

Looking at today's uranium market and beyond

BY RICK MICHAL

THE SPOT PRICE of uranium in early May was about \$65 per pound, less than half of what it was last August when it topped out at \$136/lb. The last time there was such a drastic runup was in the mid-1970s, when the spot price spiked to \$43/lb U_3O_8 from less than \$10/lb. For many years after that, however, the market settled at a fairly consistent level of less than \$20/lb. In December 1987, for example, the spot price was \$16.50/lb, then down to \$9.65 three years later, then up to \$12.25 in December 1995 and \$14.70 in December 1996, then down to \$8.75 two years later and back up to \$9.60 in December 2001. From there came the steady climb, to \$20/lb in September 2004, then to \$36.25 in December 2005, and a leap to \$72 a year later before soaring to its all-time high of \$136/lb in August 2007. Since then, the spot price has been declining. Why the recent ups and the rapid down?

Jeff Combs, president of Ux Consulting Company, said the uranium market is now cooling down after a period of overheating that caused the spot price to peak. The reasons for the rapid increase are many: hedge fund dollars entering the market, general speculation by uranium buyers, additional demand for product, the flooding of Canada's Cigar Lake and Australia's Ranger uranium mines, and the world's belief that



Combs

Combs said. "So, in a way, the market got ahead of itself. There was a lot of speculation, and now it's coming back to earth."

The downtrend could mean a spot price in the near term of just under \$60/lb, but it won't go much lower than that because of the presence of interested buyers, according to Combs.

For more than 30 years Combs has provided economic analysis and forecasting for the front end of the nuclear fuel cycle. Before joining Ux Consulting in 1994, he worked for Science Applications International Corporation and, prior to entering the

After reaching a record-setting high last summer, the spot price of U_3O_8 has come back down to earth, according to an expert who has made a career of studying the uranium market.

private sector, the Department of Energy. Ux Consulting publishes *Ux Weekly*, which issues spot prices for uranium, uranium conversion, and uranium enrichment and tracks current activities in these markets.

Looking at "long-term" uranium pricing—which is separate from spot pricing—the price dropped \$5 in late April to about \$90/lb U_3O_8 , the first time in almost a year that a change has been recorded, according to *Ux Weekly*. The reduction is due to long-term offers now coming in at the lower price, even though other offers still exist at the \$95/lb level.

Meanwhile, the U_3O_8 spot price of the future will depend on supply and demand, of course, particularly on how quickly uranium production can increase and whether more nuclear power plants are built. "If there is a strong renaissance in nuclear power, it's going to put a lot of pressure on production to expand," Combs said. "Uranium production still hasn't had a great track record in that regard. It has missed its targets the past several years."

Data from *Ux Weekly* show that the worldwide production of U_3O_8 was 107.1 million lb in 2007, which was up from 102.32 million lb in 2006, but still below the 108.37 million lb mined in 2005. It is, however, an increase in annual production over the past 13 years, during which time the world's uranium mines produced about 94 million lb U_3O_8 per year.

Canada, at 24.6 million lb, and Australia, at 22.3 million lb, were the world's leaders in uranium mining in 2007, a year in which the United States mined only 4.4 million lb U_3O_8 . Kazakhstan has had the largest expansion of uranium mining recently—17.3 million lb, which was up over 4.5 million lb from the 13.73 million lb produced in 2006, and 15 million lb higher than the 2.25 million lb produced in 1997. "Without the expansion of production in Kazakhstan, the market would be in a lot worse shape, with much higher prices than we see today," Combs said.

Some good news is that three applications for new uranium recovery operations in the United States have been filed recently with the Nuclear Regulatory Commis-

sion. Still, it takes a major effort to bring a new mine on line, Combs explained. "I don't think there's any ultimate shortage of uranium; it's more a case of how quickly it can be taken from the ground. Financing, licensing regulation, and those sorts of things have to be in order," he said.

Uranium mining, like most things these days, has become very expensive. Combs said that the market's response to higher mining costs has been less than it was in the mid-1970s, when the last big price boom occurred. Back then, the spot price went from \$6 or \$7/lb U_3O_8 to \$43 in a few years' time. In today's dollars, that high represented a spot price of \$120–\$125/lb, almost as much as the market's runup in the past year. The 1970s market ended up with too much uranium production, which, coupled with the cutback in new nuclear power plants due largely to the Three Mile Island accident and a national recession, led to a long period during which prices were under a downward pressure. Things today are different, however. "I think the situation now is that we clearly need more and more expansion in production," Combs said. "Production hasn't responded as quickly as it did in the '70s. Looking forward, there is a pretty strong growth potential for nuclear power."

