

Uranium

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OVERVIEW

In 2004, Canada retained its position as world leader in uranium production with output totalling 11 597 tU (tonnes of uranium metal) valued at over \$500 million. As Figure 1 shows, the world's two largest uranium-producing companies have operations in Canada. As of January 1, 2005, Canada's total known uranium resources amounted to some 444 000 tU, compared to 432 000 tU as of January 1, 2004. This upward adjustment of some 3% from the 2004 total is the result of recent discoveries and deposit appraisal exceeding mining depletion.

In July 2004, the Canadian Nuclear Safety Commission (CNSC) issued a licence to Cameco for the construction of specific surface facilities at the site of the proposed Cigar Lake uranium mine. On December 20, 2004, a licence to construct the remaining facilities was granted. On December 21, 2004, Cameco announced that the Cigar Lake joint venture had decided to proceed immediately with construction at the Cigar Lake project. It is anticipated that production will begin in 2007 with a ramp-up period of up to three years before the mine reaches full annual production of some 6900 tU.

Market conditions for uranium producers continued to improve in 2004, and the spot market price rose 43%, compared with a 42% increase in 2003. Supply constrictions, particularly for conversion services, continued to plague the market. The issuance of the construction licence for Cigar Lake will help alleviate this situation, but a good deal of additional production capacity will be required before the end of this decade. The most noteworthy development on the demand side of the market was the emergence of China as a force in world uranium markets as it turned to outside suppliers to meet its longer-term uranium needs for its burgeoning nuclear power program.

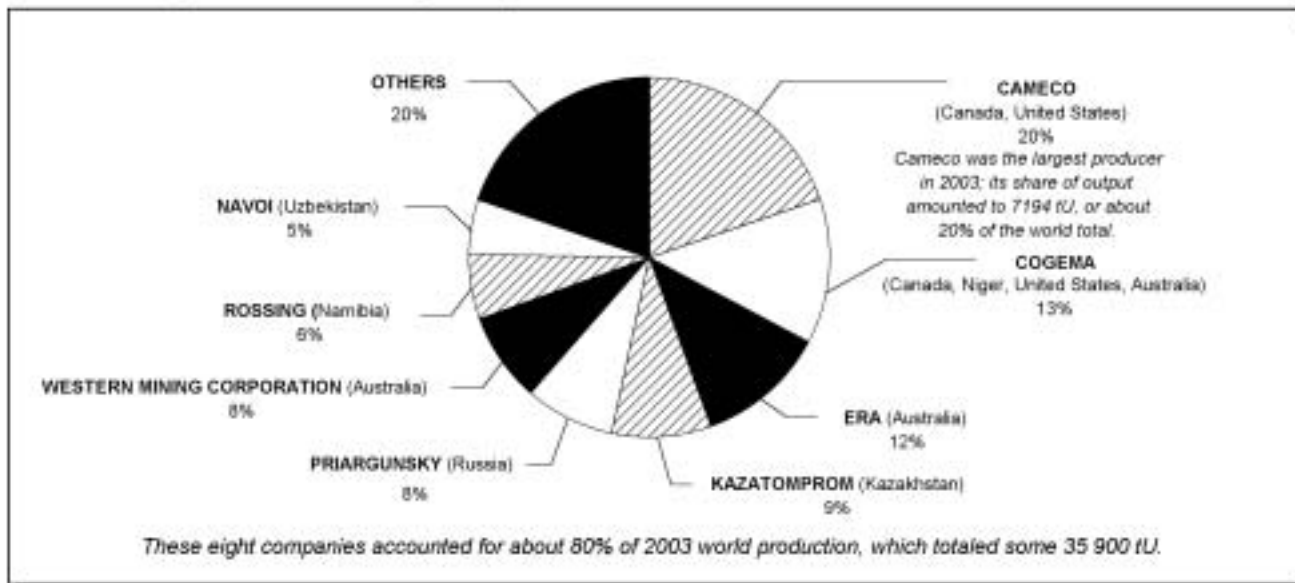
The increase in uranium spot prices was sufficient to maintain the already frantic pace of exploration activity across the country and around the world. This will likely lead to the discovery of new ore deposits and higher levels of production in the long run. However, the development times for new mines are usually in excess of 10 years, suggesting that the market will continue to be under pressure for some time.

DOMESTIC PRODUCTION AND DEVELOPMENTS

In 2003, the most recent year with complete data available, production amounted to a total of 10 455 tU, a decrease of about 10% from the 2002 total, mainly due to the three-month closure of the McArthur River mine caused by water inflow. Direct employment in Canada's uranium mining industry remained steady at slightly less than 1000 in 2003 (Table 1). Shipments from mining centres declined in 2003, compared to 2002, as did their total value (Table 2). These data primarily reflect the successful transition that uranium producers are continuing to make to new high-grade production centres as resources near depletion at the older operations. Despite the slight decrease in 2003 production, however, 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 2003, and 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. One property that was considered for development, Kiggavik in Nunavut (Figure 2), is not likely to proceed in the foreseeable future due to uncertain regulatory requirements. Uranium production in Canada in 2003 (Figure 3) was once again dominated by Cameco Corporation and COGEMA Resources Inc. (CRI).

