperience, many errors still exist. The US' EIA, for example, drives its decline curves from spurious 'fixed R/P' ratios; while the IEA has

used inappropriate US Geological Survey data. We believe that the IEA may currently be re-evaluating its forecasting procedures, and await the outcome.

Table 1 presents our current estimates of world conventional oil endowment, by country. (For analytical reasons, this table excludes polar and deepwater oil).

These estimates are based on geological knowledge, statistical approaches to assessing yet-to-find, and access to the standard industry oil and gas resource database. These numbers lead to the conclusions set out earlier. We would encourage the Energy Review to carry out, or commission, the relatively straightforward work of checking these assessments.

(Note that where others present different numbers, it would be useful to explain how the latter are derived.)

Table 2 gives our current estimates of total oil production, including that from polar, deepwater and non-conventional sources. The latter have a fair degree of uncertainty, but overall represents what we think is a realistic forecast of what is possible. Again, we would encourage the Energy Review to check these estimates.

2. UK Oil Supply

We regret to say that in our view the UK government seems to have had, at least until recently, only a rather poor understanding of UK future oil production. For example, recent 'Brown Books' made no mention of the near-term production peak, and noted only that more fields than ever before were in production. The fact that these new fields are very small, and will last just a few years, was not drawn to the readers' attention.

This lack of detailed understanding is born out by the very wide range of estimates for UK recoverable oil resources, as given in [Ref. 7]. While the ends of this range can, of course, be numerically justified from particular viewpoints, any attempt to know what is *likely* to happen has to take a more pragmatic view. Probably such a wide range can be traced, in part, to the more general industry confusion over whether it needs to report proved or (proved + probable) reserves; and to a long-term lack of research within the DTI's Oil & Gas Directorate concerning either UK or global future oil production.

Whatever the background, there is clearly a current need for the Energy Review to properly understand:

- Near-term N. Sea oil production potential.
- WoS. & Atlantic prospects, vs. timing.
- The potential for enhanced oil recovery if global oil supply is disrupted.
- The commercial cut-offs as they apply to small fields (the 'Skrebowski effect').

3. World Gas Supply

Whereas most exploration geologists, with a global view, agree that for oil the current find rate trends are unlikely to change, there is not such a consensus about gas. Some geologists feel that, since they have 'not been looking for gas', there will be a lot more to find once the effort is put in. The counter-argument is that, though there are likely to be large new gas finds, in N. Russia for example, over the last 30 years or so the total estimate for the world's original endowment of natural gas has changed little [2].

Our best view at present is that the current estimates of the original endowment of conventional gas, at about 10,000 Tcf, are correct. On this basis, though mankind is further from the peak point for global gas than for global oil, the end for conventional gas is already in sight: mankind has probably burned about half the gas needed to take us to the world production peak of conventional gas.

For gas also, therefore, the Energy Review should consider carrying out, or commissioning, global modelling. (Note that the methodologies to study future gas profiles are not as well defined, within academic or industry circles, as for oil, and will require additional research.) The current experience from the US suggests that when a gas decline does set in, it is very steep, reflecting gas's high molecular mobility.

4. Decision-Making Structure for an Energy Policy for Britain

During the last oil shocks, the experience of the world's ability to understand what was happening, and to take sensible decisions, largely told a sorry tale. Hubbert's forecast had been ignored, as had similar calculations by others, see, e.g., [Ref .8]. Fundamentally, there was no adequate mechanism within society to consider the information that was available.

The UK currently has at least four initiatives on future energy supply: the current Cabinet Office Energy Review, looking out 50 years; one within the DTI and Ofgem on nearer-term energy security; one by the House of Lords considering the EU's recent Green Paper on Security of Energy Supply; and one, we are told, within the House of Commons.

But the issues are complex, and the task is perhaps like building a bridge or designing a 'plane. It will need the concentrated effort of a wide range of technically competent people to work solidly on the issues; and require more, in our view, than the output from relatively small groups of people who can, mostly, only canvas opinion. The latter is important, but is only a first step.

