



# nonferrous metals outlook

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# Preface

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**T**he Minerals and Metals Sector is the focus of federal expertise for mineral and metal commodity information. Within the Sector, the Industry Analysis and Business Development Branch acts as the federal government's main source of in-depth knowledge, intelligence and expertise on mineral and metal commodity markets. One of its tasks is to forecast mineral and metal demand, supply and prices.

Within the Branch, the Metal Materials Division is responsible for the major nonferrous metals, precious metals, certain associated minor by-products, and recycled materials such as scrap.

The commodity specialists of the Division maintain close contacts with industry on a wide range of topics and issues. This year-end publication represents a more formal means of disseminating metal market developments through the first three quarters of the year and forecasts to the year 2010. We would appreciate your feedback and encourage you to contact the specialists directly with your comments by telephone, facsimile or electronic mail (telephone numbers and e-mail addresses are provided at the beginning of each chapter). You can also provide feedback to the coordinator of this publication, Patrick Chevalier, at telephone (613) 992-4401, fax (613) 943-8450, or e-mail [pchevali@nrcan.gc.ca](mailto:pchevali@nrcan.gc.ca).

## **NOTE TO READER**

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# Introduction

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This outlook for the major nonferrous metals was prepared by staff of the Metal Materials Division in November 2004 and reflects the market conditions and expectations at that time.

Canada's economy again registered strong growth in 2003 and is expected to continue to show modest growth over the near-term forecast period. Overall real Gross Domestic Product (GDP) increased by 2.0% in 2003. The total value of all mineral commodities produced in Canada, including metals, nonmetals and mineral fuels (including oil sands mining) reached an estimated \$47 billion in 2003.

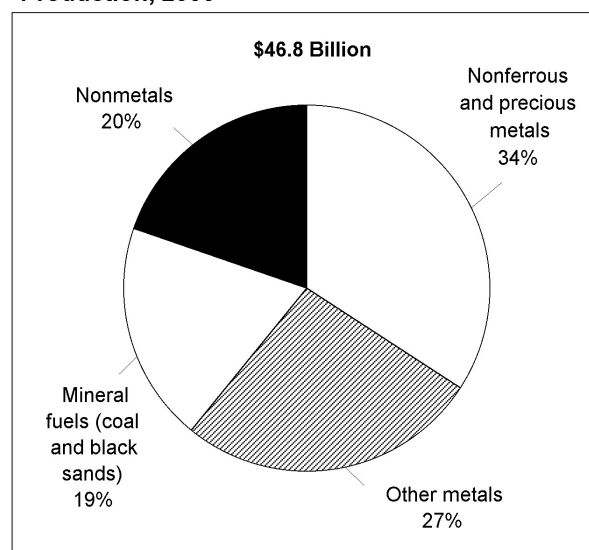
Exports of crude minerals (excluding petroleum and natural gas), coal, smelted and refined outputs, and mineral products contributed \$45.4 billion to the value of Canada's domestic exports in 2003, a 7.8% decline compared with 2002. This represented 12.8% of Canada's total domestic exports of \$354.1 billion. Metallic mineral and mineral product domestic exports accounted for 75.9% (\$35.7 billion) of the total non-fuel (including coal and coke) value, nonmetal domestic exports (including structural materials) accounted for 20.6% (\$9.7 billion), and coal accounted for 3.5% (\$1.7 billion). The United States remains Canada's principal trading partner with domestic exports of non-fuel minerals and mineral products, including coal, to that country valued at \$37.8 billion. Exports to the European Union totaled \$4.9 billion, to Japan, \$1.8 billion, and to Mexico, \$0.3 billion. Canadian imports of non-fuel minerals and mineral products, including coal, decreased by 6.2% to \$45.4 billion, resulting in an overall net balance of merchandise trade (total mineral exports minus total mineral imports) in 2003.

In the third quarter of 2004, the Canadian economy (real GDP) grew by 3.2% annualized, following increases of

3.9% in the second quarter and 2.7% in the first quarter. Domestic demand continues to be rooted in favourable fundamentals – low interest rates, record employment levels, and high commodity prices, personal incomes and corporate profits. Higher interest rates, when they come, will likely slow consumer spending and dampen residential construction activity. Real GDP in Canada is expected to grow by just under 3.0% in 2004 and by about 3.0% in 2005 and 2006.

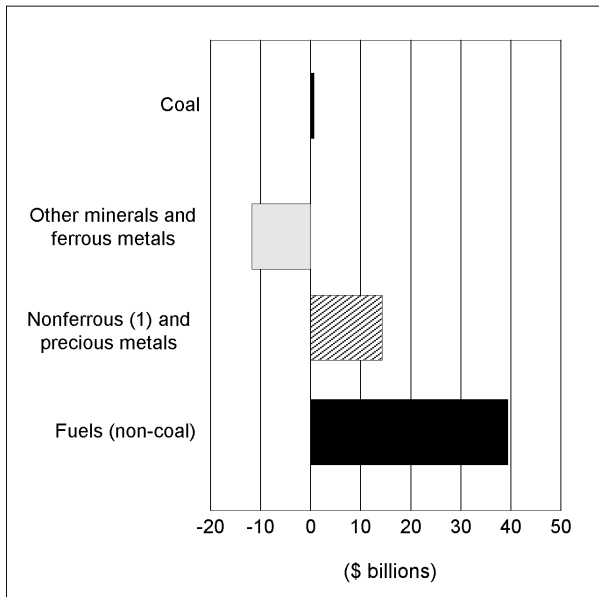
In 2003, nonferrous metals generated a net trade surplus equivalent to about 36% of that of mineral fuels (excluding coal). Canada's overall merchandise export surplus was due in large part to the net surplus generated by the Canadian mining and metals industry. Non-coal fuel minerals generated a net surplus of \$39.4 billion. The major nonferrous and precious metals (including scrap), with exports of \$24.1 billion and imports of \$9.8 billion, generated a net Canadian trade surplus of \$14.3 billion. Other mineral products generated a combined net trade deficit of \$11.8 billion.

**Figure 1**  
Value of Canadian Minerals and Metals  
Production, 2003



Source: Natural Resources Canada.

**Figure 2**  
**Net Export Earnings, 2003**  
 Mineral Commodities Net = \$30 Billion



Source: Natural Resources Canada.  
 (1) Includes aluminum.

Reviews and forecasts for aluminum, copper, gold and nickel are included in the following pages. Trade tables covering 2002, 2003 and the first nine months of 2004 follow these commodity reviews.

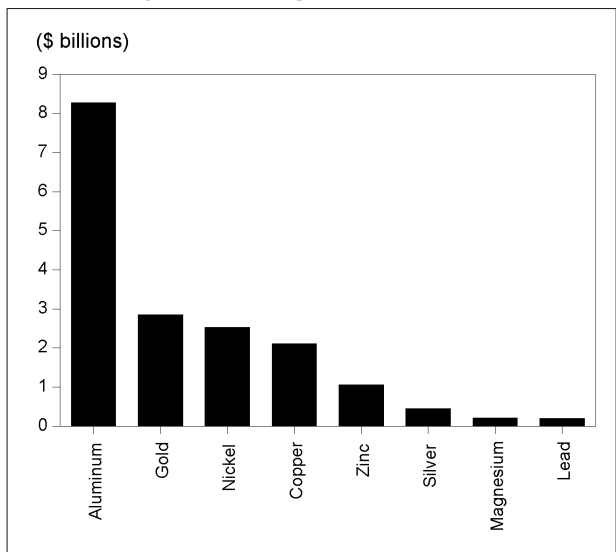
We would appreciate your feedback and encourage you to contact the specialists directly with your comments by telephone, facsimile or electronic mail.

*Note: Information in this article was current as of November 15, 2004.*

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**Figure 3**  
**Value of Exports, All Stages, 2003**



Source: Natural Resources Canada.

# Aluminum

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2003 primary metal production: \$5.6 billion (e)  
 World rank (2003): Third  
 2003 exports (unwrought): \$4.8 billion  
 Installed capacity: 2.72 Mt/y

Canada	2003	2004 (e)	2005 (f)
	(000 tonnes)		
Primary aluminum			
Production	2 792	2 590	3 000
Use	1 000	1 050	1 075

(e) Estimated; (f) Forecast.

Aluminum, in both its pure and alloyed form, is used to make a wide variety of products for the consumer and capital goods markets. Alcan reports that aluminum's largest markets are transportation (30%), packaging (17%), building and construction (18%), electrical (8%), consumer goods (6%), and machinery and equipment (9%). North America uses the largest amount of all regions in the world, accounting for 34% of total world demand. Asia accounts for 27% and Europe accounts for another 31%.<sup>1</sup>

## AVERAGE (THREE-MONTH) ALUMINUM PRICES, LONDON METAL EXCHANGE

2001	2002	2003	2004 (f)
(US\$/t and US¢/lb)			
1 440 (65¢)	1 350 (61¢)	1 430 (65¢)	1 715 (78¢)

(f) Forecast.