On June 4, 2004, the Federal Court of Appeal unanimously overturned a September 2002 Federal Court of Canada decision to quash a 1999 McClean Lake operating licence on the grounds that an environmental assessment under the *Canadian Environmental Assessment Act* (CEAA) had not been conducted prior to issuing the

Figure 1
World's Top Uranium Mining Companies in 2003



Source: World Nuclear Association Pocket Guide.

Note: Ranking reflects equity interest in production facilities, not market share.

licence. An environmental assessment of the McClean Lake project was conducted pursuant to the *Environmental Assessment and Review Process Guidelines Order* prior to the date that the CEAA was brought into force. On March 24, 2005, the Supreme Court of Canada dismissed with costs an application to appeal the Federal Court of Appeal decision. The end of this legal challenge to the McClean Lake operating licence significantly reduces uncertainties surrounding environmental assessment requirements at this and other uranium mines and mills in Canada.

On December 30, 2004, the ownership of the Midwest project was changed when the joint-venture partners acquired the 20.7% share previously held by Redstone Resources Inc. After the acquisition, CRI's share increased to 69.16% (from 54.84%), Denison Mines Limited's share increased to 25.17% (from 19.96%), and OURD Canada Co. Ltd.'s share increased to 5.67% (from 4.5%). Although firm development plans for Midwest have not been announced, mining of the deposit (13 460 tU with an average grade of 3.7%) could begin as early as 2010, pending receipt of regulatory approvals.

On March 16, 2005, Cameco announced that it had signed a toll conversion agreement with British Nuclear Fuels plc (BNFL Inc.) to acquire uranium conversion services from BNFL's Springfield conversion plant in Lancashire, United Kingdom. Under the 10-year agreement, BNFL will annually convert a base quantity of 5000 tU as UO_3 to

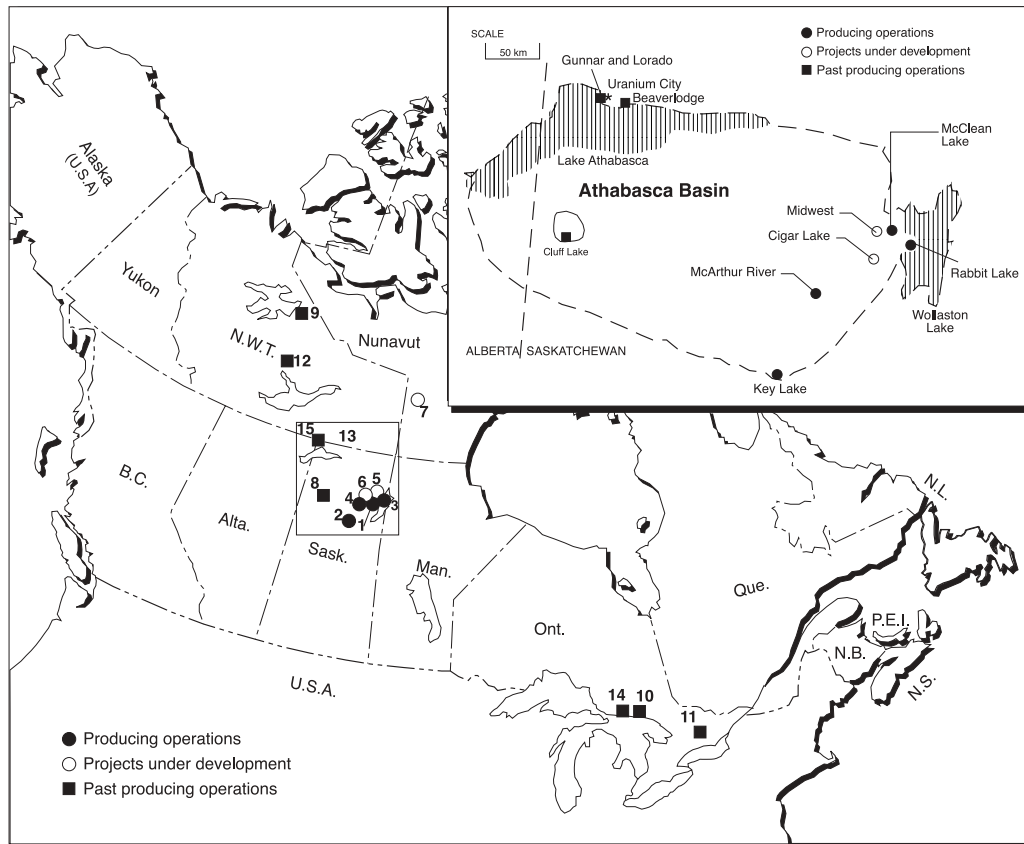
UF_6 delivered from Cameco's Blind River refinery beginning in mid-2006, thus extending the life of the Springfield facility that had been slated for closure in 2006.