Given the magnitude of the coming energy supply problems, the Energy Review might do well to help structure an 'Energy Board' of sufficient qualification, and with an adequate remit.

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R.W. Bentley, Co-ordinator,
The Oil Depletion Analysis Centre,
Suite 12, 305 Gt. Portland St., London W1W 5DA.
(Tel: 020 7436 6544; e-mail: odac@btconnect.com)
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TABLE 1:

SUMMARY: CONVENTIONAL OIL ENDOWMENT (Excludes Polar and Deepwater oil) End-2000 data													
Country	PRODUCTION		RESERVES					DISCOV- ERED	YET- TO- FIND	ULT.	Dep. Rate	DATES	
	kb/d	Cum. Prod.	Reported	O&GJ	Adjust +/-	Factor	Asse- ssed					MP Dep	Peak Prod
	2000	Gb	World Oil										
Saudi Arabia	8064	88.9	259.10	259.20	0.00	0.60	155.5	244.4	15.57	260	1.7%	2011	2011
Russia	6351	119.0	52.66	48.57	-2.32	1.3	60.1	179.1	20.91	200	2.8%	1992	1987
USA-48	4096	167.1	19.63	21.76	-9.00	1.5	19.1	186.2	3.77	190	6.1%	1970	1971
Iraq	2681	25.9	100.00	112.50	-2.67	0.85	93.4	119.2	15.79	135	0.9%	2020	2011
Iran	3568	51.7	93.10	89.70	-2.58	0.75	65.3	117.1	7.94	125	1.7%	2007	1974
Venezuela	2580	44.5	47.1	76.9	-30.00	0.9	42.2	86.7	8.3	95	1.8%	2003	1968
Kuwait	1774	29.6	92.40	94.00	-5.49	0.55	48.7	78.3	6.70	85	1.2%	2011	2011
Abu Dhabi	1850	16.7	62.50	92.20	-6.77	0.65	55.5	72.2	4.76	77	1.1%	2019	2012
Mexico	3050	27.7	28.3	28.3	0.00	1.0	26.8	54.5	2.5	57	3.7%	2001	2001
China	3255	26.1	34.1	24.0	-12.15	2.0	23.7	49.8	5.2	55	4.0%	2001	2001
Libya	1408	21.9	29.5	29.5	-1.51	0.9	23.8	45.7	2.3	48	1.9%	2004	1978
Nigeria	1991	20.9	24.5	22.5	-2.44	1.3	25.1	46.0	2.0	48	2.6%	2004	2004
Kazakhstan	627	5.40	6.42	5.42	-0.23	5.0	10.4	15.8	24.23	40	0.7%	2027	2032
Norway	3216	14.0	10.0	9.4	0.00	1.5	14.2	28.1	1.9	30	6.8%	2001	2001
U.K.	2537	18.0	5.0	5.0	0.00	2.0	10.0	28.0	1.0	29	7.7%	1996	1999
Indonesia	1299	19.0	8.4	5.0	-2.97	4.0	8.02	27.0	1.0	28	5.0%	1990	1977
Canada	1100	18.0	5.6	4.7	0.00	1.6	7.53	25.5	1.5	27	5.7%	1989	1973
Algeria	800	11.5	13.0	9.2	-2.58	2.0	13.2	24.8	1.7	26.50	1.9%	2005	1978