## CANADIAN OVERVIEW

- Canada's production of primary aluminum is expected to decrease by 7% to 2.6 Mt in 2004 from 2.791 Mt in 2003. Monthly Canadian production statistics can be obtained on Natural Resources Canada's Internet site at [http://mmsd1.mms.nrcan.gc.ca/mmsd/production/default\\_e.asp](http://mmsd1.mms.nrcan.gc.ca/mmsd/production/default_e.asp).
- Aluminerie Alouette is nearing completion of a \$1.4 billion investment to expand capacity to 550 000 t/y. The first metal is expected in early 2005 with full capacity to be reached later in the year. At that time, this smelter will be the largest in North America. Partners include: Alcan Inc. (40%), Aluminium Austria Metall Québec (20%), Norsk Hydro ASA (Hydro Aluminum - 20%), Société générale de financement du Québec (13.33%), and Marubeni Québec Inc. (6.66%). Further details are on the company's web site at [www.alouette.com](http://www.alouette.com).
- Alcan announced in September the filing of a prospectus and registration statements for the spin-off of its new rolled products company, Novelis, the world's largest aluminum rolled products company with pro-forma 2003 revenue of \$6.2 billion. The company spin-off is Alcan's answer to conditions placed on it by regulatory bodies in the European Union and the United States regarding its takeover of Pechiney to divest assets in Europe and the United States. Alcan expects to receive regulatory approvals on the spin-off late in 2004. Novelis will officially start operations on January 1, 2005.
- Alcoa has participated in discussions on power with the Quebec government and Hydro-Québec over the past two years to obtain a block of power to upgrade the Baie Comeau and Luralco Deschambault smelters. Alcoa has not yet announced its intentions regarding the doubling of the Deschambault smelter, but did announce in June that it would not implement its proposed plan to modernize its Baie Comeau smelter.
- Employees represented by the Syndicat des Employés de l'Aluminerie de Bécancour, United Steelworkers' Local 9700, started a strike on July 7 at the Bécancour smelter owned 75% by Alcoa and 25% by Alcan. Alcoa subsequently curtailed production from two of

<sup>1</sup> [www.alcan.com/web/publishing.nsf/AttachmentsByTitle/Annual+Reports/\\$file/AR\\_2003.pdf](http://www.alcan.com/web/publishing.nsf/AttachmentsByTitle/Annual+Reports/$file/AR_2003.pdf).

the three potlines in early July. The Union and Alcoa reached agreement in mid-November and the smelter will be restarted to reach full production by April 2005.

- Alcan announced the closure of the four Söderberg potlines at the Jonquière smelter in early 2004, affecting 90 000 t/y of production capacity. The remaining 161 000 t/y of prebake capacity at the smelter remains in operation.
- The Aluminium Association of Canada links the Canadian aluminum industry, aluminum users, the public and government. Further information and links to web sites of Canadian primary aluminum producers can be found on the Association's site at <http://aia.aluminium.qc.ca>.

## WORLD OVERVIEW

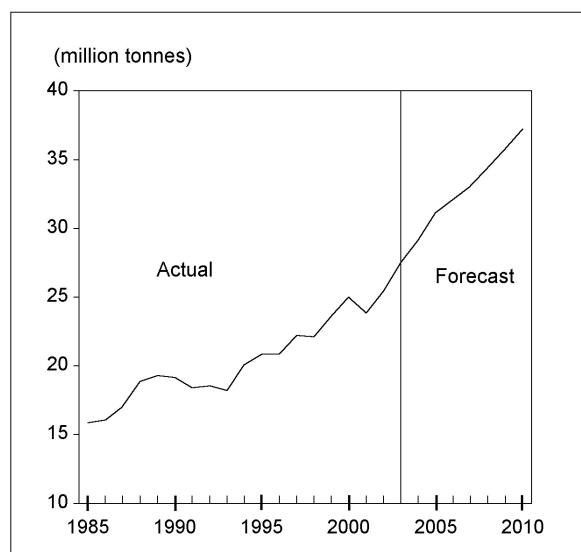
- China became the largest producer of primary aluminum in the world in 2001 (3.4 Mt). Production increased by 28% in 2002 (4.3 Mt), 25% in 2003 (5.4 Mt), and is expected to increase a further 25% in 2004 (6.5 Mt).
- North American smelter production rates have fallen during 2004 due to closures and strike action. While a near-term rebound is expected, closures of Söderberg facilities expected in the next decade and high costs for, and limited availability of, power are expected to keep production at or near the current level for the medium term.
- Noranda Inc. and Century Aluminum Company completed the acquisition of Kaiser Aluminum's Gramercy alumina plant in Gramercy, Louisiana, and related bauxite assets in Jamaica for approximately US\$23 million. Each company now owns a 25% stake in St. Ann Bauxite, formerly known as the Kaiser Jamaica Bauxite Company.
- Cambior Inc. has concluded an agreement with the Government of Guyana on the privatization of certain assets of Linden Mining Enterprises Ltd., a bauxite mining and processing operation wholly owned by the Government of Guyana. Omai Bauxite Mining Inc. has been created to revitalize and expand operations.
- Global Alumina Products Corporation (Global Alumina), a Canada-based company, has started work to develop, finance and construct a 2.8-Mt/y alumina refinery in the Boké region of the Republic of Guinea.
- New and expanded smelters and refineries around the world will increase global production capacity in 2005 by approximately 1.4 Mt (5%). For details, see the Aluminum chapter of the *Canadian Minerals Yearbook* (at [www.nrcan.gc.ca/mms/cmy/com\\_e.html](http://www.nrcan.gc.ca/mms/cmy/com_e.html)) and company web sites listed in Table 1.

## DEMAND OUTLOOK

The world's apparent use of primary aluminum is estimated to be approximately 29 Mt in 2004, about 6% higher than the 27.5 Mt used in 2003. In 2005, world demand for aluminum, dependent on the world economy, is expected to continue to be above its long-term trend of 3% annual growth.

Canada's reported use of all forms of aluminum decreased slightly in 2003 to 1.007 Mt from 1.019 Mt in 2002, and is expected to remain about the same in 2004. Over the longer term, use has increased at a rate of about 3% annually.

**Figure 1**  
World Primary Aluminum Use, 1985-2010



Sources: Natural Resources Canada; International Consultative Group on Nonferrous Metals Statistics.

## CANADIAN AND WORLD PRODUCTION OUTLOOK

Canadian installed capacity for the production of primary aluminum is now 2.7 Mt/y and, with the completion and ramp-up in production from the expanded Alouette smelter at Sept-Îles, installed capacity will reach 3.0 Mt in 2005. Although production is expected to decline in 2004 to 2.59 Mt, Canada is expected to maintain its rank as the third largest primary producer after China and Russia. Canada is expected to produce approximately 3 Mt of primary aluminum in 2005 and a slightly higher amount in 2006 due to capacity creep in existing smelters.

Production growth will flatten over the next few years, depending on production at Kitimat and closures of Söder-



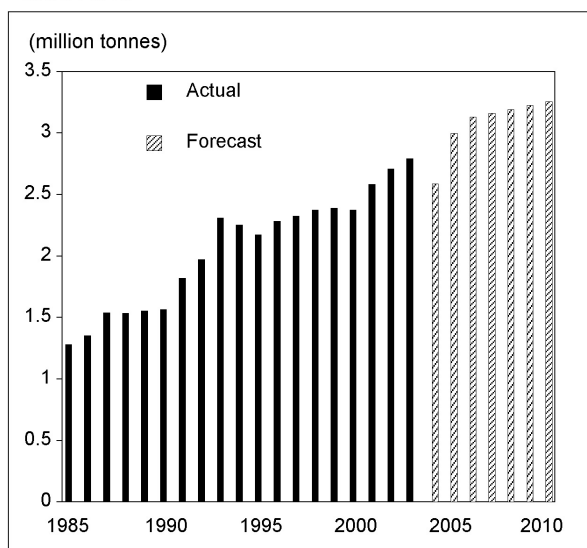
berg capacity in the next decade (not included in Figure 2), which will lower Canadian installed capacity should modernizations not occur at these facilities. Smelter expansion projects in Quebec are dependent on the construction of new power generation facilities and/or the negotiation of additional long-term power supply contracts.

World production of primary aluminum increased to an estimated 27.9 Mt in 2003, up 7.4% from a revised figure of 26 Mt in 2002. Production is expected to increase by approximately 5% in 2004 to about 29.2 Mt.

The International Aluminium Institute (IAI) indicates that members' world daily average primary aluminum production for the year to October was 79 300 t, up 4600 t/d from a comparable period in 2003. Additional information can be obtained from the IAI's web site at [www.world-aluminium.org](http://www.world-aluminium.org).