The Cluff Lake mining facility, now being decommissioned, and CRI's uranium exploration program in Saskatchewan achieved ISO 14001 environmental management system certification in 2004. The McArthur River mine and the Key Lake mill, the McClean Lake mine and mill, and the Blind River refinery and Port Hope conversion plant have already achieved this internationally recognized standard, which outlines the key requirements that companies should comply with in order to operate in an environmentally responsible manner. Thus, the front end of the nuclear fuel cycle in Canada meets rigorous international standards.

Elliot Lake, Ontario

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. These companies continue to expend some \$2 million each year for treatment and monitoring activities. Results of the first round of a comprehensive basin-wide environmental monitoring program in 1999 provided data demonstrating that the decommissioning effort has thus far been successful. Although near-field impacts of mining were detectable, mainly in the

Figure 2
Uranium Mining in Canada, 2004



Numbers refer to locations on map above.

PRODUCING OPERATIONS

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

PROJECTS UNDER DEVELOPMENT

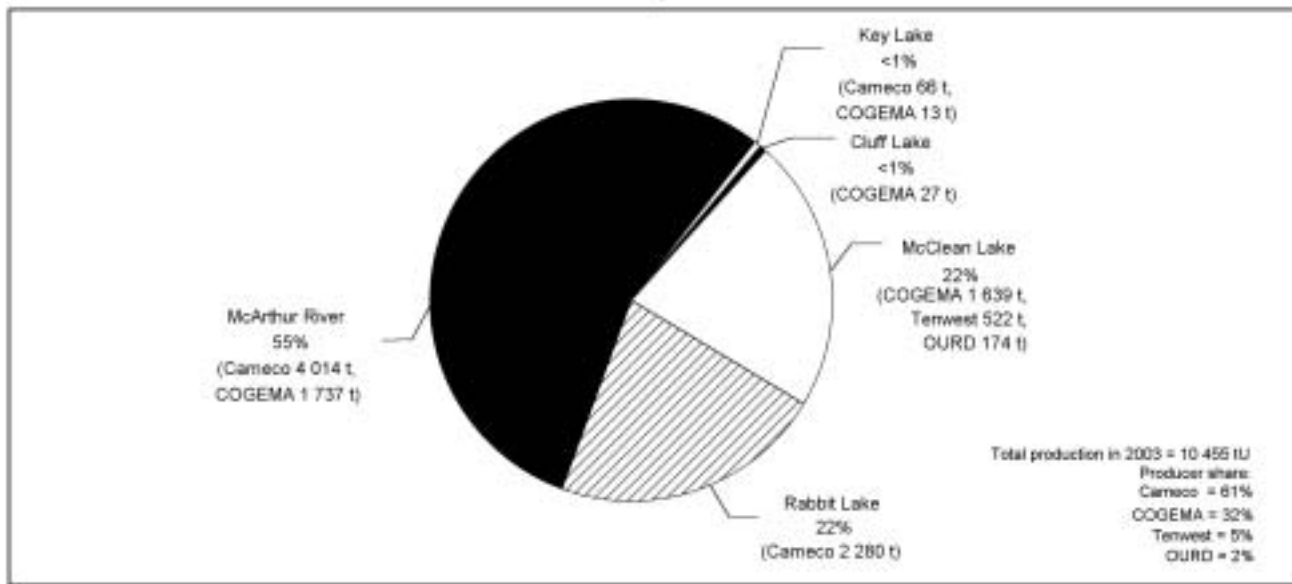
5. Midwest
6. Cigar Lake
7. Kiggavik

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, 2003



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

Cameco: Cameco Corporation; COGEMA: COGEMA Resources Inc.; OURD: OURD (Canada) Co., Ltd.; Tenwest: Tenwest Uranium Ltd.

Notes: Production reflects equity interest in production facilities. Tenwest is a wholly owned subsidiary of Denison Mines Limited.

form of above-background levels of salts, total dissolved solids and some metals, the local fish, benthic invertebrates and wildlife displayed no adverse effects. Data collection for the second round of this environmental monitoring program was completed in 2004 and a report summarizing the findings is expected to be released in 2005.