Azerbaijan	258	7.89	0.00	1.18	-0.09	5.0	5.42	13.3	1.69	15.00	1.3%	1995	2005
Qatar	681	6.3	5.4	13.2	0.00	0.7	9.21	15.5	0.5	16.00	2.5%	2006	2006
N.Zone	628	6.22	4.65	5.00	-1.61	2.00	6.77	13.0	1.00	14.00	2.9%	2003	2003
Oman	891	6.3	5.7	5.5	0.00	1.2	6.61	12.9	0.9	13.75	4.2%	2002	2002
Egypt	811	8.1	3.8	2.9	-0.30	1.5	3.98	12.1	0.6	12.75	6.0%	1994	1994
Argentina	749	7.7	2.6	3.0	0.00	1.0	2.89	10.6	0.4	11.00	7.7%	1992	1998
India	639	5.1	3.4	4.7	0.00	1.1	4.96	10.1	0.7	10.75	4.0%	2001	2001
Colombia	689	5.3	2.3	2.6	-0.55	2.0	4.06	9.4	1.1	10.50	4.6%	2000	1999
Angola	744	4.0	8.5	5.4	-4.21	5.0	6.01	10.0	0.5	10.50	4.0%	2003	2003
Australia	720	5.3	2.9	2.9	-0.46	1.2	1.55	8.25	0.50	8.75	7.1%	1995	2000
Malaysia	671	4.8	4.6	3.9	-0.77	0.9	2.82	7.57	0.43	8.00	7.0%	1997	1999
Brasil	413	4.3	8.1	8.1	-9.00	-3.0	2.70	6.97	0.53	7.50	4.4%	1997	1985
Romania	123	5.7	1.2	1.4	-0.09	0.9	1.20	6.87	0.63	7.50	2.4%	1973	1976
Ecuador	390	3.0	3.0	2.1	-0.70	3.0	4.25	7.24	0.26	7.50	3.1%	2005	2005
Turkmenistan	143	2.8	-	0.5	-0.05	4.0	1.98	4.79	1.21	6.00	1.6%	2003	1973
Syria	510	3.4	2.3	2.5	-1.23	1.2	1.53	4.94	0.56	5.50	8.2%	1997	1995
Dubai	333	3.6	1.0	4.0	-1.53	0.4	0.99	4.55	0.20	4.75	9.3%	1990	1991
Brunei	169	2.9	1.0	1.4	-0.58	2.0	1.55	4.41	0.09	4.50	3.6%	1987	1978
Gabon	331	2.6	2.6	2.5	-1.37	1.2	1.35	4.00	0.25	4.25	7.0%	1996	1996
Peru	97	2.3	4.1	0.3	0.00	5.0	1.55	3.81	0.19	4.00	2.0%	1994	1983
Ukraine	48	2.6	-	0.4	0.02	1.2	0.49	3.09	0.91	4.00	1.2%	1983	1970
Trinidad	120	3.1	0.7	0.7	0.00	1.0	0.69	3.80	0.20	4.00	4.7%	1980	1978
Yemen	441	1.4	2.1	4.0	-1.25	0.5	1.37	2.77	0.48	3.25	8.0%	2001	2001
Uzbekistan	152	0.9	-	0.6	-0.06	2.5	1.35	2.29	0.71	3.00	2.6%	2008	2008
Congo	265	1.3	1.7	1.5	-0.51	1.5	1.49	2.82	0.18	3.00	5.5%	2002	2002
Vietnam	304	0.7	1.8	0.6	-0.29	5.0	1.56	2.22	0.53	2.75	5.0%	2005	2005
Denmark	357	1.1	0.9	1.1	-0.13	1.1	1.03	2.10	0.40	2.50	8.3%	2001	2001
Germany	61	1.9	0.3	0.4	0.00	1.0	0.38	2.26	0.14	2.40	4.1%	1976	1967
Tunisia	75	1.1	0.3	0.3	-0.06	2.6	0.65	1.80	0.20	2.00	3.1%	1995	1995
Italy	92	0.8	0.6	0.6	-0.07	1.8	0.99	1.81	0.19	2.00	2.8%	2005	2005