IAI inventories of unwrought aluminum have remained relatively stable over the last year and were reported at 1.66 Mt in September 2004, up from 1.55 Mt in September 2003. IAI total inventories have also remained stable and increased slightly from 2.93 Mt last September to 3.00 Mt in September 2004. On the other hand, primary aluminum inventories at the London Metal Exchange (LME) warehouses have substantially declined throughout the year from 1.423 Mt in December 2003 to 0.681 Mt at the end of September 2004.

**Figure 2**  
**Canadian Primary Aluminum Production,**  
**1985-2010**



Source: Natural Resources Canada.

## PRICE OUTLOOK

Sales of aluminum, alumina and bauxite are generally valued in U.S. currency. The rapid changes in the relative value of other currencies to the U.S. dollar seen in the last two years have resulted in the potential for diverging conclusions on prices dependent on the currency considered.

Cash prices for primary-grade aluminum (in U.S. dollar terms) on the LME have trended upward during the year. LME cash prices started 2004 at approximately US\$1601/t (73¢/lb) and have since risen approximately 12% to US\$1800/t (83¢/lb) at the beginning of November. The Canadian currency equivalents for the start of the year at C\$2062/t (94¢/lb) and the end of the year at C\$2145/t (97¢/lb) represent a rise of about 4% in Canadian dollar terms.

In U.S. dollar terms, cash prices set new nine-year highs of US\$1894/t in early October. However, current cash prices in Euro equivalents (about 1400) are well below highs (about 1900) established in September 2000.

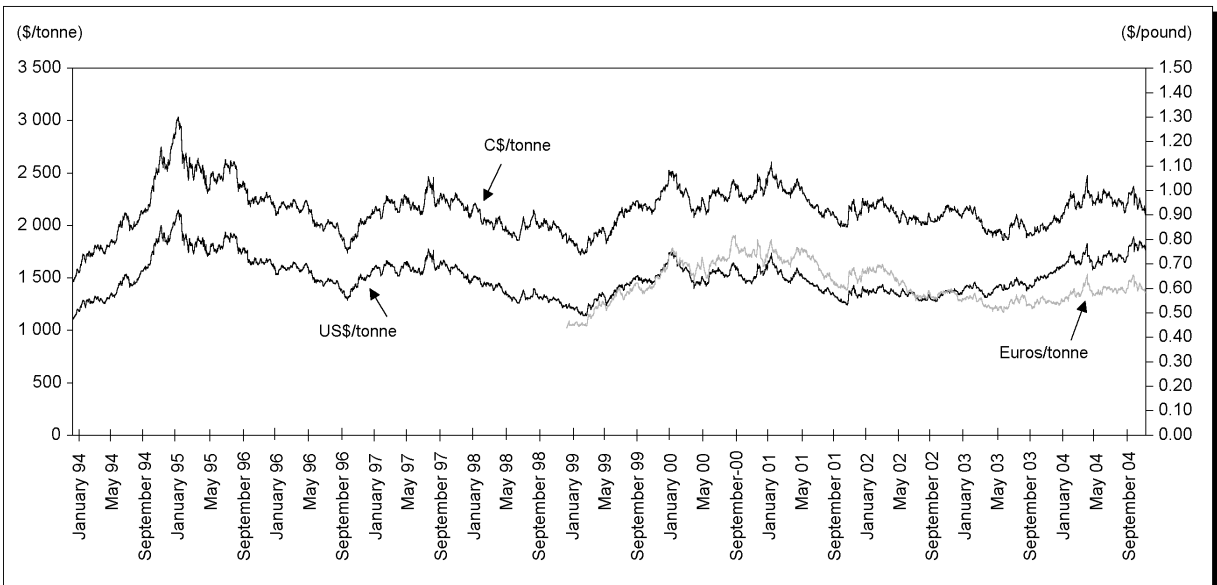
U.S. dollar-denominated prices appear to have broken out of a longer-term price range of between US\$1200 and \$1800/t (55¢/lb and 82¢/lb). Given the current strength of demand and pressure from existing higher prices for alumina, aluminum prices are expected to remain strong in 2005. On a longer-term basis, however, once Söderberg closures and expansions of existing operations have been completed in China and the expected new alumina and smelting capacity comes on line around the world, prices are likely to soften.

*Note: Information in this article was current as of November 15, 2004.*

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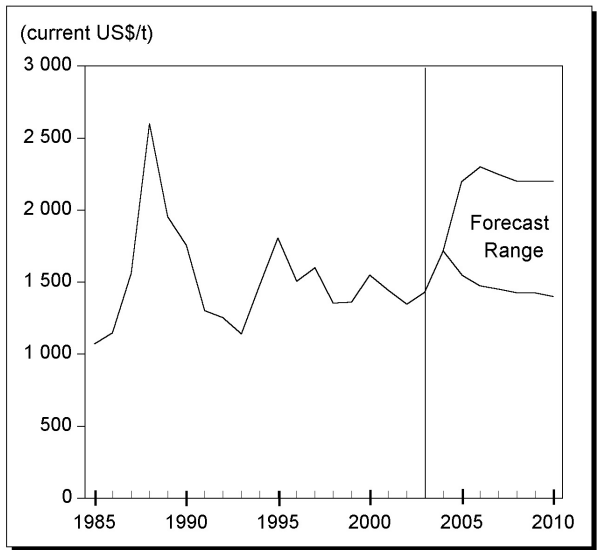
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**Figure 3**  
**Aluminum Prices, 1994-2004**



Source: Natural Resources Canada

**Figure 4**  
**Aluminum Settlement Price, 1985-2010**  
 Annual LME Settlement



Source: Metalprices.com.

**TABLE 1. COMPANY WEB SITES FOR FURTHER INFORMATION**

Company	Web Site Address
Alcan Inc.	<a href="http://www.alcan.com">www.alcan.com</a>
Alcoa Inc.	<a href="http://www.alcoa.com">www.alcoa.com</a>
Alcoa World Alumina and Chemicals	<a href="http://www.alcoa.com">www.alcoa.com</a>
Aldoga Aluminium Smelter Pty Ltd.	<a href="http://www.aldoga.com">www.aldoga.com</a>
Aluar Aluminio Argentino S.A.I.C.	<a href="http://www.aluar.com.ar">www.aluar.com.ar</a>
Alumina Limited	<a href="http://www.aluminalimited.com">www.aluminalimited.com</a>
Alumina do Norte do Brasil S.A.	<a href="http://www.cvrd.com.br">www.cvrd.com.br</a>
Aluminerie Alouette Inc.	<a href="http://www.alouette.com">www.alouette.com</a>
Aluminerie de Bécancour Inc.	<a href="http://www.alcoa.com">www.alcoa.com</a>
Aluminium Association of Canada	<a href="http://www.aia.aluminium.qc.ca">www.aia.aluminium.qc.ca</a>
Aluminium Bahrain B.S.C.	<a href="http://www.albasmelter.com">www.albasmelter.com</a>
Aluminium Company of Egypt, The	<a href="http://www.egyptalum.com.eg">www.egyptalum.com.eg</a>
Aluminium Corporation of China Limited	<a href="http://www.chinalco.com.cn">www.chinalco.com.cn</a>
Alumina Partners of Jamaica	<a href="http://www.kaiseral.com">www.kaiseral.com</a>
Atlantsal hf	<a href="http://www.atlantsal.is">www.atlantsal.is</a>
Bharat Aluminium Company Limited	<a href="http://www.balcoindia.com">www.balcoindia.com</a>
BHP Billiton	<a href="http://www.bhpbilliton.com">www.bhpbilliton.com</a>
Brunei Economic Development Board	<a href="http://www.bedb.com.bn">www.bedb.com.bn</a>
Cambior Inc.	<a href="http://www.cambior.com">www.cambior.com</a>
Century Aluminum Company	<a href="http://centuryca.com">centuryca.com</a>
Coega smelter	<a href="http://smelter.csir.co.za">smelter.csir.co.za</a>
Columbia Ventures Corporation	<a href="http://www.nordural.is">www.nordural.is</a>
Comalco Limited	<a href="http://www.riotinto.co">www.riotinto.co</a>
Companhia Brasileira de Alumínio	<a href="http://www.aluminioeba.com.br">www.aluminioeba.com.br</a>
Companhia Vale do Rio Doce	<a href="http://www.cvrd.com.br">www.cvrd.com.br</a>
Corporación Venezolana de Guayana	<a href="http://www.cvg.com">www.cvg.com</a>
CVG Alcasa	<a href="http://www.aluminio.com.ve">www.aluminio.com.ve</a>
Dubai Aluminium Company Limited	<a href="http://www.dubal.ae">www.dubal.ae</a>
East Hope Group	<a href="http://www.easthope.com.cn">www.easthope.com.cn</a>
Elkem ASA	<a href="http://www.elkem.com">www.elkem.com</a>
Federation of Aluminium Consumers in Europe	<a href="http://www.facealuminium.com">www.facealuminium.com</a>
Global Alumina Products Corporation	<a href="http://www.globalalumina.com">www.globalalumina.com</a>
Grupo Votorantim	<a href="http://www.votorantim.com.br">www.votorantim.com.br</a>
Hindalco Industries Limited	<a href="http://www.adityabirla.com">www.adityabirla.com</a>
Indian Aluminium Company, Limited	<a href="http://www.indal.com">www.indal.com</a>
International Aluminium Institute	<a href="http://www.world-aluminium.org">www.world-aluminium.org</a>
KTD L.L.C.	<a href="http://www.ktdal.com">www.ktdal.com</a>
Marubeni Corporation	<a href="http://www.marubeni.com">www.marubeni.com</a>
Minmetals Nonferrous Metals Co., Ltd.	<a href="http://www.minmetals.com">www.minmetals.com</a>
National Aluminium Company Limited	<a href="http://www.nalcoindia.com">www.nalcoindia.com</a>
Noranda Inc.	<a href="http://www.noranda.com">www.noranda.com</a>
Norsk Hydro ASA/Hydro Aluminium a.s.	<a href="http://www.hydro.com">www.hydro.com</a>
Ormet Corporation	<a href="http://www.ormet.com">www.ormet.com</a>
Pechiney SA	<a href="http://www.aluminium-pechiney.com">www.aluminium-pechiney.com</a>
PT Antam Tbk	<a href="http://www.antam.com/News/news.htm">www.antam.com/News/news.htm</a>
Queensland Alumina Ltd.	<a href="http://www.qal.com.au">www.qal.com.au</a>
Russian Aluminium (Russky Alumini)	<a href="http://www.rusal.com">www.rusal.com</a>
Saudi Arabian Mining Company	<a href="http://www.maden.com.sa">www.maden.com.sa</a>
Siberian-Urals Aluminium Company	<a href="http://www.sual.com">www.sual.com</a>
Sibirsky Aluminium	<a href="http://www.sibirskyaluminum.com">www.sibirskyaluminum.com</a>
Slovalco A.S.	<a href="http://www.slovalco.sk">www.slovalco.sk</a>
Société générale de financement du Québec	<a href="http://www.sgfqc.com">www.sgfqc.com</a>
Sterlite Industries (India) Ltd.	<a href="http://www.balcoindia.com">www.balcoindia.com</a>
The Aluminum Association, Inc. (USA)	<a href="http://www.aluminum.org">www.aluminum.org</a>
Tomago Aluminium Company Pty Ltd.	<a href="http://www.tomago.com.au">www.tomago.com.au</a>