Athabasca Basin, Saskatchewan

McArthur River

Cameco operates the McArthur River mine, a Cameco (70%)/CRI (30%) joint venture. Production at this, the world's largest uranium-producing mine, reached 5751 tU and 7035 tU in 2003 and 2004, respectively. After raise bore mining of the high-grade ore behind a freeze curtain created to control groundwater inflow, a high-grade ore slurry is produced in underground crushing, grinding and mixing circuits. The slurry is then pumped to automated stations on the surface and loaded into specially designed containers that are trucked 80 km to the Key Lake mill where all McArthur River ore is processed. The comparatively low production in 2003 is a result of groundwater inflow through a breach in a development drift that led to a three-month closure of the mine.

In 2004, the federal nuclear regulator, the Canadian Nuclear Safety Commission (CNSC), conducted an evalu-

ation of the radiation exposure estimates made during the 2003 water inflow event at McArthur River and concluded that it is unlikely that there will be any negative effects on the health of workers as a result of the doses received during the water inflow event. The CNSC also determined that the incident did not have any significant impact on the treatment facilities or the environment. The Canadian Nuclear Workers Council also concluded that there were no adverse consequences to miners from radiation exposure during the inflow incident.

Key Lake

The Key Lake mill is a Cameco (83%) and CRI (17%) joint venture operated by Cameco. Although mining was completed in 1997, the mill maintained its standing as the world's largest uranium production centre by producing 5830 tU and 7200 tU in 2003 and 2004, respectively. These totals represent a blend of high-grade McArthur River ore slurry and stockpiled, mineralized Key Lake waste rock that is mixed to produce a mill feed grade of about 3.4% U.

A proposal to increase annual production by 18% (from 7200 tU to 8500 tU) at McArthur River and Key Lake is currently the subject of a screening-level environmental assessment initiated in January 2003. A proposal to recycle uranium by-products from the Blind River refinery and the Port Hope conversion plant in the Key Lake mill is

also the subject of an ongoing screening-level environmental assessment initiated in December 2002. Following the closure of the last uranium mill in Elliot Lake, Ontario, recyclable products from the Blind River and Port Hope facilities in Ontario have been processed at the White Mesa mill in Utah.

McClellan Lake

The McClellan Lake production centre, operated by CRI, is a joint venture between CRI (70%), Denison Mines Limited (22.5%), and OURD (Canada) Co. Ltd., a subsidiary of Overseas Uranium Resources Development Corporation of Japan (7.5%). Production in 2004 amounted to 2310 tU, down slightly from the 2318 tU produced in 2003. On May 19, 2005, the CNSC renewed the facility's operating licence for four years with amendments that allow modification of the mill to receive and process ore from the Cigar Lake mine. The mill is currently fed by stockpiled Sue C ore and regulatory approval is being sought to begin open-pit mining of the on-site Sue A and Sue E deposits. Subject to the receipt of regulatory approvals, surface preparation for mining could begin as early as July 2005 at Sue A and in late 2005 at Sue E. Approval to test mine small deposits on the McClellan Lake property using surface mining techniques was also granted.

Rabbit Lake

The Rabbit Lake production centre, owned and operated by Cameco, produced 2087 tU in 2004, compared to 2280 tU in 2003. This slight decline in 2004 production is the result of difficult mining conditions encountered that reduced mill feed. Surface and underground exploration led to the delineation of 2300 tU of probable reserves in 2004 that are expected to extend the life of the Rabbit Lake facility to 2007. Underground and surface exploration drilling at the Eagle Point mine is continuing in 2005. The underground Eagle Point mine is, at present, the only operating mine at Rabbit Lake. Dams built to facilitate open-pit mining of the Collins Bay A and D zones are expected to be breached in 2005, connecting these areas once again with Wollaston Lake. Vegetation will then be planted on the re-established shoreline to restore the natural appearance and habitat.

Cluff Lake

Mining and milling were terminated at Cluff Lake in May 2002 and a two-year decommissioning program was initiated in 2004 following a five-year comprehensive study environmental assessment. By the end of the summer of 2005, a significant amount of the work is expected to be completed, including back filling the Claude and DJN pits, dismantling the mill, covering and grading the tailings management area, contouring the waste rock pile, and

backfilling the liquids pond. Later in 2005, the DJN and DJX pits are expected to be flooded with clean water from Cluff Lake, forming one pool from the two separate pits. After flooding, it is anticipated that the water treatment plant will be shut down, mill demolition will be finalized, and the site will enter a monitoring phase.

Cigar Lake

The Cigar Lake mine is a Cameco (50.025%), CRI (37.1%), Idemitsu (7.875%) and TEPCO (5%) joint venture operated by Cameco. High-tech mining methods specifically adapted to the local geology have been developed through on-site test mining programs. In December 2004, shortly after receiving a licence from the CNSC to complete mine construction, the Cigar Lake joint-venture partners announced their decision to proceed immediately to finalize construction of the Cigar Lake mine. Production is currently anticipated to begin in 2007 with a three-year period expected to be required to ramp up to full annual production capacity of some 6900 tU.