Thailand	110	0.3	0.3	0.4	0.00	2.5	0.88	1.21	0.29	1.50	3.3%	2008	2008
Cameroon	101	1.0	0.6	0.4	-0.61	-1.5	0.32	1.31	0.19	1.50	6.7%	1994	1986
Bahrain	102	1.2	-	0.1	-0.04	1.0	0.11	1.27	0.23	1.50	9.8%	1985	1993
Turkey	57	0.8	-	0.3	0.00	0.8	0.24	1.03	0.17	1.20	4.8%	1992	1991
Hungary	27	0.7	0.1	0.1	-0.01	0.9	0.09	0.78	0.22	1.00	3.1%	1986	1994
Sharjah	45	0.4	-	1.5	-0.19	0.3	0.39	0.83	0.17	1.00	2.8%	2003	1997
Croatia	23	0.5	0.0	0.1	-0.01	4.0	0.33	0.81	0.19	1.00	1.6%	2003	1977
Netherlands	51	0.8	0.1	0.1	-0.02	1.4	0.12	0.93	0.07	1.00	8.8%	1987	1989
Austria	20	0.8	0.1	0.1	-0.01	1.3	0.10	0.87	0.08	0.95	3.8%	1971	1955
France	29	0.7	0.2	0.1	0.00	1.2	0.17	0.88	0.07	0.95	4.1%	1987	1988
Papua	69	0.3	0.0	0.4	-0.06	1.3	0.39	0.70	0.20	0.90	4.0%	2005	1993
Bolivia	34	0.4	0.2	0.4	0.00	0.6	0.24	0.64	0.16	0.80	3.0%	2000	1974
Albania	6	0.5	-	0.2	-0.04	1.2	0.15	0.68	0.12	0.80	0.8%	1986	1983
Pakistan	55	0.3	0.2	0.2	-0.08	1.3	0.17	0.59	0.16	0.75	5.7%	1998	1992
Philippines	1	0.0	0.0	0.3	0.00	1.2	0.35	0.39	0.21	0.60	0.1%	2013	2013
Chile	9	0.4	0.1	0.2	-0.01	0.3	0.04	0.46	0.04	0.50	3.7%	1979	1982
REGIONS													
ME Gulf	18565	219.0	611.75	652.60	-19.13	0.67	425.2	644.2	51.8	696	1.4%	2013	2011
Eurasia	11012	172.1	94.46	82.49	-15.02	1.56	105.2	277.3	56.0	333	2.4%	1999	1987
N.America	5196	185.1	25.20	26.47	-9.00	1.53	26.7	277.3	56.0	217	5.6%	1972	1972
L.America	8131	96.6	96.48	122.50	-40.26	1.04	85.4	182.0	15.8	198	2.8%	2001	1998
Africa	6524	72.6	84.37	74.27	-13.60	1.25	75.9	148.5	8.0	157	2.8%	2002	2004
W.Europe	6363	38.0	17.19	16.86	-0.23	1.62	27.0	65.0	3.8	69	7.0%	1998	2000
Far East	4035	38.8	22.57	19.66	-5.20	1.63	23.6	62.4	4.1	67	5.0%	1997	2000
ME.Other	3060	23.3	16.50	31.11	-4.24	0.76	20.4	43.8	3.2	47	4.5%	2000	2000
Other	347	3.3	0.00	0.00	0.00	0.00	7.7	10.9	1.1	12			
Unforeseen									5.2	5.2			
Non-Swing	44725	630	357	373	-88	1.3	372	1002	102	1104	3.3%	1997	1998
WORLD	63290	849	969	1026	-107	0.9	797	1646	154	1800	2.4%	2002	2003