# Copper

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2003 production:	\$1.3 billion
Rank (mine production):	Eighth
Exports (concentrates and unwrought):	\$978 million

Canada	2002 (p)	2003 (e)	2004 (f)
		(000 t)	
Mine production	604	558	560
Refined production	495	455	500
Refined use	274	257	260

(e) Estimated; (f) Forecast; (p) Preliminary.

Copper's properties, particularly its high electrical and thermal conductivity, good tensile strength, elevated melting point, non-magnetic properties and resistance to corrosion, make it and its alloys very attractive for electrical transmission, water tubing, castings and heat exchangers. Copper is the most efficient conductor of electrical power, signals and heat of all the industrial metals. In Canada, more than half of the refined copper used annually is for electrical applications, mostly in wire.

## ANNUAL AVERAGE SETTLEMENT PRICES, LONDON METAL EXCHANGE

2000	2001	2002	2003	2004 (e)
(US\$/t)				
1 813	1 578	1 560	1 779	2 815

(e) Estimated.

## CANADIAN OVERVIEW

### Newfoundland and Labrador

- Aur Resources will make a final decision to proceed with the construction of the Duck Pond deposit in central Newfoundland once it receives a commitment from the Government of Newfoundland and Labrador to provide financial support for the surface infrastructure. Aur expected to receive a decision in mid-November 2004. Projected copper production from the Duck Pond deposit is 14 500 t/y of copper in concentrate over eight years (4.1 Mt grading 3.3% copper, 5.7% zinc, 0.9% lead, 59 g/t silver and 0.9 g/t gold of proven plus probable reserves).
- The first shipments of concentrate from Inco Limited's Voisey's Bay mine are expected in November 2005. Production from the mine is planned to average 50 000 t/y of nickel, 2300 t/y of cobalt and 6800 t/y of copper from the concentrate to be smelted at Inco's Ontario and Manitoba plants; in addition, about 32 000 t/y of copper in copper concentrate will be sold to third parties for processing.

### Quebec

- Campbell Resources Inc. is bringing the Copper Rand mine back into production in early 2005. The Chibougamau area copper-gold mine was closed in 1997 due to poor economics. Campbell Resources has spent \$58 million on infrastructure renewal, including centralizing milling facilities for both the Copper Rand ore and the nearby Joe Mann mine. Projected average annual production is 6800 t of copper and 992 t of gold.
- In October 2003, Noranda Inc. announced that it would reduce its processing rate from 840 000 t/y to 630 000 t/y at the Horne smelter effective June 2004 in order to reduce its reliance on low-margin offshore concentrates. Anode production rates will drop from 186 000 t/y to 140 000 t/y. Noranda Inc.'s Bell-Allard copper-zinc mine, located in the Matagami region of northern Quebec, ceased operation on October 15, 2004, due to the depletion of ore reserves.

- Breakwater Resources Ltd. intends to re-open the Langlois copper-zinc mine in 2006. Production from Langlois, as well as Breakwater's acquisition of the Myra Falls mine (see British Columbia), will help offset the impact of the closure of the Bouchard Hébert mine in early 2005 and the Bougrine zinc mine in Tunisia.
- The Selbaie copper-zinc mine, owned by BHP Billiton, ceased production in March 2004 after 23 years of operation due to the depletion of ore reserves.
- In July, Breakwater Resources Ltd. acquired the assets of Boliden Westmin (Canada) Limited, which include the Myra Falls zinc-copper-gold-silver mine located on Vancouver Island, B.C. Breakwater has stated that the acquisition will lessen the company's sensitivity to the zinc price. In 2003, the Myra Falls mine produced 10 700 t of copper in concentrate.
- In October, Northgate Minerals Corporation completed a feasibility study on the development of the Kemess North project. The development scenario has ore production from the Kemess North pit commencing in late 2006 at an annual rate of 9.4 t of gold and 50 450 t of copper. The plan would include increasing mill capacity from 86 000 t/d to 96 000 t/d. Kemess North ore would be processed with ore from the existing Kemess South deposit from 2007 until Kemess South reserves are exhausted in 2012. The total capital investment required is US\$190 million. Should the project proceed, the mine life of the Kemess operation would be extended from 2012 to 2019. Northgate is continuing with the permitting process and is looking at various alternatives for financing the project, including the possibility of selling a stake in the project to groups in Asia in conjunction with a concentrate supply agreement. Production in 2004 from the Kemess South deposit is expected to total 11 t of gold and 34 000 t of copper.

## Ontario

- Falconbridge Limited is bringing the Montcalm nickel-copper orebody into production in early 2005. Probable mineral resources are 5.11 Mt grading 1.46% nickel, 0.71% copper and 0.06% cobalt. The ore will be mined at a rate of 750 000 t/y and will be milled and concentrated at the Kidd Creek operations in Timmins. The nickel concentrate produced will be shipped to the Sudbury smelter for processing and the copper concentrate will be processed at the Kidd Creek smelter. Production from Mine D began in the fourth quarter of 2004. The Mine D project is the depth extension of the Kidd Creek orebody beyond the limits of the No. 3 mine at 6800 feet to a depth of 10 200 feet.
- Inco Limited expects 2004 copper production from its Ontario mines to total 120 000 t, up 32% from 2003 output of 91 100 t. Output in 2003 was negatively affected by a three-month strike and subsequent ramp-up problems.

## Manitoba/Saskatchewan

- In October 2004, OntZinc Corporation entered into an agreement to acquire 100% of Hudson Bay Mining and Smelting from Anglo American International S.A. for \$325 million, conditional on securing financing for the purchase. OntZinc intends to finance the purchase through a combination of an equity offering and debt financing.

## British Columbia

- Teck Cominco increased its share of the Highland Valley copper mine to 97.5% effective January 3, 2004, by exercising its right of first refusal with respect to BHP Billiton's 33.57% interest. Teck Cominco will decide in 2006 whether to go ahead with an expansion, which would extend the mine life a further five years to 2013. Revenues from copper production accounted for 55% of Teck Cominco's operating profit during the first three quarters of 2004.
- Redcorp Ventures Ltd. continued to develop its zinc-copper-gold Tulsequah project in northwestern British Columbia through its wholly owned subsidiary, Redfern Resources Limited. The deposit comprises measured and indicated reserves of 5.9 Mt containing 2.59 g/t gold, 107 g/t silver, 1.42% copper, 6.72% zinc and 1.26% lead. There are a further 3 Mt of inferred resources at similar grades as those in the measured and indicated category. The 2004 exploration program focused on converting the inferred resources to the indicated category through the completion of in-fill drilling. Redfern Resources was granted a Project Approval Certificate from provincial and federal authorities in December 2002 to develop the deposit, but must satisfy two conditions before project construction and development can proceed. The first relates to further characterization of sediments underlying the proposed tailings impoundment and the second relates to completion of chronic toxicity test work on effluent from the proposed water treatment plant. Redfern anticipates obtaining official notice of satisfaction of these conditions prior to the end of 2004. A 1997 feasibility study estimated average annual metal output

at 45 000 t of zinc, 9980 t of copper, 1.8 t of gold and 72 t of silver based on a 2500-t/d mine output.