Additional Production Possibilities

Beyond the existing and committed centres of uranium production mentioned above, there are two projects that could be brought on stream in the future, subject to market conditions and the receipt of regulatory approvals. Table 4 updates, as of June 30, 2005, recent developments at the mining projects that could contribute to Canada's future uranium production capability.

Other Developments Affecting Canada's Uranium Industry

In July 2004, the Ontario government endorsed a plan submitted by Ontario Power Generation Inc. to proceed with the refurbishment of Unit 1 at the Pickering A station. The return to service of this 515-MW reactor by September 2005 is expected to cost approximately \$900 million. The Ontario government has also indicated that the decision to proceed with the refurbishment of units 2 and 3 at the same station will depend on a post-review of the restart of Unit 1.

In September 2004, the Government of Ontario initiated discussions with Bruce Power to restart the two remaining laid-up units at the Bruce A site. On March 21, 2005, the Government of Ontario and Bruce Power announced that a tentative agreement had been reached to restart the two units. Details of the tentative agreement, which has been approved in principle by the boards of directors of the major partners of Bruce Power, are now being considered by the Ontario government. Bruce Power is also examining the possibility of refurbishing the four Bruce B reactors now operating and the feasibility of building one or more new reactors on the site.

EXPLORATION

Natural Resources Canada (NRCan) completed its annual assessment of Canada's uranium supply capabilities and reported² the results in October 2004. Uranium exploration activity remains concentrated in areas favourable for the occurrence of deposits associated with Proterozoic unconformities, notably in the Athabasca Basin of Saskatchewan and the Thelon Basin of the Northwest Territories and Nunavut. In 2003, overall uranium exploration expenditures amounted to \$36 million, compared to \$35 million reported in 2002, while uranium exploration and surface development drilling totalled over 74 000 m, down slightly from the 78 000 m reported in 2002.

Significant recent uranium spot price increases have created a surge in exploration activity that post-dates the 2003 exploration expenditures discussed above, principally in the Athabasca Basin, Nunavut and the Northwest Territories, but also in Quebec, Newfoundland and Labrador, Ontario, Manitoba, Alberta, and the Yukon. The strong market has also stimulated interest in re-examining deposits discovered in the late 1970s in British Columbia.

In 2003, slightly less than half of the overall exploration expenditures can be attributed to advanced underground exploration, deposit-appraisal activities and care-and-maintenance expenditures associated with those Saskatchewan projects awaiting production approvals. The Saskatchewan government estimates that "grass-roots" uranium exploration in the province amounted to \$13 million in 2003, down slightly from the 2002 total of \$15 million. Table 5 summarizes uranium exploration activity in Canada from 1990 to 2003.

In recent years, the number of companies with major exploration programs in Canada has remained steady, although price increases have stimulated a great deal of activity by a variety of junior exploration companies. The top five operators,³ accounting for a major portion of the \$36 million expended in 2003, were Cameco Corporation, CRI, UEX Corporation, SOQUEM INC. and Uranor Inc. Expenditures by AREVA Group's subsidiary COGEMA Resources Inc. (CRI) include those of Urangesellschaft Canada Limited.

RESOURCES

NRCan's 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 year. As of January 1, 2004, total recoverable known uranium resources were estimated at 432 000 tU, compared with 439 000 tU as of January 1, 2003. This downward adjustment of some 2% is the result of depletion through mining and ongoing resource assessment.

SUPPLY CAPABILITY

At the end of 2002, Canada's uranium supply capability declined as production at Cluff Lake ended. A continued smooth transition to other new mines, notably Cigar Lake, as well as approval of the proposal to expand McArthur River production by almost 20%, combined with timely licensing approvals and improved market conditions, will be required to allow Canada's production capability to expand to its full potential of over 15 000 tU annually.