TABLE 2:

RESOURCE-BASED PRODUCTION FORECAST										
Conventional Oil - Base Case Scenario					CONVENTIONAL OIL					Mb/d
kb/d	2000	2005	2010	2020	By Region	2000	2005	2010	2020	
Saudi Arabia	806	980	1137	859		18.	24.	32.	24.	
	4	0	4	0	ME-Gulf	6	7	0		
	635	551		361		11.	10.			
Russia	1	6	4790	3	Eurasia	0	3	9.2	7.	
	409	298		115						
USA-48	6	6	2177	7	N-America	5.2	3.9	2.9	1.	
	268	445		571						
Iraq	1	2	7366	4	L.America	8.1	7.7	6.4	4.	
	356	395		397						
Iran	8	8	5124	5	Africa	6.5	7.0	5.8	4.	
	258	285		202						
Venezuela	0	4	2547	8	W.Europe	6.4	4.5	3.1	1.	
	177	296		298						
Kuwait	4	8	3843	1	Far East	4.0	3.4	2.6	1.	
	185	281		308						
Abu Dhabi	0	5	3678	5	ME.Other	3.1	2.7	2.1	1.	
	305	272		147						
Mexico	0	2	2220	8	Other	0.4	0.5	0.7	0.	
	325	286		147						
China	5	4	2297	6	Unforeseen	0.0	0.1	0.3	0.	
	140	166		113						
Libya	8	7	1464	0	Non-Swing	45	40	33	2	
	199	233		135		29	38	49	52	
Nigeria	1	3	1945	1	Swing Share	%	%	%	%	
				192						
Kazakhstan	627	924	1235	6	WORLD	63	65	65	4	
	321	234								
Norway	6	4	1609	758	NON-CONVENTIONAL HYDROCARBONS					
	253	169								
U.K.	7	6	1133	506	Oil				Mb/d	
	129	100								
Indonesia	9	5	778	466	Heavy Oils	1.3	2.1	2.1	2.	
	110									
Canada	0	885	712	461	Canada	0.7	0.7	0.7	0.	
		102								
Algeria	800	1	889	674	Venezuela I	0.7	0.6	0.6	0.	
Azerbaijan	258	415	370	293	Venezuela II	0.0	0.7	0.7	0.	
Qatar	681	869	774	514	Other		0.1	0.1	0.	
N.Zone	628	742	641	497	Deepwater	2.2	5.8	9.1	5.	
Oman	891	841	650	388	G. Mexico	0.9	1.6	3.3	2.	
Egypt	811	595	436	235	Brasil	0.2	1.2	2.9	1.	
Argentina	749	503	337	152	W.Africa	1.2	3.0	2.9	2.	
India	639	554	444	285	Other	0.0	0.0	0.0	0.	

Colombia	689	544	429	267	Polar	1.0	0.8	0.6	0.
Angola	744	771	586	357	Alaska	1.0	0.8	0.6	0.
Australia	720	498	344	165	Other	0.0	0.0	0.0	0.
Malaysia	671	466	324	157					
Brasil	413	329	262	166	Other	0.6	0.9	1.2	1.
Romania	123	109	96	76	Subtotal	5	10	13	1
Ecuador	390	498	391	242	GAS & GAS LIQUIDS				
Turkmenistan	143	138	127	107	Gas (by value at 10Tcf = 1 Gboe)				
Syria	510	333	217	92	Gas	24	27	32	3
Dubai	333	205	126	48	Non-con gas	4	5	5	
Brunei	169	140	117	81	Subtotal	29	31	37	4
Gabon	331	230	160	77	Gas Liquids				
Peru	97	88	79	65	Condensate/NGL	7	7	9	
Ukraine	48	45	42	37	ALL HYDROCARBONS				
Trinidad	120	94	74	46	Gas	29	31	37	4
Yemen	441	316	196	76	Liquids	75	82	87	6
Uzbekistan	152	194	202	118	Total	104	113	124	10
Congo	265	237	166	82					
Vietnam	304	387	243	95	BALANCE				at notional annual
Denmark	357	251	152	56	Liquids Mb/d				1.8%
Germany	61	49	40	26	Supply	75	82	87	demand growth
Tunisia	75	64	54	40	Demand	75	82	90	6
Italy	92	117	95	62	Balance	0.0	-0.1	-2.7	40.
Thailand	110	141	140	66	Price shocks from growing swing share mean demand is in reality unlikely to grow				
Cameroon	101	71	51	25	NOTES				
Bahrain	102	61	36	13	Heavy Oils = oil from coal, "shale", tarsand & oil <17.5 API				
Turkey	57	44	35	21	Venezuela I = normal heavy oil				
Hungary	27	23	20	14	Venezuela II = 4 contracted Extra-Heavy oil projects				
Sharjah	45	48	40	28	(Most "Other Heavy" included in Conventional due to database limitations)				
Croatia	23	22	20	17	ME Gulf is treated as "swing"				
Netherlands	51	32	20	8					
Austria	20	17	14	9					
France	29	23	19	12					
Papua	69	87	62	31					
Bolivia	34	29	25	18					
Albania	6	6	6	27					
Pakistan	55	41	30	17					
Philippines	1	58	73	43					
Chile	9	7	6	4	ALL INPUT DATA APPROXIMATE				