- DRC Resources Corporation continues to advance the Afton copper-gold project to final feasibility. The company is spending \$18 million on a program to upgrade the Afton mineral resource to the reserve category. As of October 2004, DRC has outlined a measured and indicated resource of 68.7 Mt grading 1.08% copper, 0.85 g/t gold, 2.63 g/t silver and 0.12 g/t palladium. The resource is adjacent to the previously mined Afton open pit, 10 km west of Kamloops. An advanced scoping study completed in February 2004 indicates that a 51.5-Mt resource could be mined at a rate of 9000 t/d to produce an average 34 000 t of copper and 2.5 t of gold per year.
- Imperial Metals is planning to re-open the Mount Polley open-pit copper-gold mine in 2005 on the strength of positive drilling results at the recently discovered Northeast zone and improved metal prices. The mine closed in 2001 due to low metal prices. During 2004, Imperial Metals updated the reserve estimate for the Northeast, Bell and Springer zones and obtained a permit amendment to include mining of the Northeast zone. At the time of publication, the updated mine plan was not yet available. Prior to shutting down in September 2001, average annual production was 16 300 t of copper.

## WORLD OVERVIEW

### Chile

- BHP Billiton is investing US\$495 million in the Escondida sulphide leach project, which involves the bio-assisted leaching of low-grade run-of-mine (ROM) sulphide ore from the Escondida pit and low-grade ROM sulphide and oxide ore from the Escondida Norte pit. The project is expected to produce 180 000 t/y of cathode and is scheduled to begin during the second half of 2006. Total ore reserves are estimated at 1.134 billion t of sulphide ore grading 0.52% copper. Outokumpu will design the solvent extraction plant using its Vertical Smooth Flow technology.
- In October, BHP Billiton announced plans to develop its Spence SX-EW project in northern Chile at a cost of US\$990 million. Planned annual production is 200 000 t of cathode over a 19-year mine life. First cathode production is scheduled for the fourth quarter of 2006.
- Codelco may begin developing a full-scale bio-leaching plant at Mansa Mina in 2005. Targeted production is 100 000 to 200 000 t/y of copper by 2008. It has invested US\$60 million in a pilot plant since 2000.

Codelco released an environmental impact statement of its smelting/refining project at Mejillones in Chile; the US\$1.25 billion operation would produce 1.4 Mt/y of cathode.

### Peru

- Xstrata has been selected as the winning bidder by the Government of Peru for the Las Bambas project. Las Bambas comprises four known deposits with proven reserves of 40.5 Mt grading around 2% copper and an indicated resource of 500 Mt containing copper grades of over 1% plus gold. Xstrata will have a period of up to six years to complete exploration and feasibility work.

### China

- Jianxi Copper is to increase cathode production by 31% to 450 000 t/y in 2005 compared to 343 000 t/y in 2003. The expansion will be financed from internal cash flows.
- Yunnan Copper Industry is planning to spend US\$60 million per year over the next six years on exploration and development of copper and zinc projects.

### United States

- Production at the Bagdad and Sierrita mines ramped back up to full capacity. The Chino concentrator and the Cobre mine were restarted. Newmont announced it has started development of its Phoenix gold-copper project in Nevada. Planned annual production is 12-14 t of gold and 8000-9000 t of copper over 15 years starting in 2006. Production at Quadra Mining's Robinson mine began in September. Robinson is expected to produce 75 000 t/y of copper over 10 years.

### Zambia

- First Quantum Minerals' Kansanshi copper-gold project was commissioned in late 2004 and commercial production is expected in early 2005. Equinox Resources is developing the Lumwana mine. Production of 140 000 t/y copper is expected by 2006.
- Vedanta Resources has acquired a 51% stake in Konkola Copper Mines (KCM) in Zambia for US\$48.2 million. Vedanta's subsidiary, Sterlite Industries, will operate KCM. Sterlite will focus on improving operations at KCM's Nkana smelting and refining complex and plans to increase output to the 225 000 to 250 000-t/y level. Production in 2003 was 188 000 t of copper.

## Democratic Republic of Congo

- The Democratic Republic of Congo has granted conditional approval to American Minerals Fields' subsidiary Congo Mineral Developments to develop the Kolwezi copper-cobalt tailings project. Planned production is 42 000 t/y of copper and 7000 t/y of cobalt over a 38-year mine life starting in the fourth quarter of 2006 (112.8 t of oxide tailings grading 1.49% copper and 0.32% cobalt). AMF owns 82.5%, Gecamines owns 12.5%, and the government owns 5%.

The International Copper Study Group's (ICSG) September forecast of production (in 000 t) was:

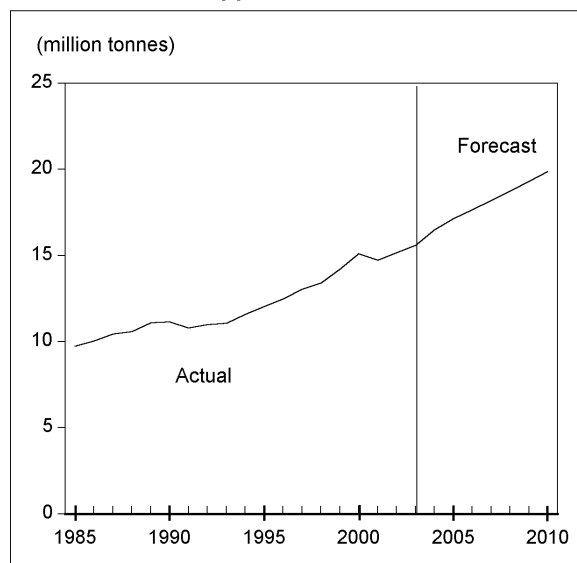
	2002	2003	2004	2005
Mine production	13 554	13 657	14 554	15 626
Refined production	15 266	15 210	15 868	17 094
Copper usage	15 142	15 586	16 473	17 146
Refined copper balance	124	-376	-704	-220

The long decline in treatment and refining charges, (TC/RCs) or the price charged to smelt copper concentrates and to produce refined copper, that began in early 2001 came to an abrupt end in the second quarter of 2004 thanks to an improved concentrate supply situation. Declining copper prices from mid-2000 to late 2002 led to mine cut-backs and closures, pushing the supply/demand balance for concentrate (the difference between production and consumption of concentrates) into a deficit from 2001 through 2003 in the range of 100 000-200 000 t of copper in concentrate. Average annual spot TC/RCs declined from a level of US\$62.50/t (TC) and US6.25¢/lb (RC) in 2001 to US\$17.30/t and US1.73¢/lb in 2003 (c.i.f. Shanghai delivery terms). The concentrate balance for the full year (2004) is expected to be at around a 400 000 to 500 000-t surplus. Spot TC/RCs bottomed out at below US\$15/t and US5¢/lb during the first quarter and then rose to the US\$130/t and US13¢/lb level by the third quarter (c.i.f. Shanghai). Annual TC/RCs (terms agreed to by mines and smelters under long-term concentrate supply agreements) are settling at the US\$85/t and US8.5¢/lb level compared to US\$46/t and US4¢/lb in 2003 (c.i.f. Japan).

## DEMAND OUTLOOK

The ICSG forecast in late September (see data above) that world use of refined copper would increase 5.7% to 16.47 Mt in 2004 from 15.6 Mt in 2003; in 2005, use is forecast to rise by 4.1%, or 573 000 t, to 17.15 Mt. The ICSG forecasts continued strong growth in Asia in 2005, slowing growth in North America in 2005 compared to 2004, and modest growth in Europe in both 2004 and 2005.

**Figure 1**  
World Refined Copper Use, 1985-2010



Source: Natural Resources Canada.