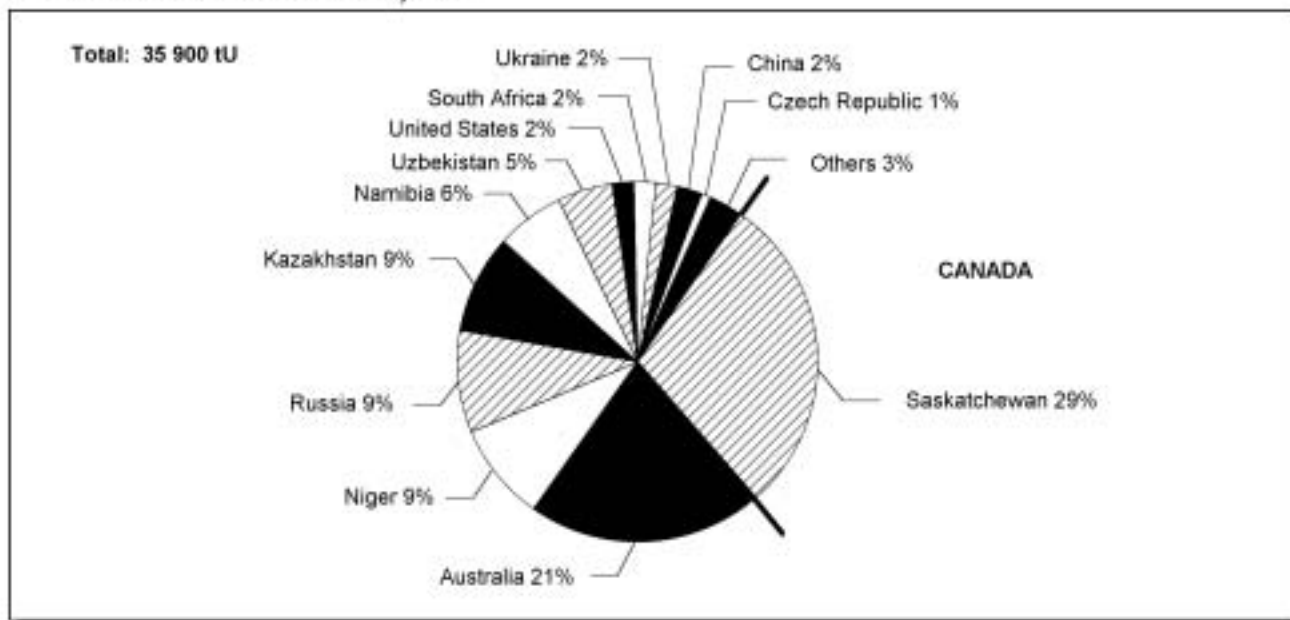
Developments in the international uranium market, the rate at which projects receive environmental approvals, and uncertainty regarding the costs associated with the development of the planned new projects preclude projecting future production capability levels with much certainty. Table 7 ranks Canada among the world's major producers, showing actual uranium production from 1999 through 2003. Figure 4 illustrates Canada's share of world output in 2003 compared with other major producing countries.

GOVERNMENT INITIATIVES

On June 17, 2005, the Government of Canada announced that it will cost-share with the Government of Saskatchewan the remediation of certain legacy uranium mining facilities in northern Saskatchewan (principally Gunnar and Lorado). Clean-up costs will be determined as a Memorandum of Agreement is developed between the two governments in the coming months.

The Gunnar and Lorado uranium mining facilities, active from the 1950s until the early 1960s, contributed to the Government of Canada's national security effort at that time. When the sites were closed, there was no regulatory framework in place to ensure the appropriate containment and treatment of the waste, which has led to environmental impacts on local soils and lakes. Although operated by the private sector, the companies no longer exist. A private company that retains ownership of a portion of the Lorado site will be contributing to the uranium mine clean-up costs with the two levels of government.

Figure 4
World Uranium Production, 2003



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

URANIUM MARKET

Overview

The pattern of real or potential supply disruptions that led to rising uranium spot market prices during 2003 continued throughout 2004. The U.S. uranium hexafluoride conversion facility that shut down in December 2003 resumed production during April. However, Cameco Corporation's Port Hope conversion facility was closed by a strike and a summer maintenance shut-down for about four months, further constricting the supply of nuclear fuel. Reluctant to drive up spot prices further, buyers shifted their focus to the long-term market and caused the long-term price premium to rise from the traditional level of about US\$1.00/lb U_3O_8 above the spot price to about \$4.50/lb by the end of the year.

During the year, the growing energy appetite of China began to affect the market. Its fuel buyers signed a large long-term contract with a producer in Kazakhstan and began to scour world markets for future uranium supplies to support its rapidly growing nuclear power program. Its interest in Canadian uranium is well known. This development points to sustained pressure on world nuclear fuel markets over the coming years.

On June 16, 2004, Cameco, COGEMA S.A. and RWE NUKEM Inc. announced that they had amended their contract with TENEX of Russia in order to forego a portion of

their future options on uranium derived from Russian nuclear weapons. Ultimately, this change was needed to accommodate Russia's growing requirements for uranium to fuel its expanding nuclear plant construction in Russia and abroad, and confirmed the rumours of 2003 that less uranium would be available to Western markets after 2008 than had been expected.

The U.S. dollar also continued its decline against the currencies of the major uranium-producing countries in 2004, making it less attractive for them to expand operations to meet growing uranium demand. Thus, the potential 2007 closure of the Rossing mine in Namibia was deferred to 2009, but no commitment was made with respect to the major investment required to support continued production for the longer term.