Another spike?

Combs said that while the supply for the longer term—stretching to 2020—seems stable, the spot price will depend not only on how quickly new reactor orders are made, but also on when utilities secure the uranium for those reactors and how conservative they are prior to the reactors' going on line. "The reactor might be delayed, but if you've locked up that supply, that demand has already come into the market," he said. "That's one dimension of the situation. Another is what happens with respect to production. If there is a lot of aggressive contracting for uranium, and if there are future problems with production, there could be another price spike in the future."

Because the current spot price has come down, market players may also have the attitude that the worst is over, even though

UxC URANIUM PRODUCTION DATA 1990-2007

MILLION LB U₃O₈

Region	Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Australia	Australia	9.20	9.82	6.07	5.86	5.74	9.62	12.90	14.28	12.76	15.64	19.75	19.92	17.96	19.76	23.33	24.68	19.69	22.30
Australia		9.20	9.82	6.07	5.86	5.74	9.62	12.90	14.28	12.76	15.64	19.75	19.92	17.96	19.76	23.33	24.68	19.69	22.30
Canada	Canada	22.83	21.33	24.21	23.88	25.22	27.15	30.57	31.27	28.72	21.40	27.75	32.57	30.16	27.07	30.15	30.23	25.64	24.64
Canada		22.83	21.33	24.21	23.88	25.22	27.15	30.57	31.27	28.72	21.40	27.75	32.57	30.16	27.07	30.15	30.23	25.64	24.64
Central Africa	Gabon	1.82	1.77	1.40	1.53	1.48	1.64	1.47	1.23	1.93	0.76	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Central Africa	Niger	7.38	7.70	7.71	7.58	7.70	7.72	8.63	9.02	9.71	7.59	7.54	7.59	8.00	8.17	8.53	8.04	8.10	8.20
C. Africa		9.20	9.47	9.11	9.11	9.18	9.36	10.10	10.25	11.64	8.35	7.54	7.59	8.00	8.17	8.53	8.04	8.10	8.20
FSU	Kazakhstan	9.62	8.23	7.28	7.02	5.79	4.24	3.15	2.25	3.32	3.55	4.55	5.33	7.28	8.64	8.63	11.34	13.73	17.26
FSU	Russia	9.48	8.44	6.55	5.99	7.25	5.85	6.20	5.00	4.00	4.00	7.00	6.76	7.29	7.37	7.52	8.65	8.84	8.78
FSU	Ukraine	2.58	2.08	1.56	1.30	0.60	1.30	1.30	1.30	1.50	1.50	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.21
FSU	Uzbekistan	8.15	7.62	6.97	6.60	5.50	4.68	4.40	5.06	5.20	5.46	5.23	5.12	4.84	4.55	5.33	5.98	5.88	6.03
FSU		29.83	26.37	22.36	20.91	19.14	16.07	15.05	13.61	14.02	14.51	18.88	19.31	21.51	22.66	23.58	28.07	30.54	34.28
Eastern Europe	Bulgaria	1.60	1.20	0.24	0.13	0.18	0.16	0.10	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Eastern Europe	Czech Rep.	4.45	3.86	3.83	2.47	1.87	1.58	1.56	1.60	1.30	1.30	1.30	1.12	1.12	1.17	0.86	0.99	0.94	0.80
Eastern Europe	Hungary	1.36	1.20	1.12	0.99	1.07	0.55	0.50	0.52	0.03	0.03	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00
