Uranium

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HIGHLIGHTS

- In 2008, Canada retained its position as the world leader in uranium production with output totaling 9000 tU (tonnes of uranium metal).
- Domestic uranium exploration expenditures were $378 million in 2008, 8.5% below 2007 exploration expenditures of $413 million.
- As of January 1, 2009, Canada's total known uranium resources, recoverable at a cost of $100/kgU, were approximately 485 600 tU.
- During 2008, the uranium spot market price decreased by 29%, closing the year at US$55/lb U_3O_8.

DOMESTIC PRODUCTION AND DEVELOPMENTS

In 2008, Canadian uranium production totaled 9000 tU, a decrease of 4% from the 9476 tU produced in 2007. Canada accounted for 20.5% of total world output in 2008 with all production coming from three mining centres operated in Saskatchewan by two of the world's largest uranium-producing companies (Figure 1). Direct employment in Canada's uranium mining industry increased from 1133 in 2005 to 1316 in 2008 (Table 1). Shipments from mining centres decreased in 2007 and 2008, although their total value increased, reflecting higher uranium prices (Table 2). Uranium continues to rank among Canada's top 10 metal commodities in terms of output value. Table 3 documents the main operational characteristics of the existing uranium production centres in Canada in 2008.

Table 4 updates the status of new projects that represent Canada's future production capability. All current production and new projects awaiting development are located in the Athabasca Basin of northern Saskatchewan (Figure 2). Uranium production in Canada in 2008 (Figure 3) was once again dominated by Cameco Corporation and AREVA Resources Canada Inc.

Athabasca Basin, Saskatchewan

McArthur River

Cameco Corporation is the operator of the McArthur River mine, a Cameco (70%) and AREVA (30%) joint venture. Production at this, the world's largest high-grade uranium mine, was 6313 tU in 2008. After raise bore mining of the high-grade ore is conducted behind a freeze curtain created to control groundwater inflow, a high-grade ore slurry is produced by underground crushing, grinding, and mixing. The slurry is then pumped to the surface and loaded on specially designed containers that are trucked 80 km to Key Lake where all McArthur River ore is milled.

Key Lake

The Key Lake mill is a Cameco (83%) and AREVA (17%) joint venture operated by Cameco. Although mining at Key Lake was completed in 1997, the mill maintained its standing as the world's largest uranium production centre by producing 6383 tU in 2008. This total represents a combination of high-grade McArthur River ore slurry and stockpiled, mineralized Key Lake special waste rock that is blended to produce a mill feed grade of about 3.4% U.

A proposal to increase production at McArthur River and Key Lake by some 18% annually (from 7200 tU/y to 8500 tU/y) is currently being reviewed by the federal nuclear regulator, the Canadian Nuclear Safety Commission (CNSC). Increased production at McArthur River requires changes to manage additional waste rock, mineralized waste, and mine water flow. The means to address the increased rate of tailings and treated effluent at the Key Lake mill will be considered in this assessment.

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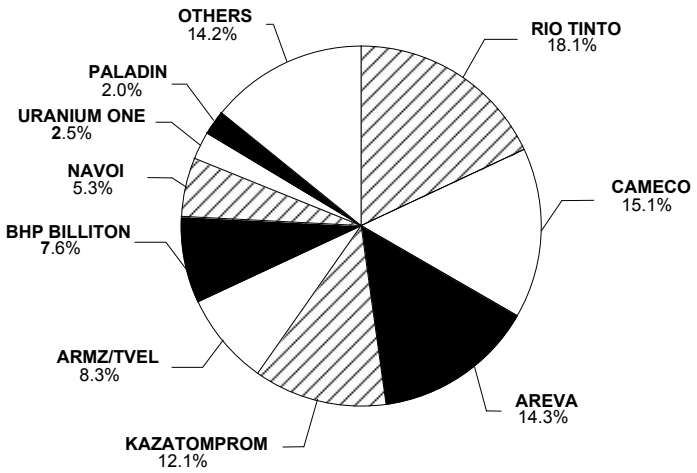
[1] John French, Advisor, Uranium Markets (613-995-7474), has contributed to the text in those sections dealing with international uranium market developments and uranium prices.

Figure 1
World's Top Uranium Mining Companies in 2008



These nine companies accounted for 86% of 2008 world uranium production of 43 969 tU.

Source: *World Nuclear Association Pocket Guide*.
Note: Ranking reflects equity interest in production facilities and not market share.

McClean Lake

The McClean Lake production centre, operated by AREVA, is a joint venture between AREVA (70%), Denison Mines Inc. (22.5%), and OURD (Canada) Co. Ltd., a subsidiary of Overseas Uranium Resources Development Corporation of Japan (7.5%). Production in 2008 amounted to 1249 tU. Modifications to the mill to increase capacity to 4600 tU/y and to process ore from the Cigar Lake mine are nearing completion. Mining at the Sue E and B pits was completed in 2008 and about 375 600 t of ore containing 2500 tU was stockpiled to provide mill feed for the next few years. Mining of the Caribou deposit, which was expected to commence in 2009 and is undergoing an environmental assessment, will be delayed for at least a year due to weakening uranium prices that are affecting the economic viability of the deposit.

