URANIUM

By Stephen Kidd
Head of Strategy and Research, World Nuclear Association

World uranium producers continued to experience challenging times during 2002, as prices remained almost stable at levels insufficient to give them an adequate rate of return on their investments. The fundamental picture in the market of excess supply continued to predominate. World production fell very slightly, to 35,770 t from a revised figure of 36,007 t in 2001. The 12% rebound experienced in 2000 after the nadir of only 31,000 t in 1999 has yet to be repeated. The production cutbacks in 1997-1999 were motivated by low prices and led to the gradual termination of production in some countries. The rebound in 2000 (and to a lesser extent 2001) was concentrated in the two leading producers, Canada and Australia, and to a lesser extent in the Commonwealth of Independent States (CIS). This pattern changed during 2002, as special factors caused production in both Australia and Canada to fall substantially (by 10% and 8% respectively). In Australia, the reason was the production problems at the Olympic Dam mine and in Canada, the continuation of the gradual switch from the older mines to the new. Nevertheless, there are signs that the major producers in these countries have their inventories well under control and are succeeding in moving production to new and more modern mining facilities

As in recent years, primary supply filled only about 55% of world reactor requirements during 2002. The balance was made up by secondary supplies, including an expected further reduction in uranium inventory levels throughout the world and by the recycling of both reprocessed spent reactor fuel and other fissile materials. These included a major contribution from former military materials and also from re-enriched depleted uranium stockpiles.

Uranium spot market prices were almost stable during 2002, but still ended the year at levels below the marginal operating costs of some mines. However, at least there was no return to the downward trend which began in the second half of 1996, after prices had peaked in mid-year at around US$16.50/lb for Western supply. Prices, which started 2002 at around US$9.50/lb, rose to US$10.00 early in the year and remained there for the remainder of 2002. Although the vast majority of uranium is traded under longer-term contracts, the spot market provides a guide to the material traded at the margin and is also an influence on these contract terms themselves.

The major influence on the market continued to be the uncertainty surrounding the timing and magnitude of secondary supply on the commercial market. This includes the uranium component of the blended down highly-enriched uranium (HEU) sold by Russia to the US. Despite the agreement in early 1999 between the Russians and three Western companies concerning the prudent marketing of this, the magnitude of this supply source continues to overhang the market. In addition, supply from the United States Enrichment Corp. (USEC), from some Japanese utilities running down their inventories

and from re-enriched depleted uranium, kept up the notion that supply should be freely available into the medium term.

With the abolition of restrictions on most supply from the CIS in the US market (now only remaining for Russian origin uranium) the gap between spot prices quoted for supply from this source and from elsewhere in the world has narrowed to the extent that market makers no longer quote a separate price. In the European Union (EU), the Euratom Supply Agency (ESA) maintains a policy of aiming to restrict supply from this source to 25% of demand. Producers in the CIS continue to export all their production, while Russia is believed to have substantial inventories of fissile material of various types to fuel domestic and captive customers up to perhaps 2010. However, new investments in uranium production facilities will likely be needed by then if these countries are to remain substantial exporters to the West.

Australia

Total Australian production fell by 10% in 2002, following the strong upward trend apparent since 1994 (only temporarily reversed in 1998). Nevertheless, total production of 7,070 t represented over a fifth of world production in 2002. ERA's production at Ranger was higher than in 2001 at 3,804 t, but below the rated capacity of 4,230 t/y. ERA's parent company Rio Tinto has decided to retain its ownership, acquired when it bought North Ltd in 2000, but it has been announced that plans to develop the Jabiluka orebody, 20 km from the existing Ranger mill, have been put on hold. Uranium output at WMC's Olympic Dam copper/uranium mine fell significantly in 2002 to 2,451 t. A fire at the solvent extraction plant in late 2001 substantially curtailed output throughout the year. A new plant will be commissioned during 2003. The Beverley in situ leach (ISL) mine in Southern Australia, owned by Heathgate Resources (a General Atomics subsidiary), recorded its second year's production in 2002 of 815 t, approaching rated capacity of 850 t/y. The Honeymoon ISL project may enter production in the near future.

Canada

Canada's uranium output fell by 9% in 2002 to 11,604 t, but it easily retained its place as the leading world producer, accounting for nearly a third of the total. The dip in production was similar to that of 1999 and represents the continuation of the period of transition as it moves towards the new higher-grade mines. Key Lake/McArthur River output rose slightly in 2002 to 7,199 t, with the mill (now adapted to take the higher-grade McArthur ore) achieving its rated capacity throughout the year. Rabbit Lake production fell sharply again, to only 440 t, despite the restart of the mill. Cluff Lake continued in operation throughout 2002 with production of 1,620 t, but ceased production at the end of the year. McClean Lake produced at a slightly lower level of 2,345 t during 2002, with some uncertainities persisting about its operating licence. Development of the Cigar Lake project remains on hold.

Europe

French production has now effectively terminated with the exhaustion of economic reserves. In 2002, only minor production of 20 t came from decommissioning operations. German production was also solely associated

with the decommissioning and environmental clean-up of mining operations belonging to Wismut, in the former East Germany, which ceased production in the early 1990s after being a major world producer in the 1950s-1980s. Production in Spain was slightly higher at 37 t, but mining operations also terminated there at the end of 2000 - residual production is from clean-up activities. DIAMO in the Czech Republic is now the only substantial European producer, but is itself planning to gradually phase out uranium production. Nevertheless, it still produced 465 t in 2002, slightly up on the previous year.