## CANADIAN PRODUCTION OUTLOOK

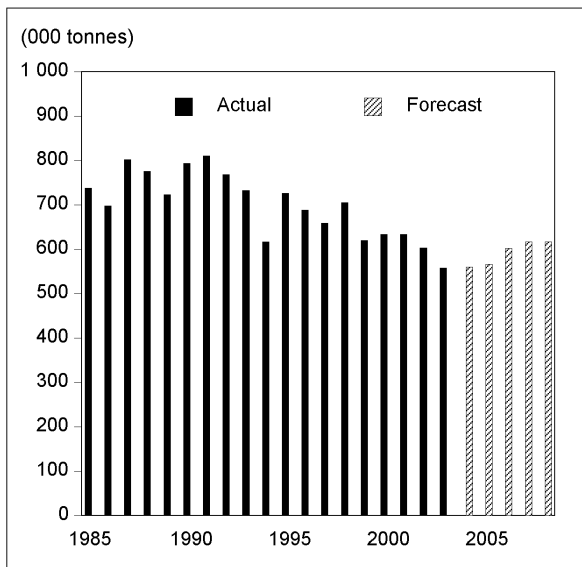
Following two years of declining production due to closures/shut-downs, Canadian mine production is expected to increase slightly in 2004 over 2003 as output from the re-start at Gibraltar offset closures at Selbaie and Bell Allard. Mine production is expected to increase during 2005-08 as new output from Voisey's Bay and Copper Rand 5000, as well as increased output from the Kemess North project, will more than offset the closure of Louvicourt. There is potential for further increases in the forecast period if production from projects such as Afton, Duck Pond and Mt. Polley comes on stream.

Canadian refined production of copper is forecast to increase to 500 000 t in 2004 from 455 000 t in 2003. Strikes at Noranda's Horne smelter and Inco's Ontario operations contributed to the lower 2003 output.

## PRICE OUTLOOK

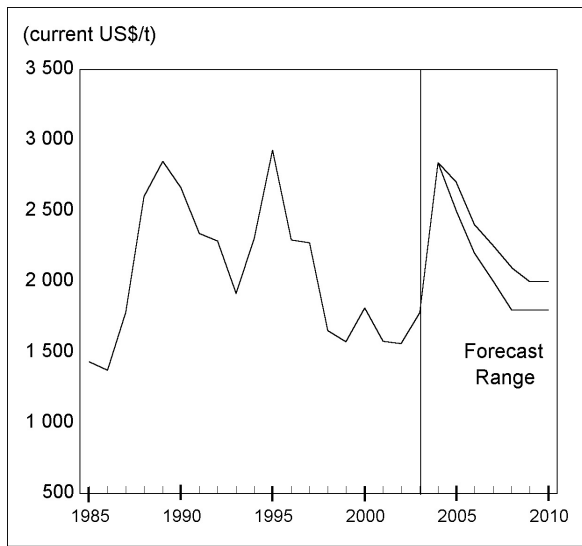
The average London Metal Exchange (LME) settlement price for copper for November of US\$3122.80/t represents a 15-year high. The LME settlement price for Grade A copper varied between US\$2348/t on January 2 and US\$3262/t on November 30; for the year it appears likely to average US\$2840/t (US128.8¢/lb). LME inventories began 2004 at 431 000 t and had declined to below 60 000 t at the end of November.

**Figure 2**  
**Canadian Mine Production of Copper,**  
**1985-2008**



Source: Natural Resources Canada.

**Figure 3**  
**Copper Prices, 1985-2010**  
**Annual LME Grade A Copper Settlement**



Source: Natural Resources Canada.

Copper prices should remain firm into 2005, possibly averaging as high as US\$2700/t, based on several factors. Demand growth in 2005 is forecast in the 4-5% range, which, although down from the 5.7% level estimated for 2004, is nonetheless very strong. In addition, it will take time for increased smelter and refinery production to translate into increased cathode output; therefore, cathode stocks will remain extremely tight in the first half of 2005. However, global industrial production (IP) growth seems to have peaked in the second quarter of 2004 and, should demand for copper slow, prices could decline to the US\$2400/t level into 2006. Prices should range between US\$2000 and US\$2400/t over the period 2006-07. Beyond 2007, increased supply from several new large mine/smelter projects could result in a better match between supply and demand; therefore, a levelling out of prices around the US\$1900/t level is forecast for the period 2007-10.

**ADDITIONAL INFORMATION**

More information about Canadian companies is available on the Internet at [www.sedar.com/issuers/issuers\\_en.htm](http://www.sedar.com/issuers/issuers_en.htm). Canadian monthly copper statistics are available in Table 3 at [http://mmsd1.mms.nrcan.gc.ca/mmsd/data/default\\_e.asp](http://mmsd1.mms.nrcan.gc.ca/mmsd/data/default_e.asp). For an indepth review of exploration trends in Canada, see the report entitled *Overview of Trends in Canadian Mineral Exploration* at [www.nrcan.gc.ca/mms/pubs/explor\\_e.htm](http://www.nrcan.gc.ca/mms/pubs/explor_e.htm).

*Notes: Forecasts and projections are subject to change by such factors as changing copper prices, exploration successes or failures, ability to arrange financing, technological developments, and environmental permitting. Information in this article was current as of November 30, 2004.*

**NOTE TO READER**

**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. COMPANY WEB SITES FOR FURTHER INFORMATION**

Company	Web Site Address
<b>CANADA</b>	
Agnico-Eagles Mines Limited	<a href="http://www.agnico-eagle.com">www.agnico-eagle.com</a>
Aur Resources Inc.	<a href="http://www.aurresources.com">www.aurresources.com</a>
Barrick Gold Corporation	<a href="http://www.barrick.com">www.barrick.com</a>
Billiton Metals Canada Inc. (see BHP Billiton Plc)	<a href="http://www.bhpbilliton.com/bb/home/home.jsp">www.bhpbilliton.com/bb/home/home.jsp</a>
Breakwater Resources Ltd.	<a href="http://www.breakwater.ca">www.breakwater.ca</a>
Callinan Mines Limited	<a href="http://www.callinan.com">www.callinan.com</a>
Campbell Resources Inc.	<a href="http://www.ressourcescampbell.com/en/index.html">www.ressourcescampbell.com/en/index.html</a>
DRC Resources Corporation	<a href="http://www.drcresources.com/s/Home.asp">www.drcresources.com/s/Home.asp</a>
Expatriate Resources Ltd.	<a href="http://www.expatriateresources.com/start.htm">www.expatriateresources.com/start.htm</a>
Falconbridge Limited	<a href="http://www.falconbridge.com">www.falconbridge.com</a>
Getty Copper Corporation	<a href="http://www.gettycopper.com">www.gettycopper.com</a>
Highland Valley Copper (see Teck Cominco Limited)	<a href="http://www.teckcominco.com">www.teckcominco.com</a>
Hudson Bay Mining and Smelting Co., Ltd. (see OntZinc Corporation)	<a href="http://www.ontzinc.ca">www.ontzinc.ca</a>
Imperial Metals Corporation	<a href="http://www.imperialmetals.com/s/Home.asp">www.imperialmetals.com/s/Home.asp</a>
Inco Limited	<a href="http://www.inco.com">www.inco.com</a>
Inmet Mining Corporation	<a href="http://www.inmetmining.com">www.inmetmining.com</a>
Noranda Inc.	<a href="http://www.noranda.com">www.noranda.com</a>
North America Palladium Ltd.	<a href="http://www.napalladium.com">www.napalladium.com</a>
Northgate Exploration Ltd.	<a href="http://www.northgateexploration.ca">www.northgateexploration.ca</a>
Placer Dome Inc.	<a href="http://www.placerdome.com/index.jsp">www.placerdome.com/index.jsp</a>
Redcorp Ventures Ltd.	<a href="http://www.redcorp-ventures.com">www.redcorp-ventures.com</a>
Taseko Mines Limited	<a href="http://www.tasekominer.com/tko/Home.asp">www.tasekominer.com/tko/Home.asp</a>
Teck Cominco Limited	<a href="http://www.teckcominco.com">www.teckcominco.com</a>
Voisey's Bay Nickel Company Limited	<a href="http://www.vbnc.com">www.vbnc.com</a> and <a href="http://www.inco.com">www.inco.com</a>
<b>AUSTRALIA</b>	
M.I.M. Holdings Limited	<a href="http://www.mim.com.au">www.mim.com.au</a>
WMC Resources Ltd.	<a href="http://www.wmc.com">www.wmc.com</a>
<b>BELGIUM</b>	
Umicore Group (Olen refinery/Pirdop smelter)	<a href="http://www.um.be">www.um.be</a>
<b>BRAZIL</b>	
Companhia Vale do Rio Doce (CVRD)	<a href="http://www.vale.com.br">www.vale.com.br</a>
Chile Antofagasta Holdings	<a href="http://www.aminerals.cl">www.aminerals.cl</a>
Compañía Minera Doña Inés de Collahuasi	<a href="http://www.collahuasi.cl">www.collahuasi.cl</a>
Corporación Nacional del Cobre de Chile	<a href="http://www.codelco.com">www.codelco.com</a>
Empresa Nacional de Minería (ENAMI)	<a href="http://www.enami.cl">www.enami.cl</a>
Minera Escondida Limitada	<a href="http://www.escondida.cl">www.escondida.cl</a>
<b>CHINA</b>	
Hindustan Copper Ltd. (HCL)	<a href="http://www.hindustancopper.com">www.hindustancopper.com</a>
India Birla Copper	<a href="http://www.birlacopper.com">www.birlacopper.com</a>
Jiangxi Copper Company Limited	<a href="http://www.jxcc.com/english/engfgs/enindex.htm">www.jxcc.com/english/engfgs/enindex.htm</a>
Jinchuan Group Limited	<a href="http://www.jnmc.com/default.asp">www.jnmc.com/default.asp</a>
Yunnan Copper Industrial Corp. Ltd.	<a href="http://www.yunnan-copper.com/ehhtml/copper.html">www.yunnan-copper.com/ehhtml/copper.html</a>
<b>INDONESIA</b>	
Freeport-McMoRan Copper & Gold Inc.	<a href="http://www.fcx.com">www.fcx.com</a>
<b>JAPAN</b>	
Dowa Mining Co., Ltd.	<a href="http://www.dowa.co.jp">www.dowa.co.jp</a>
Furukawa Electric Co., Ltd.	<a href="http://www.furukawa.co.jp/english/index.htm">www.furukawa.co.jp/english/index.htm</a>
Mitsubishi Group	<a href="http://www.mitsubishi.or.jp/e/contents/contents_2.html">www.mitsubishi.or.jp/e/contents/contents_2.html</a>
Mitsubishi Materials Corporation	<a href="http://www.mmc.co.jp/english/top_e.html">www.mmc.co.jp/english/top_e.html</a>
Mitsui & Co., Ltd.	<a href="http://www.mitsui.co.jp/tkabz/english/index.html">www.mitsui.co.jp/tkabz/english/index.html</a>
Nippon Mining & Metals Co., Ltd.	<a href="http://www.nikko-metal.co.jp">www.nikko-metal.co.jp</a>
Nittetsu Mining Co., Ltd.	<a href="http://www.nittetsukou.co.jp">www.nittetsukou.co.jp</a>
Onahama Smelting and Refining Co., Ltd.	<a href="http://www.group.mmc.co.jp/osr/eng">www.group.mmc.co.jp/osr/eng</a>
Sumitomo Metal Mining Co., Ltd.	<a href="http://www.smm.co.jp/index_E.html">www.smm.co.jp/index_E.html</a>
<b>KOREA</b>	
LG-Nikko Copper Inc.	<a href="http://www.lgnikko.com/eng/#">www.lgnikko.com/eng/#</a>