Rabbit Lake

The Rabbit Lake production centre, wholly owned and operated by Cameco, produced 1368 tU in 2008. Exploratory drilling in the Eagle Point mine during 2008 delineated additional assured resources, extending the life of the mine. Cameco has indicated that it intends to continue the exploratory drilling at the Eagle Point mine in 2009.

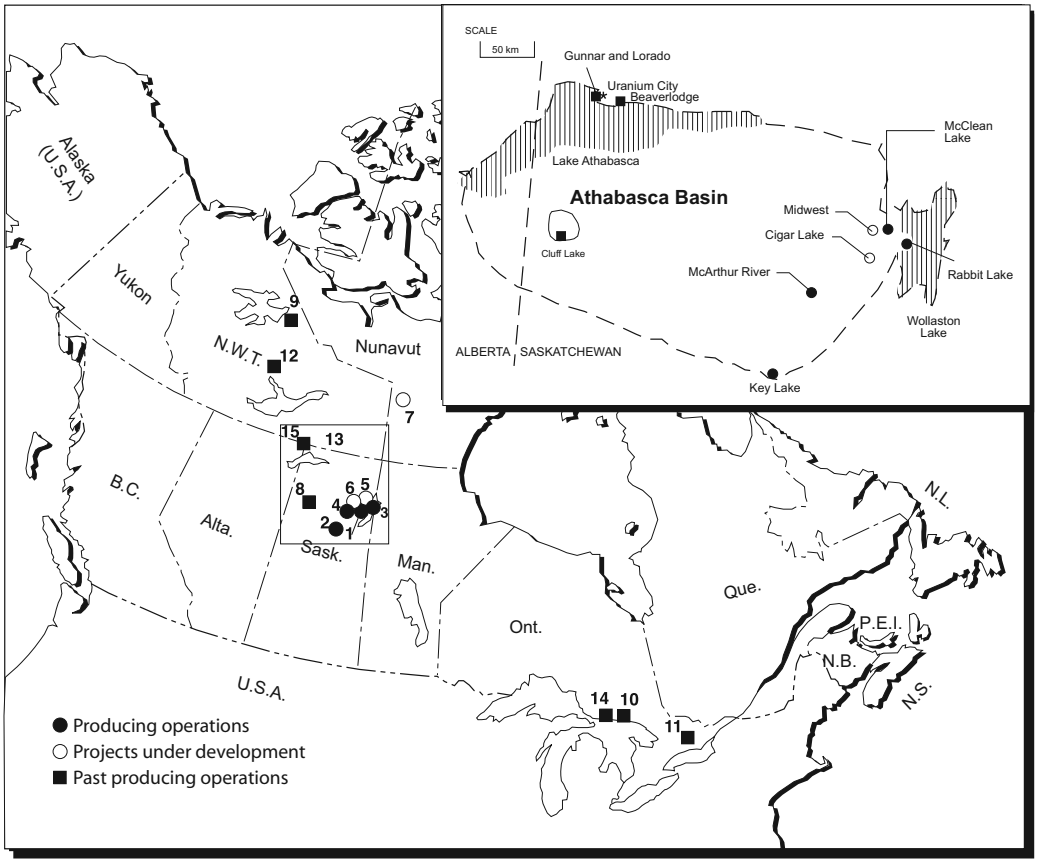
Additional Production Possibilities

Two uranium mining projects in Saskatchewan could enter into production within a few years, extending the lives of existing production centres. Cigar Lake ore will provide feed for the McClean Lake and Rabbit Lake mills, and Midwest ore will provide additional feed for the McClean Lake mill. In addition, there are several exploration projects in the Athabasca Basin which have identified significant high-grade uranium mineralization that may develop into proposals for new mines.

The environmental assessment for the Midwest project began on March 2, 2006. The Midwest project is a joint venture between AREVA (69.16%), Denison Mines Inc. (25.17%), and OURD (Canada) Co. Ltd. (5.67%). The proposal is to mine the Midwest deposit (16 700 tU averaging 4.4% U) by open pit and to transport the ore to McClean Lake for milling. In 2008, AREVA announced a decision to postpone development of the project due to low uranium prices. AREVA will continue with the environmental assessment process. If the project receives regulatory approval and the economics of the project improve, it would take two years to develop the mine and a further two years to mine the ore. Milling of the Midwest ore is expected to take from five to seven years.

Cigar Lake, with identified resources of 88 200 tU at an average grade of approximately 16% U, is the world's second-largest high-grade uranium deposit. The mine is a Cameco (50.025%), AREVA (37.1%), Idemitsu (7.875%), and TEPCO (5%) joint venture operated by Cameco. When completed, the mine is expected to have a full annual production capacity of 6900 tU. About half of the first phase of Cigar Lake ore will be shipped as a uranium-rich solution from the McClean Lake mill to the Rabbit Lake mill for final processing.

Figure 2
Uranium Mining in Canada, 2008



Numbers refer to locations on map above.

