

# Depletion now running at over 1mn b/d

This year's *BP Statistical Review of World Energy* once again provides a mine of information for those wishing to analyse the energy industries.

*Chris Skrebowski* has used this year's data to try to analyse the impact that declining production is having.

Last year *Petroleum Review* (August 2003) re-presented the BP production statistics, dividing them into producers in decline, Opec producers with growth potential and non-Opec producers with growing output. This year, the re-presentation of the latest (June 2004) BP statistics has been done as a continuum of producers from those with the largest declines to those with the largest gains. To damp out individual year bias the listing has been based on the average annual change in production over the last two years of data, ie the average of the 2001/2003 output changes. One- and three-year average changes are also listed in **Table 1** and it can be seen that decline/increase order changes only slightly depending on the period used.

Production declines for entire countries, as opposed to individual fields or regions, is a recent phenomenon. Until the 1990s the only countries in decline had been the US, which moved into continuous decline after 1985 (although peak production was actually in 1971), and Romania, that also peaked in 1985. By the late 1990s, however, the BP statistics were showing at least 10 significant producers in decline; 1999 added two more, as did 2000 and 2001.

The most dramatic change to be seen in the latest BP statistics is the way the 32 countries where production is still expanding are having to produce ever faster to make up for the 18 countries where decline is into at least its third year. Overall production growth in 2003 at 2.71mn b/d (3.66%) was one of the five largest annual volume increments seen since 1973. However unlike all the earlier production surges, countries with declining output were a significant

factor in 2003. Because the 18 countries in sustained decline 'lost' production of 1.14mn b/d (-4.91%) this meant those still expanding had to increase production by 3.82mn b/d (7.52%) in order to achieve an overall production growth of 2.71mn b/d (3.66%).

Apart from the 18 in clear decline it is too early to be confident about which other producers will join them. Denmark looks a likely candidate and China looks to be another, the Chinese Government having confirmed that the two largest producing regions – Daqing and Shengli – are now in decline.

The rapid fall in Iraqi production is clearly a special case. Similarly, the small decline in Nigerian production is exceptional, reflecting the impact of recent social and political strife.

Two countries that had appeared to be in decline – Syria and India – have recovered over recent years, but it is unclear if this is sustainable. Similarly, Egypt has almost stabilised production following a period of steady decline.

Venezuela presents a real enigma. The reserves are generally thought to be available but a sustained lack of investment and the more recent political problems mean Venezuelan production has actually been declining since 1998 – despite the start-up of the four heavy oil projects in the Orinoco tar belt.

It should also be noted that, in totalling volumes in decline, Nigeria and Iraq have been excluded from the calculations.

## Impact of decline

Production from the 18 producers now in obvious decline actually peaked in 1997 at 24.7mn b/d and by 2003 their production had fallen to 22.1mn b/d.

All the signs are that the rate of decline among the countries is actually rising. Decline among the group had been running at over 0.5mn b/d in 1998/1999 but recovered in 1999/2000 to post a gain of over 100,000 b/d, which was largely because Australian and Norwegian production surged. Since 2000, however, decline appears to have steadily escalated, with group production falling by over 500,000 b/d in 2001, by over 400,000 b/d in 2002 and by a stunning 1.1mn b/d in 2003 (see **Table 1**).

Calculation of the annual average decline rate shows that in the 18 years since the US went into continuous decline (in 1985) it has been losing an average of 1.6%/y, which is probably the reason why people have generally been fairly relaxed about depletion, assuming it progresses slowly. This view may be misplaced as, for example, Indonesia, in its 12 years of decline, has averaged 2.6%/y but over the last few years this has accelerated to last year's 8.5%.

Although it is generally true that decline rates for predominantly offshore producers are faster than for land-based production, there are notable exceptions. In the period since peak, Oman's production has declined by over 7%/y, Australia's by 7.6%/y, Colombia's by 8.2%/y, and UK production by 5.6%/y. Among the smaller producers there is wide range of gains and losses, but care needs to be taken as the performance of a single field can have a disproportionate impact.