Eastern Europe	Romania	0.55	0.42	0.31	0.30	0.30	0.26	0.30	0.26	0.30	0.30	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.23
E. Europe		7.96	6.68	5.50	3.89	3.42	2.55	2.46	2.40	1.63	1.63	1.54	1.36	1.33	1.38	1.07	1.20	1.15	1.03
France	France	7.33	6.75	5.58	4.45	2.69	2.55	2.42	1.44	1.33	1.18	0.83	0.51	0.05	0.00	0.00	0.00	0.00	0.01
France		7.33	6.75	5.58	4.45	2.69	2.55	2.42	1.44	1.33	1.18	0.83	0.51	0.05	0.00	0.00	0.00	0.00	0.01
Namibia	Namibia	8.35	6.37	4.32	4.34	4.94	5.23	6.35	7.55	7.18	6.99	7.04	5.76	6.06	5.29	7.90	8.18	7.97	7.48
Namibia		8.35	6.37	4.32	4.34	4.94	5.23	6.35	7.55	7.18	6.99	7.04	5.76	6.06	5.29	7.90	8.18	7.97	7.48
Other	Argentina	0.03	0.05	0.32	0.33	0.38	0.17	0.07	0.09	0.08	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other	Belgium	0.10	0.10	0.10	0.12	0.10	0.07	0.09	0.10	0.08	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other	Brazil	0.01	0.00	0.00	0.07	0.28	0.27	0.33	0.00	0.00	0.00	0.18	0.10	0.71	0.88	0.88	0.88	0.88	0.88
Other	China	1.08	1.14	1.17	1.27	1.30	1.56	1.57	2.60	2.60	2.60	2.00	2.00	1.82	1.82	1.82	1.82	1.82	1.82
Other	Germany	7.70	3.14	0.60	0.30	0.12	0.09	0.09	0.10	0.05	0.05	0.05	0.05	0.55	0.30	0.20	0.25	0.15	0.15
Other	India	0.49	0.55	0.39	0.39	0.40	0.45	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52
Other	Pakistan									0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Other	Portugal	0.29	0.07	0.08	0.08	0.06	0.05	0.07	0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other	Spain	0.56	0.51	0.48	0.47	0.66	0.66	0.66	0.66	0.66	0.66	0.65	0.10	0.10	0.00	0.00	0.00	0.00	0.00
Other		10.26	5.56	3.14	3.03	3.30	3.32	3.40	4.12	4.10	4.05	3.46	2.83	3.76	3.58	3.48	3.53	3.43	3.43
South Africa	South Africa	6.40	4.46	4.35	4.42	4.36	3.71	3.84	2.90	2.50	2.43	2.07	2.27	2.14	1.97	1.96	1.75	1.39	1.39
S. Africa		6.40	4.46	4.35	4.42	4.36	3.71	3.84	2.90	2.50	2.43	2.07	2.27	2.14	1.97	1.96	1.75	1.39	1.39
U.S.	U.S.	9.03	7.96	5.45	2.95	3.40	5.82	6.21	5.78	4.87	4.65	3.81	2.63	2.39	2.02	2.17	2.69	4.41	4.36
U.S.		9.03	7.96	5.45	2.95	3.40	5.82	6.21	5.78	4.87	4.65	3.81	2.63	2.39	2.02	2.17	2.69	4.41	4.36
Grand Total		120.39	104.77	90.09	82.84	81.39	85.38	93.30	93.60	88.74	80.82	92.68	94.75	93.36	91.91	102.17	108.37	102.32	107.13
Avg. Spot Price		\$9.73	\$8.73	\$8.55	\$10.10	\$9.37	\$11.36	\$15.50	\$12.09	\$10.42	\$10.20	\$8.29	\$8.70	\$9.87	\$11.41	\$18.33	\$28.14	\$47.91	\$98.55
Western production		81.52	70.58	61.06	56.77	57.53	65.20	74.22	74.99	70.50	62.08	70.26	72.08	68.70	66.04	75.70	77.28	68.82	69.99
Eastern production		38.87	34.19	29.03	26.07	23.86	20.18	19.08	18.61	18.25	18.74	22.42	22.67	24.66	25.86	26.47	31.08	33.51	37.13

(Table: Ux Consulting Co.)