Producing Operations

1. Rabbit Lake
2. Key Lake
3. McClean Lake
4. McArthur River

Projects Under Development

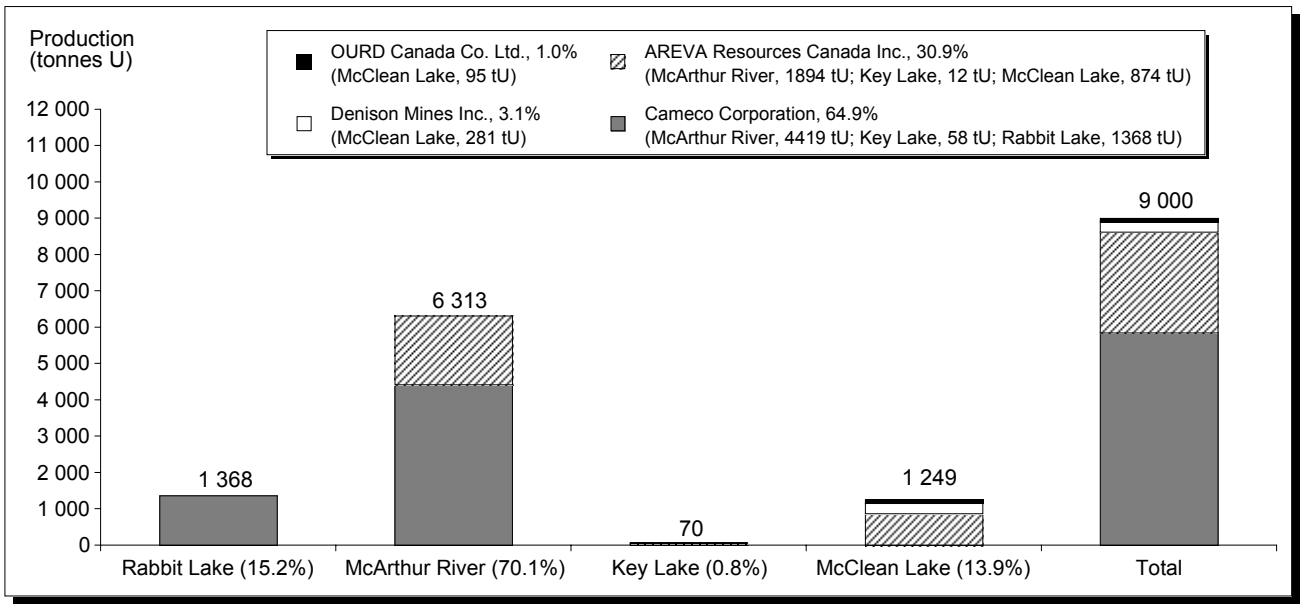
5. Midwest
6. Cigar Lake
7. Kiggavik

Past Producing Operations

8. Cluff Lake
9. Port Radium
10. Agnew Lake
11. Madawaska et al (Bancroft)
12. Rayrock (Marian River)
13. Beaverlodge et al
14. Quirke/Panel/Denison and Stanleigh et al (Elliot Lake)
15. Gunnar and Lorado et al

Source: Uranium and Radioactive Waste Division, Natural Resources Canada.

Figure 3
Canadian Uranium Production and Ownership, 2008



Source: Uranium and Radioactive Waste Division, Natural Resources Canada.

Construction of the Cigar Lake mine began on January 1, 2005, with completion originally expected in 2007. During October 2006, construction was halted due to a major inflow of groundwater that could not be controlled and the mine became flooded. Remediation of the mine is progressing slowly. Cameco conducted work to seal off the breach; however, when de-watering the mine in 2008, a second inflow of groundwater occurred and operations were halted. Cameco is conducting investigations into the cause of the latest inflow before continuing with remediation. Production from the mine is not expected until 2012 at the earliest.

There is also the possibility of mines being developed outside of Saskatchewan in the near future. AREVA is proposing to develop the Kiggavik and Sissons deposits in Nunavut, which contain an estimated 57 000 tU at an average grade of 0.2% U. The project is currently undergoing an environmental assessment and a feasibility study. In Quebec, Strateco Resources Inc. has applied for a licence to conduct underground exploration at the Matoush deposit. The Matoush deposit has identified resources of 6500 tU with an average grade of 0.42% U. In Newfoundland and Labrador, Aurora Energy Resources Inc. is proposing to develop the Michelin and Jacques Lake deposits and is currently consulting with the community to gain support for the project.

Decommissioning Activities

Elliot Lake was the major uranium mining centre in Canada for over 40 years. Since the last mining facility closed in 1996, uranium mining companies have committed well over $75 million to decommission all mines, mills, and waste management areas. Water treatment and minor engineering works continued to be the main activities at the closed Elliot Lake area uranium mine and mill sites in 2008. In October 2008, the State of Environment (SOE) report on the Serpent River Watershed was released. Water quality within the Serpent River Watershed has improved since the closure and decommissioning of the mines and currently meets Ontario Drinking Water Standards.

The Cluff Lake mine, located in the western Athabasca Basin of Saskatchewan, ceased mining and milling operations in May 2002. A two-year decommissioning program was initiated in 2004 following a five-year comprehensive study environmental assessment. Decommissioning was essentially completed by 2006 and AREVA continues to work on site restoration activities such as the planting of tree seedlings. A follow-up monitoring program is in place to confirm that the objectives of the decommissioning plan are met.

On April 2, 2007, the Government of Canada and the Government of Saskatchewan announced funding for the first phase of the clean-up of closed uranium mines in northern Saskatchewan (principally the Gunnar and Lorado mines). The total cost of the clean-up, which the governments of Canada and Saskatchewan will share, will be $24.6 million. Although these mines were operated by the private sector from the 1950s until the early 1960s, the companies no longer exist. When the sites were closed, there was no regulatory framework in place to appropriately contain and

treat the waste, which has led to environmental impacts on local soils and lakes. The project is now undergoing an environmental assessment.