Comparing average annual percentage changes over one, two and three years clearly indicates that, for the majority of the producers in decline, the rate of decline is increasing. The most dramatic example is Gabon, where, averaged over the last three years, decline is running at over 8%/y – but over the last year by over 18%. This and the other data tends to undermine the widely held view that decline rates tend to slow as depletion progresses.

Sustained large-scale production decline by an increasing numbers of countries means that the burden on countries with expansion potential increases, as the volumes lost to depletion have to be made up before any incremental demand can be met.

Average % decline/gain 2003/2001	Country and Peak production year	1995	1996	1997	1998	1999	2000	2001	2002	2003	%Change 1 year 2003/2002	%Change 3-year av 2003/2000
-21.66	<i>Iraq</i>	530	580	1,166	2,126	2,541	2,583	2,371	2,030	1,344	-33.79%	-15.99
-10.13	Gabon -1996	356	<b>365</b>	364	337	340	327	301	295	240	-18.64%	-8.87
-7.56	Indonesia -1991	1,578	1,580	1,557	1,520	1,408	1,456	1,389	1,288	1,179	-8.46%	-6.34
-7.50	Cameroon -1997	106	110	<b>124</b>	105	95	88	80	72	68	-5.56%	-7.58
-7.44	Australia -2000	583	610	668	644	625	<b>809</b>	733	731	624	-14.64%	-7.62
-7.18	Oman -2001	868	897	909	905	911	959	<b>961</b>	900	823	-8.56%	-4.73
-5.17	Congo (Brazz)	180	200	225	264	<b>293</b>	275	271	259	243	-6.18%	-3.88
-5.02	Colombia -1999	591	635	667	775	<b>838</b>	711	627	601	564	-6.16%	-6.89
-4.66	UK -1999	2,749	2,735	2,702	2,793	<b>2,893</b>	2,657	2,476	2,463	2,245	-8.85%	-5.17
-3.80	Venezuela -1970	2,959	3,137	3,321	<b>3,510</b>	3,248	3,321	3,233	3,218	2,987	-7.18%	-3.35
-3.52	Tunisia -1992	90	89	81	83	84	78	71	73	66	-9.59%	-5.13
-3.06	Peru -1994	123	121	120	119	110	104	98	98	92	-6.12%	-3.85
-2.69	Romania -1985	145	142	141	137	133	131	130	127	123	-3.15%	-2.04
-2.28	Norway -2001	2,903	3,233	3,280	3,139	3,139	3,343	<b>3,416</b>	3,329	3,260	-2.07%	-0.83
-2.17	Argentina -1998	758	823	877	<b>890</b>	847	819	829	808	793	-1.86%	-1.06
-1.80	Yemen -2001	351	357	375	380	405	450	<b>471</b>	462	454	-1.73%	0.30
-1.46	Uzbekistan -1999	172	174	182	191	<b>191</b>	177	171	171	166	-2.92%	-2.07
-1.40	US -1971/1985	8,322	8,295	8,269	8,011	7,731	7,733	7,669	7,626	7,454	-2.26%	-1.20
-0.53	Egypt -1993	924	894	873	857	827	781	758	753	750	-0.40%	-1.32
-0.32	<i>Nigeria</i>	1,998	2,138	2,303	2,163	2,028	2,104	2,199	2,013	2,185	8.54%	1.28
	<b>Total decline</b>	<b>23,758</b>	<b>24,397</b>	<b>24,735</b>	<b>24,660</b>	<b>24,118</b>	<b>24,219</b>	<b>23,684</b>	<b>23,274</b>	<b>22,131</b>	<b>-4.91%</b>	<b>-2.87</b>
	(excl Iraq and Nigeria)											
	Change from year earlier	-	639	338	-75	-542	101	-535	-410	-1143	-	-
	% change on year	-	2.69	1.39	-0.30	-2.20	0.42	-2.21	-1.73	-4.91	-	-
0.00	other Mid East	52	50	50	49	48	48	48	48	48	0.00%	0.00
0.83	India -1995?	<b>804</b>	778	800	791	788	780	780	794	793	-0.13%	0.56
0.94	Syria -1995?	<b>596</b>	586	577	576	579	550	583	572	594	3.85%	2.67
1.32	Ecuador	395	393	397	384	382	409	416	410	427	4.15%	1.47
1.36	China	2,989	3,170	3,211	3,212	3,213	3,252	3,306	3,346	3,396	1.49%	1.48
1.58	Iran -1974	3,744	3,759	3,776	3,855	3,603	3,818	3,734	3,420	3,852	12.63%	0.30
1.85	UAE	2,410	2,495	2,490	2,558	2,302	2,499	2,430	2,159	2,520	16.72%	0.28
2.14	other Euro/Eurasia	576	548	526	507	475	466	467	483	487	0.83%	1.50