Africa

Overall production was up in 2002, with the two biggest producers Niger and Namibia both higher. Niger's production from Akouta and Arlit was 7% higher at 3,075 t, exceeding 3,000 t for the first time for some years. South Africa, on the other hand, was 6% lower at 824 t, with the improvement during 2001 at AngloGold not continuing and Palabora having ended uranium production following the closure of the heavy minerals recovery plant. The Rossing mine in Namibia experienced a 4% production increase in 2002, at 2,335 t.

United States

Production fell yet again in 2002 for the fifth year in succession to only 923 t, the first time it has been below 1,000 t for over 30 years. ISL production accounted for over 90% of the total. Cameco's acquisition of the Smith Ranch ISL mine has led to a rationalisation of the Highland and Smith Ranch projects, with all processing from the two areas now at Smith Ranch. Production from Crow Butte (also owned by Cameco) was down slightly on 2001. The only other production came from reclamation projects, which are gradually ceasing. US production is now essentially dependent on the three ISL operations, with a revival of any conventional mills dependent on improved market conditions.

Other countries

There was no uranium production in Argentina in 2002, while it is believed to have remained virtually constant in both India and Pakistan. It is now believed that Chinese production has been rising slowly, after the start up of ISL operations, with production of 730 t in 2002. These countries can be termed 'captive producers' in that they produce for domestic reactor requirements only. Their reserves tend to be low grade, making widespread commercial exploitation unlikely in foreseeable market environments. Brazil recommenced production in 2000 but suffered a setback in 2001 when licensing problems restricted output to 58 t. Production rose to 150 t in 2002 but is expected to rise further in future to utilise full mine capacity.

CIS

Overall uranium production has continued to rise after the low point reached in 1997. This followed a long decline, apparent from the early 1990s. The poor economic conditions in these countries have continued adversely to affect uranium mining, as has the very competitive market in the West. Output in both Kazakhstan and Russia rose sharply in 2002, both stemming from successful ISL operations (in the case of Russia, this was the initial year of production from ISL). Kazakhstan and Uzbekistan have the best links with

Western partners, with the former having two joint-venture ISL mines with Western partners just starting up in the production stage. In both countries, conventional mines have closed and they are now dependent on ISL technology.

Outlook

The market outlook for uranium is for a slow rise in world production, led by Canada and Australia and, to a lesser degree, by the CIS. Nevertheless, despite the run-down of inventories by Western utilities, secondary supply from ex-military materials is likely to prevent a strong boom. The trend for supply to become concentrated in a few large low-cost mines in a limited number of countries is likely to continue, with some of the smaller projects which have been mentioned over the past few years finding it hard to compete on cost grounds. Delays to approval for the major projects may, however, provide an opportunity for these, as would any interruption in the expected supply of blended-down highly-enriched uranium (HEU). There remains considerable uncertainty surrounding future CIS production levels. In terms of reserve availability, the CIS producers are in a good position to expand output and production may become increasingly necessary in order to feed domestic reactors (rather than solely for export). The problem is securing sufficient funds for the significant capital investments required

Exploration

Programmes have remained at very modest levels. As surveys of uranium reserves identify well-established deposits totalling over 3 Mt, equivalent to almost 100 years' production at the recent level, the incentive for exploration has remained poor. The focus has been directed at identifying deposits amenable to low-cost production, either through their high grade or through their suitability for ISL technology. The search for high-grade deposits has continued in Canada (Saskatchewan and the Northern Territories) and in Australia, where previous successes have been achieved. Sandstone deposits suitable for ISL have been sought in the US, the CIS, Mongolia, India and China.

Demand

At the end of 2002, there were 438 nuclear reactors in operation throughout the world with a combined capacity of 352 GWe. An increasingly important factor is the rise in generating capacity of existing reactors via upgrades, as opposed to new reactor start-ups. There were also 36 reactors throughout the world either under construction or temporarily suspended from operation at the end of 2002, with combined capacity of 30 GWe. These can be expected to come into operation over the next ten years, to be partly offset by closures of some older (and usually smaller) reactors.

Although nuclear generating capacity is an important indicator of demand for uranium, the operating characteristics of reactors are also crucial and are sometimes ignored by commentators. The almost universal recent experience has been for higher reactor load factors to be achieved, which pushes up uranium demand. This was particularly so in 2002 – despite only a slow increase in nuclear generating capacity, nuclear production has maintained its

share of world electricity at approximately 17% throughout the 1990s into the new century. There are also other important factors to consider, including fuel burn-ups and enrichment levels, plus the length of reactor operating cycles. The annual current world reactor requirement is for around 65,000 t of uranium, and this is expected to grow slowly over the longer term by up to 1% per annum.

World Uranium Production (t)

				% Change
	2000	**2001**	**2002**	**2001-2002**
Argentina	0	0	0	0
Australia	7,609	7,883	7,070	-10
Brazil	50	58	150	160
Canada	10,590	12,520	11,604	-8
China*	500	655	730	12
Czech Republic	507	456	465	2
France	320	195	20	-85
Gabon	0	0	0	0
Germany	33	32	27	-15
Hungary	10	0	0	0
India*	200	230	230	0
Kazakhstan	1,740	2,050	2,490	16
Namibia	2,714	2,239	2,335	4
Niger	2,900	2,920	3,075	5
Pakistan*	23	46	38	-17
Portugal	10	3	2	-33
Romania*	50	85	90	6
Russia*	2,000	2,000	2,900	45
South Africa	878	873	824	-6
Spain	251	30	37	23
Ukraine*	500	750	800	7
US	1,456	1,020	923	-9
Uzbekistan	2,350	1,962	1,960	0
Total	**34,691**	**36,007**	**35,770**	**-1**

* World Nuclear Association estimate.