Other Developments Affecting Canada's Uranium Industry

On July 19, 2007, uranium hexafluoride (UF_6) production was halted at Cameco's Port Hope conversion facility after the discovery of sub-surface uranium contamination. Operations restarted in September 2008 following investigation and remediation work, but were halted again in December due to a shortage of hydrofluoric acid on world markets. A contract with a supplier of hydrofluoric acid was recently signed that will allow the conversion facility to resume production in the third quarter of 2009.

Canada has 22 CANDU reactors operated by public utilities and private companies in Ontario (20), Quebec (1), and New Brunswick (1). Of these 22 reactors, 17 were in full commercial operation in 2008 generating, on average, about 15% of Canada's total electricity production. Of the five reactors that were not operating, two are shut down and three are being refurbished.

Several new nuclear build projects are being considered by public and private companies in Canada. The actual number of new reactor units to be built hinges largely on refurbishment plans for the existing units. In Ontario, both Ontario Power Generation (OPG) and Bruce Power submitted formal applications to the CNSC for new reactor construction at their Darlington and Bruce sites, respectively.

In June 2008, the Government of Ontario announced it had selected OPG's Darlington site for new reactor construction. Although Bruce Power's proposal was not selected by the Ontario government, it still intends to build new reactors at the site of its existing facilities on Lake Huron. Bruce Power is also examining the possibility of building a nuclear power plant in the Nanticoke area of Ontario.

New nuclear build projects are also being proposed in other provinces. Bruce Power Alberta is expected to resubmit to the CNSC its application to build nuclear power reactors in Alberta, and the New Brunswick government is examining the feasibility of building a second reactor in that province. The governments of Alberta and Saskatchewan have each established public panels to examine the potential use of nuclear power to meet their future electricity requirements.

EXPLORATION

Attracted by higher uranium prices, the number of companies with major exploration programs in Canada has increased dramatically over the last few years. Although major companies such as Cameco and AREVA account for the majority of exploration expenditures, more than 200 junior exploration companies are now active in uranium exploration.

During 2007 and 2008, exploration efforts continued to focus on areas favourable for the occurrence of deposits associated with Proterozoic unconformities in the Athabasca Basin of Saskatchewan, and to a lesser extent on similar geologic settings in the Thelon and Hornby Bay basins of Nunavut and the Northwest Territories. Uranium exploration also remained very active in the Otish Mountains of Quebec where Strateco Resources Inc. has applied for a licence to conduct underground exploration on the Matoush deposit. Exploration activity in the Central Mineral Belt of Newfoundland and Labrador, where Aurora Energy Resources Inc. is proposing to develop the Michelin and Jacques Lake deposits, was reduced significantly after April 2008 when the Nunatsiavut government imposed a three-year moratorium prohibiting uranium mining on Labrador Inuit lands. The significant drop in the uranium spot price in the second half of 2007 triggered a decrease in exploration activity in other areas of Canada.

Surface drilling, geophysical surveys, and geochemical surveys continued to be the main tools used to identify new uranium occurrences, define extensions of known mineralized zones, and reassess deposits that were last examined in the 1970s and 1980s.

The recent increased exploration activity has led to new uranium discoveries in the Athabasca Basin. Notable high-grade uranium mineralization discoveries include Centennial (UEM Inc.), Shea Creek (AREVA Resources Canada Inc.), Wheeler River (Denison Mines Inc.), Midwest A (AREVA Resources Canada Inc.) and Roughrider (Hathor Exploration Ltd.).

Domestic uranium exploration expenditures were $378 million in 2008, down 8.5% from the peak in exploration expenditures of $413 million that occurred in 2007. Uranium exploration and development drilling totaled 821 300 m in 2008, compared to the record 853 200 m that was reported in 2007. Over 60% of the combined exploration and development drilling in 2007 took place in Saskatchewan.

RESOURCES

Natural Resources Canada's (NRCan) annual assessment of domestic uranium supply capability provides a compilation of Canada's "known" uranium resources based on the results of an evaluation of company data. Uranium supply from Canada in the next decade will come from known resources, estimates of which are divided into three major categories (measured, indicated, and inferred) that reflect different levels of confidence in the reported quantities. Most of these resources are associated with deposits identified in Figure 2.

Recent NRCan assessments of Canada's uranium resources have been restricted to those recoverable from mineable ore at prices of $100/kgU or less. Table 6 shows the breakdown of the latest resource estimates compared with those of the previous two years. As of January 1, 2009, total recoverable known uranium resources were estimated at 485 600 tU, compared with 484 400 tU as of January 1, 2008, and 423 000 tU as of January 1, 2007. This increase is primarily due to junior exploration companies reporting National Instrument 43-101 compliant resource estimates for previously discovered uranium deposits.

SUPPLY CAPABILITY

Canada's uranium supply capability declined as production at Cluff Lake ended in 2002. Supply capability will increase with the opening of new mines, notably Cigar Lake and Midwest, and with approval of the proposal to expand McArthur River production by almost 20%. Timely licensing approvals and continued positive market conditions will be required to allow Canada's production capability to expand to its full potential of over 15 000 tU annually.