2.17	Azerbaijan	185	183	185	230	278	281	300	311	313	0.64%	3.80
2.21	Libya -1970	1,439	1,452	1,489	1,480	1,425	1,475	1,425	1,376	1,488	8.14%	0.29
2.32	other Asia-Pacific	231	246	228	218	219	198	194	200	203	1.50%	0.84
2.71	Brunei -1979	175	165	163	157	182	193	203	210	214	1.90%	3.63
3.03	Denmark -2002?	188	207	233	235	301	364	347	<b>372</b>	368	-1.08%	0.37
3.14	Vietnam	155	179	205	245	296	328	350	354	372	5.08%	4.47
3.22	Mexico	3,065	3,277	3,410	3,499	3,343	3,450	3,560	3,585	3,789	5.69%	3.28
3.69	Qatar	461	568	694	747	797	855	854	783	917	17.11%	2.42
4.08	Kuwait	2,130	2,129	2,137	2,176	2,000	2,105	2,069	1,871	2,238	19.62%	2.11
4.59	Saudi Arabia	9,032	9,180	9,361	9,370	8,694	9,297	8,992	8,664	9,817	13.31%	1.86
5.05	Canada	2,402	2,480	2,588	2,672	2,604	2,721	2,712	2,838	2,986	5.21%	3.25
5.66	Malaysia	724	736	764	815	791	791	786	828	875	5.68%	3.54
7.81	other Africa	51	62	64	63	56	61	64	65	74	3.85%	7.10
8.04	Brazil	718	807	868	1,003	1,133	1,268	1,337	1,499	1,552	3.54%	7.47
9.06	other L America	96	102	108	125	122	129	138	153	163	6.54%	8.79
9.44	Algeria	1,327	1,386	1,421	1,461	1,515	1,578	1,562	1,681	1,857	10.47%	5.89
9.64	Angola	633	716	741	731	745	746	742	905	885	-2.21%	6.21
10.37	Trin & Tob -1978	142	141	135	134	141	138	135	155	163	5.16%	6.04
10.43	Sudan	2	5	9	12	63	174	211	233	255	9.44%	15.52
10.54	Russian Fed -1987	6,288	6,114	6,227	6,169	6,178	6,536	7,056	7,698	8,543	10.98%	10.24
12.36	Thailand	87	97	116	121	132	164	174	191	217	13.61%	10.77
14.81	Turkmenistan	84	90	108	129	143	144	162	182	210	15.38%	15.28
16.15	Kazakhstan	434	474	536	537	631	744	836	1,018	1,106	8.64%	16.22
17.72	Italy -1997	101	104	<b>114</b>	108	96	88	79	106	107	0.94%	7.20
18.78	Equatorial Guinea	7	17	60	83	100	113	181	237	249	5.06%	40.12
	<b>Total incr + Iraq, Nigeria</b>	<b>44,251</b>	<b>45,414</b>	<b>47,260</b>	<b>48,741</b>	<b>47,944</b>	<b>50,450</b>	<b>50,803</b>	<b>50,790</b>	<b>54,607</b>	<b>7.52%</b>	<b>2.75</b>
	Change on year	-	1,163	1,846	1,481	-797	2,506	353	-13	3,817	-	-
	% change on year	-	2.63	4.06	3.13	-1.64	5.23	0.70	-0.03	7.52	-	-
	Regional Totals											
1.03	Total N America	13,789	14,052	14,267	14,182	13,678	13,904	13,941	14,049	14,229	1.28	0.78
-0.53	Total L America	5,782	6,159	6,493	6,940	6,822	6,899	6,813	6,942	6,741	-2.90	-0.76
4.81	Total Euro/Asia	13,825	14,004	14,233	14,175	14,458	14,932	15,441	16,259	16,927	4.11	4.45
0.21	Total M East	20,130	20,555	21,564	22,742	21,880	23,163	22,512	20,909	22,607	8.12	-0.80
3.40	Total Africa	7,112	7,434	7,754	7,638	7,571	7,800	7,866	7,962	8,401	5.51	2.57
-0.27	Total Asia-Pacific	7,325	7,571	7,713	7,724	7,654	7,971	7,914	7,943	7,872	-0.89	-0.41
-0.34	OECD	20,737	21,356	21,665	21,477	21,082	21,504	21,330	21,402	21,185	-1.01	-0.49
0.21	OPEC	27,607	28,387	29,743	30,965	29,561	31,090	30,258	28,503	30,383	6.60	-0.76
0.49	non-Opec excl FSU	33,013	34,245	34,904	35,044	34,951	35,565	35,570	36,049	35,917	-0.37	0.33
10.50	FSU	7,297	7,171	7,377	7,391	7,551	8,013	8,659	9,513	10,477	10.13	10.25
<b>1.54</b>	<b>Total World</b>	<b>68,008</b>	<b>69,803</b>	<b>72,024</b>	<b>73,400</b>	<b>72,063</b>	<b>74,669</b>	<b>74,487</b>	<b>74,065</b>	<b>76,777</b>	<b>3.66</b>	<b>0.94</b>
	Change on year	-	1,795	2,221	1,376	-1,337	2,606	-182	-422	2,712	-	-
	% Change on year	-	2.64	3.18	1.91	-1.82	3.62	-0.24	-0.57	3.66	-	-