Notwithstanding that there are very few expansions or developments of new mines that could take place in the near term, heightened exploration activity is expected to lead to a number of new discoveries in Canada and elsewhere over the next few years and 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

The uranium spot market price, as reported by Ux,⁴ rose through the year from its opening value of US\$14.50/lb

Figure 5
Trend in Uranium Spot Prices, 1994-2004



Source: TradeTech.

U₃O₈ (a standard measure of uranium metal content) to \$20.70/lb at the end of 2004 (Figure 5). This 43% increase reflected the continuing shortage of uranium available to the spot market, as well as the realization that it would take several years to develop new sources of supply sufficient to close the gap between consumption and production.

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, the world's largest, uranium mine concentrates from Canada and abroad are refined to uranium trioxide (UO₃), an intermediate product. The UO₃ is then trucked to the Port Hope facility, which has about one-quarter of the Western World's annual uranium hexafluoride (UF₆) conversion capacity and currently provides the only commercial supply of fuel-grade natural uranium dioxide (UO₂). UF₆ is enriched outside of Canada for use in foreign light-water reactors, while natural UO₂ is used to fabricate fuel bundles for CANDU reactors in Canada and abroad. About 80% of the UO₃ from Blind River is converted to UF₆, while the remaining 20% is converted to UO₂. Table 8 tabulates Canada's production of refined and converted uranium, and notes the associated work force, from 2000 to 2003, inclusive.

OUTLOOK

A marked improvement in the uranium market, along with continued improvement in the political climate for nuclear energy in 2004, was good news for uranium producers in Canada. Dwindling inventories and the prospects of increased demand, particularly in China, indicate that significant quantities of Canadian uranium will need to be produced 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 maintain leadership in uranium production for more than the next three decades. Given the high potential for economically attractive uranium occurrences in Canada, the recent marked increase in uranium exploration in many regions of the country 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 the world's premier uranium producer well into the 21st century.

ENDNOTES

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

² *McArthur River at Full Production as Prices Rise*, NRCAN Mailing, October 2004.

³ In certain cases, the identified operator has reported the total expenditures of a joint-venture effort. Therefore, contributions by other parties not responding to the NRCAN survey are accounted for in the \$36 million total expenditure for 2003.

⁴ 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. UxC also prepares special reports on key topics of interest.

Notes: (1) For definitions and valuation of mineral production, shipments and trade, please refer to chapter 64. (2) Information in this review was current as of June 30, 2005. (3) This paper on uranium and other information on developments in Canadian nuclear policy can be accessed on the Internet at <http://nuclear.nrcan.gc.ca>. (4) This and other reviews, including previous editions, are also available on the Internet at www.nrcan.gc.ca/mms/cmy/com_e.html.

NOTE TO READERS

The intent of this document is to provide general information and to elicit discussion. It is not intended as a reference, guide or suggestion to be used in trading, investment, or other commercial activities. The author and Natural Resources Canada make no warranty of any kind with respect to the content and accept no liability, either incidental, consequential, financial or otherwise, arising from the use of this document.

TABLE 1. URANIUM PRODUCTION AND ASSOCIATED WORK FORCE IN CANADA, 2001-03

Production Centre and Producer	Company Work Force (1) (Dec. 31)			Annual Output (2) (tU)		
	2001	2002	2003	2001	2002	2003
ATHABASCA BASIN, SASKATCHEWAN						
Cluff Mining (CRI, 100%)	98	56	22	1 288	1 626	27
Key Lake JV (Cameco operator)	289	281	291	299	117	79
Rabbit Lake JV (Cameco, 100%)	66	186	187	1 755	440	2 280
McClellan Lake JV (CRI operator)	238	172	181	2 540	2 342	2 318
McArthur River JV (Cameco operator)	263	260	264	6 639	7 082	5 751
Cigar Lake JV (pre-production)	19	19	20	–	–	–
Total	973	974	965	12 522	11 607	10 455

Sources: Company annual reports; Canadian Nuclear Safety Commission open files.

– 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, 1999-2003

	Unit	1999	2000	2001	2002	2003 (p)
Total producer shipments	tU	10 157	9 921	12 991	12 855	9 939
Total value of shipments	\$ millions	500	485	600	615	485

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, 2003

Operating Entity (Operator)/Location	Ore-Processing Plant (1)			
	Capacity	Recovery	Annual Throughput	
	Nameplate	Overall	Total Ore	Ore Grade
	(t/d)	(%)	(t)	(%)
McClellan Lake JV (CRI)/ at McClellan Lake, Saskatchewan	300	98	132 437	1.75
Rabbit Lake (Cameco Corporation)/ at Rabbit Lake, Saskatchewan	2 400	97	278 461	0.81
Key Lake JV (Cameco Corporation)/ at Key Lake, Saskatchewan (2)	750	99	175 803	3.39