Developments in the international uranium market, the rate at which projects receive environmental approvals, and uncertainty regarding the costs associated with the development of the planned new projects preclude projecting future production capability levels with much certainty. Table 7 ranks Canada first among the world's major producers based on actual uranium production from 2002 through 2008. Figure 4 illustrates Canada's share of world output in 2008 compared with other major producing countries.

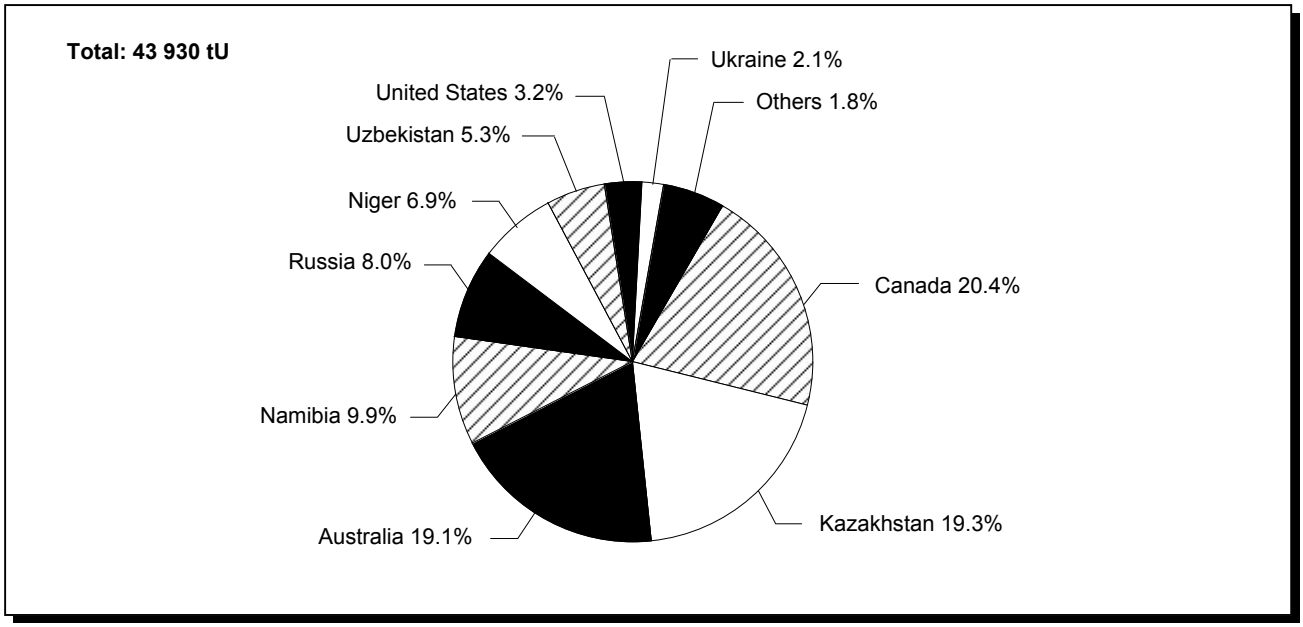
URANIUM MARKET

Overview

During 2008, the uranium spot market price declined from US$78/lb U_3O_8 in January to US$55/lb U_3O_8 in December. Long-term contract prices for uranium decreased from US$95/lb U_3O_8 to US$70/lb U_3O_8 during the same period. World production increased from 41 280 tU in 2007 to 43 930 tU in 2008, primarily due to increased output from Kazakhstan and Namibia. World production is expected to increase in 2009.

The uranium supply is expected to continue to be tight over the next few years as production from the Cigar Lake mine, which was to start in 2007 and provide a significant portion of world uranium output, has been delayed until at least 2012 due to flooding of the mine in October 2006. However, production in other major uranium-producing countries is expected to increase significantly over the next few years. In Australia, a major change in government policy supports the development of additional uranium mines. This, along with the planned tripling of output for the Olympic Dam mine and the extension of the operating life

Figure 4
World Uranium Production, 2008



Source: World Nuclear Association.

of the Ranger mine, could lead to a significant increase in Australian uranium production. Production from Kazakhstan continued to increase, rising 28% from 6640 tU in 2007 to 8520 tU in 2008. Kazakhstan has announced intentions to increase production by a further 40% in 2009 and is likely to surpass Canada as the world's largest uranium producer. In Namibia, production is also expected to increase with the expansion of the Rossing mine and the development of new mines.

The intensive uranium exploration activity is expected to lead to a number of new discoveries in Canada and elsewhere over the next few years. The long planning and development cycle for both new mines and new nuclear power plants may provide sufficient time for production to catch up with current levels of demand for uranium.