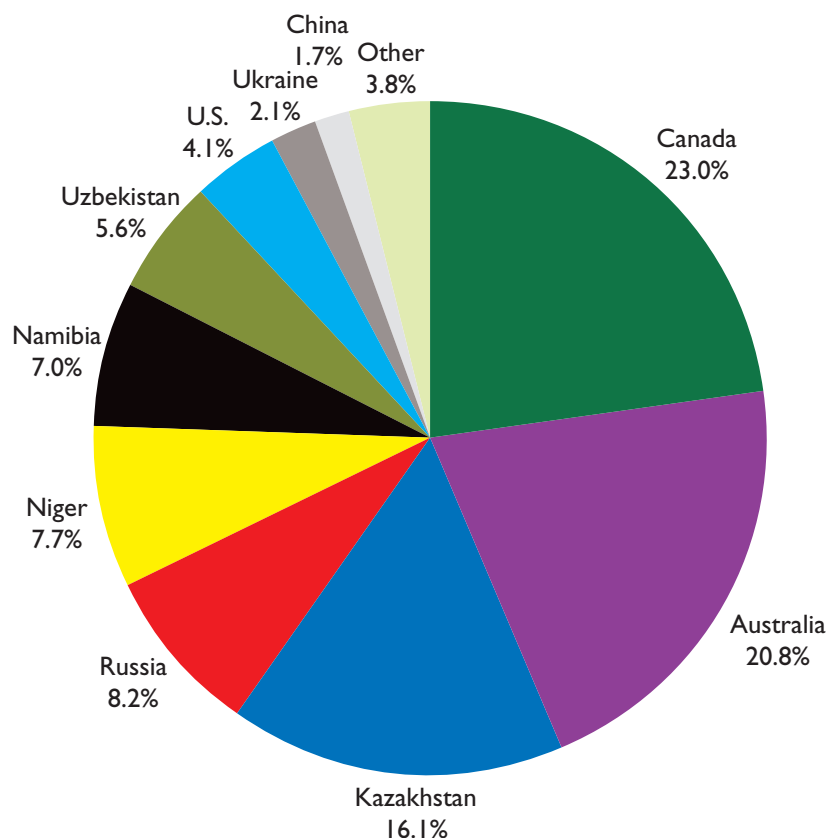
the future supply-and-demand situation is far from certain. A large part of that uncertainty, according to Combs, comes from the fact that the 1993 Highly Enriched Uranium Purchase Agreement—better known as the Megatons to Megawatts program—will expire in 2013. Under that program, the United States is required, over 20 years, to purchase 500 metric tons (t) of high-enriched uranium derived from Russian nuclear weapons. The HEU is downblended in Russia to low-enriched uranium and shipped to the United States for use in commercial power reactors. The HEU deal is implemented in Russia by the government-

run Technabexport and in the United States by privately owned USEC Inc. To date, Russia has converted approximately 320 t of HEU from almost 13 000 nuclear weapons into LEU, according to USEC. The company noted that the amount of LEU downblended for the program since its inception could generate enough electricity to meet the annual needs of 361 million U.S. households.

Once the program ends, the market will have to make up the lost production, which is about 24 million lb annually of LEU, plus whatever additional growth there is in the industry. Combs cautioned that it's not just

these factors, but also how nuclear growth in India, Russia, and China plays out. "If nuclear really takes hold in those places, then there is going to be a fair amount of demand for uranium," he said. "It's going to challenge future production, which is still a fairly uncertain situation. I don't think we'll see a stable price that has everything in equilibrium. I think there will still be some volatility going forward."

Looking at other issues in the news, Combs said that recent discussions about the DOE selling its excess uranium inventory (*NN*, May 2008, p. 67) may have already had a short-term effect on the mar-



The world's top 10 U_3O_8 -producing countries in 2007, broken down by percentage. The rest of the U_3O_8 producers are represented in the 11th slice of the pie, as "other."
(Chart: Ux Consulting Co.)

ket to the extent that other suppliers of UF_6 have sold material in anticipation of the DOE's sales.

The DOE also has depleted uranium—known as tails—that it could sell on the market, according to a Government Accountability Office report issued in April (*NN*, May 2008, p. 62). The tails, however, would need to be enriched to be of use in reactors. "The economics of the tails is affected by what happens to the spot price," Combs said. "As the spot price goes down, not as many tails would be economical. It wouldn't be easy to transfer them into a fungible supply because of the dependence on enrichment capacity, and there is not a lot of excess enrichment capacity available these days." At the same time, the news that the tails could be made available could affect the spot price because of the way that buyers and sellers view the impact. "Whether their interpretations are correct or not, it could still affect the market by being perceived as bringing more supply to the table," he said.

Then there is the far-off possibility that the United States could recycle its domestic spent fuel, bringing another fresh fuel source to the market. Combs said that even if recycling were to be done someday, it would be a long time before it would play a large part in uranium supply or have an effect on spot pricing.

NN