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, 2005

Project, Province or Territory/Operator	Owners Share	Deposit Type/ Discoverer and Discovery Date	Resources (Company Estimates as of January 1, 2004)	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), CRI (37.100), Idemitsu (7.875), TEPCO (5)	Unconformity-related/ CRI, 1981	Overall property 89 000 tU <i>mineable</i>	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; Joint Panel reports November 1997; government response April 1998; final phase of construction initiated January 2005	670 km N of Saskatoon; 500-m-deep shaft sunk; brine freezing of ground is required to mine the ore; production expected to begin 2007
Midwest, Sask./CRI	CRI (69.1), Tenwest Uranium Ltd. (25.2), OURD (5.7)	Unconformity-related/ Esso Minerals Canada, 1977 (interests of Bow Valley, Numac Oil & Gas, <i>et al</i> bought by partners)	Overall property 16 000 tU <i>mineable</i>	Overall property grade of 4.6% U; grades vary from 2% to 30% U; orebody at depth of 200 m	"Non-entry" underground; "jet-boring" mining method or open-pit; milling at McClean Lake; contributing 2300 tU/y	\$80 million co-venture with McClean; in 1993, Joint Panel rejects proposal; new EIS in 1995; final hearings August 1997; Joint Panel report November 1997; government response April 1998	710 km N of Saskatoon; 185-m-deep test-mine shaft; new operator, CRI revised EIS; start-up subject to feasibility study; project placed in care and maintenance in 2003
Kiggavik, Nunavut/ Urangesellschaft Canada Limited	Urangesellschaft (79), CRI (20), Daewoo Corporation (1)	Unconformity-related/ Urangesellschaft, 1977	Overall property 15 000 tU <i>mineable</i> ; (more incl. Andrew Lake <i>et al</i>)	0.41% U average overall; Centre pit depth 100 m, Main pit 200 m	Open-pit mining methods; mill feed at 1200 t/d; output rate of 1200 tU/y originally expected	EIS submitted but project deemed deficient by Panel; new EIS required before project start-up	75 km W of Baker Lake; start-up not expected in the foreseeable future; >11-year mine life with tributary ore included

Notes: OURD (Canada) Co., Ltd. is a subsidiary of the Overseas Uranium Resources Development Corporation (OURD) of Japan. Urangesellschaft Canada Limited, operated by CRI, is a subsidiary of COGEMA S.A., which is wholly owned by the AREVA Group of France. 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. Tenwest Uranium Ltd. is a wholly owned subsidiary of Denison Energy Inc.

TABLE 5. URANIUM EXPLORATION ACTIVITY IN CANADA, 1990-2003

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

Source: Natural Resources Canada.

(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, 2003, AND JANUARY 1, 2004

Price Ranges Within Which Mineable Ore is Assessed (2)	Measured		Indicated		Inferred	
	1/1/03	1/1/04	1/1/03	1/1/04	1/1/03	1/1/04
	(000 tU)					
Up to \$50/kgU	288	252	10	81	86	44
\$50 to \$100/kgU	–	–	37	37	18	18
Total	288	252	47	118	104	62

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 2003/04 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 U₃O₈ = \$2.6/kgU.

TABLE 7. PRODUCTION OF URANIUM IN CONCENTRATES BY SELECTED MAJOR PRODUCING COUNTRIES, 1999-2003

	1999	2000	2001	2002	2003
	(tonnes U)				
Canada	8 210	10 680	12 520	11 610	10 450
Australia	5 980	7 580	7 580	6 850	7 570
China	500	500	700	730	750
France	440	310	180	20	10
Gabon	290	–	–	–	–
Kazakhstan	1 350	1 740	2 110	2 820	3 310
Namibia	2 690	2 710	2 240	2 330	2 300
Niger	2 920	2 900	2 920	3 080	3 140
Russia	2 000	2 000	3 000	2 850	3 070
South Africa	980	870	880	820	800
Uzbekistan	2 130	2 350	1 950	1 860	1 650
United States	1 810	1 460	1 010	900	750
Other (1)	1 770	1 860	1 710	2 170	2 100
Total (2)	31 070	34 960	36 800	36 040	35 900

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, and miscellaneous corporate, national and international reports.

– Nil.

(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, 2000-2003

Process and Location (Nameplate Capacity)	Production				Site Work Force			
	2000	2001	2002	2003	2000	2001	2002	2003
	(tonnes U)				(number)			
Refining at Blind River (18 000 tU as UO ₃)	9 605	x	x	x	98	98	98	98
Conversion at Port Hope (12 500 tU as UF ₆ and 2800 tU as UO ₂)	9 327	10 958	12 428	13 273	267	264	271	275

Source: Cameco Corporation.

x For commercial confidentiality reasons, Cameco no longer reports a production figure for Blind River.