Uranium Prices

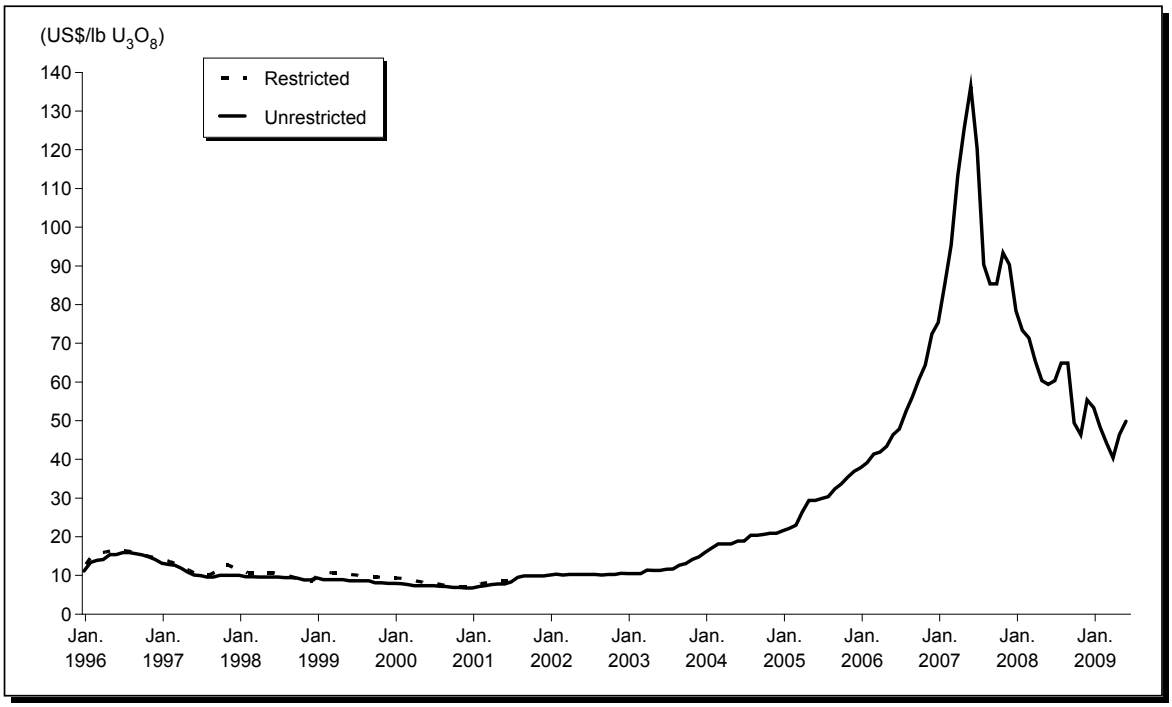
In 2008, uranium spot market prices, as reported by the Ux[2] Consulting Company, continued the decline that began in the second half of 2007 (Figure 5). Spot market prices, which were US$78/lb U_3O_8 in January, fell to US$55/lb by the end of the year. Prices continued to decline in early 2009, falling to US$40/lb U_3O_8 by April before rebounding to around US$50/lb in June. Most uranium is traded through fixed-price long-term contracts between the suppliers and utilities. During 2008, the average long-term contract price declined from US$95/lb U_3O_8 in January to US$70/lb in December, a decrease of about 26%.

[2] The Ux Consulting Company, LLC (UxC) was founded in March 1994 as an affiliate of The Uranium Exchange Company (Ux). UxC publishes The Ux Weekly and the UxC Market Outlook Reports on uranium, enrichment, and conversion.

Refining and Conversion

Cameco operates Canada's only uranium refining and conversion facilities, located at Blind River and Port Hope, Ontario, respectively. At the Blind River refinery, which is the world's largest, uranium mine concentrates from Canada and abroad are refined to uranium trioxide (UO_3), an intermediate product. The UO_3 is then trucked to the Port Hope facility, which has about one-quarter of the Western World's annual uranium hexafluoride (UF_6) conversion capacity and currently provides the only commercial supply of fuel-grade natural uranium dioxide (UO_2). UF_6 from the Port Hope facility is exported and enriched outside Canada for use in foreign light-water reactors while natural UO_2 is used to fabricate fuel bundles for CANDU reactors in Canada and abroad. About 80% of the UO_3 from Blind River is converted to UF_6, while the remaining

Figure 5
Trend in Uranium Spot Prices, 1996-2008



Source: TradeTech.

20% is converted to UO_2. Table 8 tabulates Canada's production of refined and converted uranium and notes the associated work force from 2004 to 2008 inclusive.

OUTLOOK

The prospect of a worldwide increase in the use of nuclear power indicates that future demand for Canadian uranium will increase. Inventories are low and world uranium production has not increased sufficiently to meet the prospects of increased demand. Significant quantities of Canadian uranium will be required to meet global demand well into the foreseeable future. With a large, low-cost uranium resource base and current output, Canada is well positioned to remain a leading uranium producer for several decades. Given the high potential for economically attractive uranium occurrences in Canada, the recent increase in uranium exploration will likely result in additions to the resource base. However, although there are significant quantities of uranium in the ground, bringing this material to the market is a challenging task that requires expertise, time, and capital. Continued success in bringing environmentally sustainable Canadian uranium mining operations on stream in a timely fashion will ensure that Canada remains a leading uranium producer well into the future.

Notes: (1) For definitions and valuation of mineral production, shipments and trade, please refer to Chapter 58. (2) Information in this review was current as of June 30, 2009. (3) This paper, and other information on developments in Canadian nuclear policy, can be accessed on the Internet at nuclear.nrcan.gc.ca. (4) This and other reviews, including previous editions, are also available on the Internet at www.nrcan-rncan.gc.ca/mms-smm/busi-indu/cmy-amc/com-eng.htm.