**TABLE 1 (cont'd)**

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Company	Web Site Address
<b>MEXICO</b>	
Grupo México S.A. de C.V.	<a href="http://www.gmexico.com">www.gmexico.com</a>
<b>PAPUA NEW GUINEA</b>	
Ok Tedi Mining Limited	<a href="http://www.oktedi.com">www.oktedi.com</a>
<b>PERU</b>	
Centromín Peru S.A.	<a href="http://www.centromin.com.pe">www.centromin.com.pe</a>
Southern Peru Copper Corporation	<a href="http://www.southernperu.com/pages/home.htm">www.southernperu.com/pages/home.htm</a>
<b>PHILIPPINES</b>	
Philippine Associated Smelting & Refining Corp.	<a href="http://www.pasar.net.ph">www.pasar.net.ph</a>
<b>POLAND</b>	
KGHM Polska Miedz S.A.	<a href="http://www.kghm.pl/en/index.php">www.kghm.pl/en/index.php</a>
<b>RUSSIA</b>	
MMC Norilsk Nickel	<a href="http://www.nornik.ru/en">www.nornik.ru/en</a>
<b>UNITED KINGDOM</b>	
Anglo American plc	<a href="http://www.angloamerican.co.uk">www.angloamerican.co.uk</a>
BHP Billiton Plc	<a href="http://www.bhpbilliton.com">www.bhpbilliton.com</a>
Rio Tinto plc	<a href="http://www.riotinto.com">www.riotinto.com</a>
<b>UNITED STATES</b>	
ASARCO Incorporated	<a href="http://www.asarco.com">www.asarco.com</a>
Kennecott Utah Copper Corporation	<a href="http://www.kennecott.com">www.kennecott.com</a>
Phelps Dodge Corporation	<a href="http://www.phelpsdodge.com">www.phelpsdodge.com</a>

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# Gold

## Patrick Chevalier

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Minerals and Metals Sector

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2003 mine production: \$2.3 billion

World rank: Eighth

Exports: \$2.7 billion

Canada	2002	2003 (e)	2004 (f)
	(tonnes)		
Production	151.9	140.5	130

(e) Estimated; (f) Forecast.

Gold is valued for its rarity, lustrous beauty, ductility, high resistance to corrosion, and conductivity. It has been treasured for its decorative and monetary value for at least 8000 years. Gold has a high density, its weight being equal to 19.3 times an equivalent volume of water. The main industrial uses for gold are in jewellery (83%) and electronics (8%). Gold bullion coins, such as the Maple Leaf coin, are also important products.

## PRICES, LONDON BULLION MARKET ASSOCIATION

2001	2002	2003	2004 (e)
(London PM, US\$/oz)			
271.04	309.68	363.32	405.00

(e) Estimated.

## CANADIAN OVERVIEW

- Richmont Mines ceased mining operations at its Hammerdown mine in Newfoundland and Labrador in June following the depletion of ore reserves. The Nugget Pond mill continued to process ore until the beginning of July. The Hammerdown mine produced a total of slightly more than 143 000 oz of gold since production started in July 2001.
- In October 2004, Barrick completed the sale of the Holt-McDermott mine, adjacent land holdings, and the mill and mill-related facilities to Newmont Canada Limited. Newmont will assume the asset retirement and other environmental obligations associated with the mine.
- Mining operations were concluded in July at Miramar's Giant mine in Yellowknife, Northwest Territories. Together with the closure of the Con mine in 2003, both of Miramar's operations in the Yellowknife region are now moving into a phase of mine reclamation.
- Overburden removal at the Pamour mine near Timmins, Ontario, is expected to begin in the fourth quarter of 2004 with gold production expected to start in the second quarter of 2005, one quarter earlier than previously planned. The Pamour mine is jointly owned by Kinross Gold Corporation (49%) and Placer Dome (CLA) Limited (51%) under the Porcupine Joint Venture.
- Cambior's Mouska mine in northwestern Quebec resumed operations at the beginning of October following the completion of a shaft deepening program one month earlier than scheduled and within the allotted budget of \$11 million.

## WORLD OVERVIEW

- In March 2004, the European Central Bank and 14 other central banks announced the renewal of the Central Bank Gold Agreement. The new agreement's terms are similar to the old agreement that expired in

September. The only substantive difference is a change in the maximum level of sales, which has been increased from 400 t to up to 500 t/y, with an overall total of no more than 2500 t over the five-year life of the new agreement.

- Major gold companies continued efforts to merge or acquire companies in order to increase market capitalization and attract investor interest. Among the unsuccessful bids were U.S.-based Coeur d'Alene Mines' attempt to take over Vancouver-based Wheaton River Minerals, and Denver-based Golden Star Resources' unsolicited bid for Toronto-based IAMGOLD Corporation.
- The Ghanaian government approved the AngloGold takeover of Ashanti Goldfields to create AngloGold Ashanti Limited in April. The new company is expected to rival U.S.-based Newmont for the top spot as the world's largest gold producer of 2004 at close to 7 million oz.
- MMC Norilsk Nickel acquired 20% of South Africa's Gold Fields Ltd. from Anglo American plc in April. By year-end, Norilsk was reportedly supporting an unsolicited bid by Harmony Gold to acquire 100% of Gold Fields.
- Major gold producers (Placer Dome, Barrick, Anglo-Gold, Gold Fields) reduced their hedging programs to increase exposure to spot gold prices and improve market sentiment.
- Newmont started development of the Phoenix project in Nevada, which is expected to produce more than 12 000 kg/y when production starts in 2006.
- Peru is set to become the world's fifth largest producer in 2005 with the start-up next year of the Alto Chicama and La Zanja projects and the expansion of the Aruntani mine.
- Cambior Inc. started commercial production at its new Rosebel mine in Suriname in the first quarter of 2004. Cambior began to wind down operations at its Omai property in Guyana with the last of the pit production completed in October. The mill will continue to process stockpiled ore through the first nine months of 2005.
- In November, Kinross announced the acquisition of its joint-venture partner's 51% interest in the Paracatu mine in Brazil for US\$260 million.
- A new gold-backed security known as streetTRACKS Gold Shares was listed on the New York Stock Exchange in November. The exchange-traded fund, which is sponsored by a unit of the World Gold Council, offers investors the ability to access the gold bul-

lion market, with each share representing one-tenth of an ounce of gold. Similar investment products are found on the Johannesburg Stock Exchange and in the United Kingdom and Australia.