Source: BP Statistical Review June 2004: Re-presentation and calculations by Petroleum Review

NB: All percentage changes calculated on bld numbers, unlike BP, who uses the metric tonne numbers for percentage change calculations  
 Bold italic figures are peak production years

Table 1: World oil and liquids production 1995-2003

## Peak production

For global oil production to move into decline – in other words to ‘peak’ – all that is required is for the volume lost in the declining countries to exceed the gains made in countries where production is still expanding. As the figures show it will be some time before this occurs.

In 2003 decline was running at a little over 1mn b/d and production gains at just under 4mn b/d. Last year can, however, be regarded as exceptional, with notably large output increases (over 10%) seen from a number of major producers – Iran, UAE, Qatar, Kuwait, Saudi Arabia, Algeria and Russia. It seems unlikely that such large increases can be repeated or sustained without massive new investment.

## Production gains

Over the last two years no less than 15 countries have recorded production increases of over 5%/y; eight of these have sustained gains of over 10%/y. Amongst this group, where production is expanding fastest, the most important is undoubtedly Russia, where production has expanded rapidly since 1999 and is set to top 9mn b/d this year (2004). The other large sustained expanders are Brazil, Algeria, Angola and Kazakhstan. Sudan and Equatorial Guinea have been growing notably fast, but from low bases, and have not yet attained the status of major producers.

Five Middle East producers expanded very fast in 2003. This, however, came after an extended period in which their production levels were little changed. With little or no spare capacity now available around the world, production expansion will be closely linked to new project start-ups. (See table of megaprojects, pXX.)

Analysis of this year’s oil production statistics leads to the conclusion that declining production and depletion is now a significant influence and that rapid production increases are sustainable in only a limited number of countries. This, in turn, gives a very great deal of political and financial leverage to those countries that do have expansion potential. As **Table 1** shows, total North American production peaked in 1997 while Asia-Pacific production peaked in 2000 and OECD production in 1998. Latin American production may have peaked in 2002, although it is too early to be sure.

What this year’s BP statistics confirm is that, if the world is to get the oil production it is likely to require, a great deal of additional investment will have to take place. ●