NOTE TO READERS

TABLE 1. URANIUM PRODUCTION AND ASSOCIATED WORK FORCE IN CANADA, 2005-08

Production Centre and Producer	Company Work Force (1) (Dec. 31)				Annual Output (2) (tU)			
	2005	2006	2007	2008	2005	2006	2007	2008
ATHABASCA BASIN, SASKATCHEWAN								
Key Lake JV (Cameco operator)	307	311	344	270	237	196	114	70
Rabbit Lake JV (Cameco, 100%)	197	231	266	317	2 316	1 972	1 544	1 368
McClean Lake JV (AREVA operator)	252	294	325	348	2 111	690	734	1 249
McArthur River JV (Cameco operator)	309	316	357	381	6 963	7 004	7 085	6 313
Cigar Lake JV (pre-production)	68	–	–	–	–	–	–	–
Total	1 133	1 152	1 294	1 316	11 628	9 862	9 476	9 000

Sources: Natural Resources Canada; company annual reports.
– Nil.
(1) Figures are for company payroll employees only; on-site contractors (mining, construction, services, etc.) are not included. (2) Primary output only. With the closure of Rio Algom Limited's Stanleigh operation at Elliot Lake in mid-1996, by-products from Cameco's refinery/conversion facilities are no longer processed in Canada.

TABLE 2. VALUE (1) OF URANIUM SHIPMENTS (2) BY PRODUCERS IN CANADA, 2003-08

	Unit	2003	2004	2005	2006	2007	2008
Total producer shipments	tU	9 939	11 548	12 597	9 781	9 098	8 702
Total value of shipments	$ millions	485	520	620	615	835	1 038

Source: Natural Resources Canada.
(p) Preliminary.
(1) Value of shipments is estimated from an average market price. (2) Shipments in tonnes of uranium (tU) contained in concentrate from ore-processing plants.

TABLE 3. OPERATIONAL CHARACTERISTICS OF EXISTING CANADIAN URANIUM PRODUCTION CENTRES, 2008

Operating Entity (Operator)/Location	Ore-Processing Plant (1)			
	Capacity	Recovery	Annual Throughput	
	Nameplate	Overall	Total Ore	Ore Grade
	(t/d)	(%)	(t)	(%)
McClean Lake JV (AREVA)/ at McClean Lake, Saskatchewan	500	95	160 829	0.81
Rabbit Lake (Cameco Corporation)/ at Rabbit Lake, Saskatchewan	2 000	97	190 044	0.74
Key Lake JV (Cameco Corporation)/ at Key Lake, Saskatchewan (2)	750	98	171 502	3.77

Sources: Corporate annual reports; Canadian Nuclear Safety Commission open files.
(1) Figures are rounded. (2) All McArthur River ore is processed at the Key Lake mill.

TABLE 4. CANADIAN URANIUM MINING PROJECTS PLANNED FOR PRODUCTION AS OF JUNE 30, 2009

Project, Province or Territory/Operator	Owners' Share	Deposit Type/ Discoverer and Discovery Date	Resources (Company Estimates as of January 1, 2008)	Ore Grade and Notes on Deposits	Mining Method, Milling Rate and Capacity	Project Particulars and Status	Location of Project/ Notes of Interest
	(%)						
Cigar Lake, Sask./ Cameco Corporation	Cameco (50.025), AREVA (37.100), Idemitsu (7.875), TEPCO (5)	Unconformity-related/ AREVA, 1981	Overall property 89 000 tU *mineable*	Overall property grade of 17% U; grades vary from 5% to 70% U; orebody at depth of 450 m	"Non-entry" underground; "jet-boring" mining method; milling at McClean Lake and Rabbit Lake; contributing 6900 tU/y at full production	$555 million project; test mining completed in 1992; EIS submitted in October 1995; final phase of construction initiated January 2005; mine flooded in October 2006	670 km N of Saskatoon; 500-m-deep shaft sunk; brine freezing of ground is required to mine the ore; flooding of mine has delayed production until 2012
Midwest, Sask./AREVA Resources Canada Inc.	AREVA (69.1), Denison Mines (25.2), OURD (5.7)	Unconformity-related/ Esso Minerals Canada, 1977 (interests of Bow Valley, Numac Oil & Gas, *et al* bought by partners)	Overall property 16 000 tU *mineable*	Overall property grade of 4.6% U; grades vary from 2% to 30% U; orebody at depth of 200 m	Open-pit; milling at McClean Lake; contributing 2300 tU/y	$80 million co-venture with McClean; currently undergoing environmental assessment	710 km N of Saskatoon; 185-m-deep test-mine shaft; pending regulatory approval and economic feasibility
Kiggavik-Sissons, Nunavut/ AREVA	AREVA (99), Daewoo Corporation (1)	Unconformity-related/ Urangesellschaft, 1977	Overall property 57 000 tU *mineable*	0.41% U average overall; Centre pit depth 100 m, Main pit 200 m	Open-pit mining and underground methods; mill feed at 1200 t/d; output rate of 1200 tU/y originally expected	Currently undergoing environmental assessment	75 km W of Baker Lake; AREVA to conduct feasibility study >11-year mine life with tributary ore included

Notes: Idemitsu Uranium Exploration Canada Ltd. is a wholly owned subsidiary of Idemitsu Kosan Co., Ltd. of Japan. TEPCO Resources Inc. is a subsidiary of Tokyo Electric Power Co., Inc. (TEPCO), Japan's largest nuclear power utility. Denison Mines Inc. is a wholly owned subsidiary of Dension Mines Corp. OURD (Canada) Co., Ltd. is a subsidiary of the Overseas Uranium Resources Development Corporation (OURD) of Japan. AREVA Resources Canada Inc .is a subsidiary of AREVA-NC Inc., which is wholly owned by the AREVA Group of France.

TABLE 5. URANIUM EXPLORATION ACTIVITY IN CANADA, 1990-2008

Year	Expenditures (1)	Drilling (2)	Million-Dollar Projects (3)
	($ millions)	(km)	(no.)
1990	45	66	6
1991	44	67	4
1992	46	79	4
1993	40	62	5
1994	36	67	8
1995	44	75	10
1996	39	79	8
1997	58	104	6
1998	60	95	6
1999	49	89	3
2000	46	77	3
2001	25	48	3
2002	35	78	7
2003	36	74	6
2004	44	119	8
2005	99	275	22
2006	213	472	22
2007	413	654	20
2008	378	672	. .

Source: Natural Resources Canada.
. . Not available.
(1) Direct exploration and drilling expenditures in current dollars; from the late 1980s, includes advanced underground exploration and deposit appraisal expenditures; from the mid-1990s, may also include care-and-maintenance costs associated with deposits awaiting production approvals. (2) Exploration and surface development drilling; excludes development drilling on producing properties. (3) Number of projects where direct exploration and drilling expenditures exceeded $1 million in current dollars.

TABLE 6. ESTIMATES OF CANADA'S URANIUM RESOURCES RECOVERABLE FROM MINEABLE ORE, (1) JANUARY 1, 2007, JANUARY 1, 2008, AND JANUARY 1, 2009

Price Ranges Within Which Mineable Ore is Assessed (2)	Measured			Indicated			Inferred		
	1/1/07	1/1/08	1/1/09	1/1/07	1/1/08	1/1/09	1/1/07	1/1/08	1/1/09
	(000 tU)								
Up to $50/kgU	251	244	221	19	21	46	82	83	100
$50 to $100/kgU	–	–	–	59	104	60	12	30	10
Total	251	244	221	78	125	116	94	113	110

Source: Natural Resources Canada.
– Nil.
(1) Actual or expected losses in mining recovery and ore processing have been accounted for; these factors were individually applied to resources tributary to existing or prospective production centres. In underground operations, mineable ore is generally 75-85% of the ore-in-place; higher mining recoveries are achievable in open-pit operations. Canada's weighted average ore processing recovery for existing conventional operations exceeded 97% over the survey period.
(2) The Canadian dollar figures reflect the price of a quantity of uranium concentrate containing 1 kg of elemental uranium. The prices were used in determining the cut-off grade at each deposit assessed, taking into account the mining method used and the processing losses expected. The price of $100/kgU was used by Natural Resources Canada to illustrate those resources that were of economic interest to Canada during the survey period.
Note: $1/lb U_3O_8 = $2.6/kgU.

TABLE 7. PRODUCTION OF URANIUM IN CONCENTRATES BY SELECTED MAJOR PRODUCING COUNTRIES, 2002-08

	2002	2003	2004	2005	2006	2007	2008
				(tonnes U)			
Canada	11 610	10 450	11 600	11 630	9 860	9 480	9 000
Australia	6 850	7 570	8 980	9 520	7 590	8 610	8 430
China	730	730	730	750	750	710	770
Kazakhstan	2 820	3 330	3 720	4 360	5 280	6 640	8 520
Namibia	2 330	2 040	3 040	3 150	3 070	2 880	4 370
Niger	3 080	3 160	3 260	3 090	3 440	3 150	3 030
Russia	2 850	3 070	3 200	3 430	3 190	3 410	3 520
South Africa	820	760	750	670	530	540	660
Uzbekistan	1 860	1 600	2 090	2 300	2 260	2 320	2 340
United States	900	770	880	1040	1 800	1 650	1 430
Other (1)	2 170	2 000	2 000	1 750	1 820	1 890	1 860
Total (2)	36 040	35 490	40 260	41 700	39 600	41 280	43 930

Sources: *Uranium: Resources, Production and Demand*, a biennial report published jointly by the Nuclear Energy Agency of the OECD and the International Atomic Energy Agency; miscellaneous corporate, national, and international reports.
(1) Includes Argentina, Brazil, Bulgaria, the Czech Republic, Germany, Hungary, India, Pakistan, Portugal, Romania, Spain, and Ukraine. (2) Totals are of the listed figures only and represent global production.
Note: Country figures are rounded to the nearest 10 tU.

TABLE 8. URANIUM PROCESSING PRODUCTION AND ASSOCIATED WORK FORCE IN CANADA, 2004-08

Process and Location (Nameplate Capacity)	Production					Site Work Force				
	2004	2005	2006	2007	2008	2004	2005	2006	2007	2008
	(tonnes U)					(number)				
Refining at Blind River (18 000 tU as UO_3)	10 500	15 100	17 200	9 500	10 600	98	125	140	150	150
Conversion at Port Hope (12 500 tU as UF_6 and 2800 tU as UO_2)	9 500	11 400	12 500	7 600	n.a.	320	370	360	360	360

Source: Cameco Corporation.
n.a. Not applicable.