## MARKET OUTLOOK

World gold demand rose over 4% in 2003 largely as the result of stronger investment buying offsetting declines in fabrication and de-hedging. Fabricated demand for gold fell by 3.6% to 3049 t, the lowest level in 12 years. While fabrication demand was up sharply in Turkey (47%) to reach third place after India and Italy, the increase was not enough to offset the fall in fabrication demand in Europe, Latin America and parts of east Asia. Jewellery demand fell by over 100 t, largely as the result of a 20% drop in the important Italian market.

While only accounting for 8% of total fabricated demand for gold, the electronics industry is the second largest market for gold after jewellery. Gold's high electrical conductivity, its malleability, and its resistance to corrosion have made it an important component in the manufacture of a wide range of electronic products and equipment, including computers, telephones, cellular telephones, and home appliances. Some 237 t was used in 2003, with Japan leading the way in the market accounting for 42% of the demand, or 100 t.

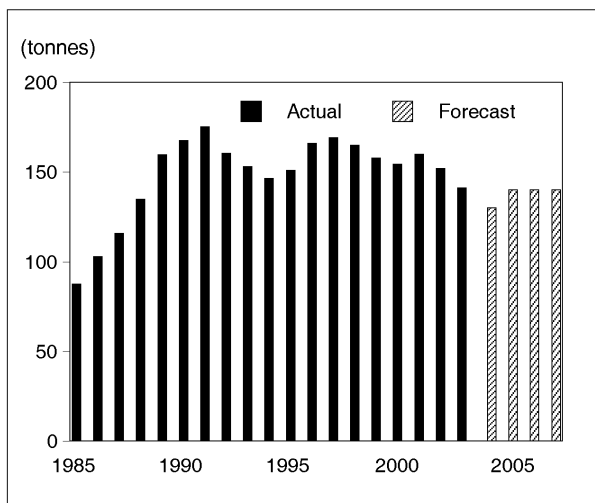
Turkey led the way in official coin production (47 t) in 2003, ahead of the United States (15 t) and Canada (7 t). Total world coin production rose 9% to reach close to 105 t.

## CANADIAN PRODUCTION OUTLOOK

In 2003, Canadian gold production totalled 141.5 t, a decrease of 7% compared to the 2002 total of 152 t. The reduction in production resulted primarily from a number of mine closures in Quebec, Ontario and Nunavut. For the first nine months of 2004, Canada produced some 94.8 t of gold, down by 9.6% over the same period in 2003. Production declines over the first nine months of 2004 were recorded in the Atlantic Provinces (down 43%), Quebec (down 10%), Ontario (down 6%), British Columbia (down 13%) and Northwest Territories (down 87%). The only increases were recorded in the Prairie Provinces (up 8%) and the Yukon (up 110%).

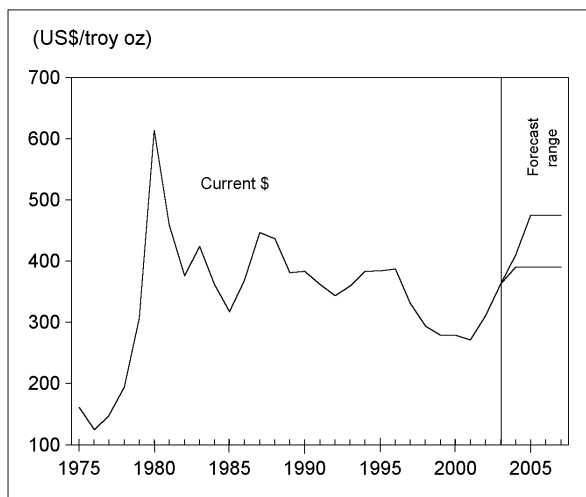
About 90% of Canada's gold production comes from hardrock underground and open-pit gold mines. The remainder is from base-metal mines and placer mining operations. Much of the decline in production over the first nine months of 2004 was the result of mine closures at gold mines. This trend is likely to continue as older base-metal mines reach the end of their ore reserves and fewer new mines come on stream to replace them.

**Figure 1**  
**Mine Production of Gold in Canada, 1985-2007**



Source: Natural Resources Canada.

**Figure 2**  
**London Bullion Market Association Gold Prices, 1975-2007**



Source: Natural Resources Canada.

## PRICE OUTLOOK

Gold prices made an impressive recovery in 2003 rising above the US\$400/oz barrier towards year-end, the highest level seen in 14 years. On average, gold was up 17% over 2002, reaching an annual average of US\$363/oz. While the price rise in U.S. dollar terms was positive, the net effect of the stronger Canadian dollar against the U.S. dollar resulted in gold prices in Canadian dollar terms ending the year lower than where they started in 2003 at an average \$508/oz.

Low interest rates and the record U.S. current account deficit continued to put downward pressure on the U.S. dollar in 2004. This in turn put upward pressure on gold prices. The renewal of the agreement by central banks to limit sales, de-hedging by producers, and lower mine output, combined with strong demand, all helped push gold prices to 16-year highs by November. The liberalization of gold markets in China and India is expected to increase investor demand in both of these important markets. Merger and acquisition activity will also likely continue in 2005 as large producers continue to seek increased market share.

Gold is expected to average somewhere in the \$410/oz range in 2004. Having broken through the \$450/oz barrier in late November, many analysts now predict that gold will continue to trade in the \$450-\$475/oz range in the first half of 2005.

*Note: Information in this article was current as of November 30, 2004.*

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**TABLE 1. COMPANY WEB SITES FOR FURTHER INFORMATION**

Company	Web Site Address
Agnico Eagle Mines Limited	<a href="http://www.agnico-eagle.com">www.agnico-eagle.com</a>
Aur Resources Inc.	<a href="http://www.aurreources.com">www.aurreources.com</a>
Aurizon Mines Ltd.	<a href="http://www.aurizon.com">www.aurizon.com</a>
Barrick Gold Corporation	<a href="http://www.barrick.com">www.barrick.com</a>
Bema Gold Corporation	<a href="http://www.bema.com">www.bema.com</a>
Breakwater Resources Ltd.	<a href="http://www.breakwater.ca">www.breakwater.ca</a>
Callinan Mines Limited	<a href="http://www.callinan.com">www.callinan.com</a>
Cambior Inc.	<a href="http://www.cambior.com">www.cambior.com</a>
Campbell Resources Inc.	<a href="http://www.ressourcescampbell.com">www.ressourcescampbell.com</a>
Centerra Gold Inc.	<a href="http://www.centerragold.com">www.centerragold.com</a>
Claude Resources Inc.	<a href="http://www.clauderresources.com">www.clauderresources.com</a>
Falconbridge Limited	<a href="http://www.falconbridge.com">www.falconbridge.com</a>
Goldcorp Inc.	<a href="http://www.goldcorp.com">www.goldcorp.com</a>
IAMGOLD Corporation	<a href="http://www.iamgold.com">www.iamgold.com</a>
Imperial Metals Corporation	<a href="http://www.imperialmetals.com">www.imperialmetals.com</a>
Inco Limited	<a href="http://www.inco.com">www.inco.com</a>
Inmet Mining Corporation	<a href="http://www.inmet-mining.com">www.inmet-mining.com</a>
Johnson Matthey Plc	<a href="http://www.matthey.com">www.matthey.com</a>
Kinross Gold Corporation	<a href="http://www.kinross.com">www.kinross.com</a>
Kirkland Lake Gold Inc.	<a href="http://www.klgold.com">www.klgold.com</a>
Miramar Mining Corporation	<a href="http://www.miramarmining.com">www.miramarmining.com</a>
Newmont Mining Corporation	<a href="http://www.newmont.com">www.newmont.com</a>
Noranda Inc.	<a href="http://www.noranda.com">www.noranda.com</a>
Northgate Minerals Corporation	<a href="http://www.northgateminerals.ca">www.northgateminerals.ca</a>
Placer Dome Inc.	<a href="http://www.placerdome.com">www.placerdome.com</a>
Richmont Mines Inc.	<a href="http://www.richmont-mines.com">www.richmont-mines.com</a>
River Gold Mines Ltd.	<a href="http://www.rivergoldmine.com">www.rivergoldmine.com</a>
Royal Canadian Mint	<a href="http://www.mint.ca">www.mint.ca</a>
Teck Cominco Limited	<a href="http://www.teckcominco.com">www.teckcominco.com</a>
Wheaton River Minerals Ltd.	<a href="http://www.wheatonriver.com">www.wheatonriver.com</a>

# Nickel

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(Abbreviations used in this article include: (e) = Estimated; (f) = forecast; (p) = Preliminary; Ni = nickel; Cu = copper; Co=cobalt; FeNi = ferronickel; LME = London Metal Exchange; NiO = nickel oxide; PGM = platinum group metals; 6 mo. = January to June; 9 mo. = January to September; conc. = concentrate.)

2003 mine production: \$2.0 billion  
 World rank: Third (mine production)  
 2003 exports: \$2.6 billion

Canada	2003	2004 (e)	2005 (f)
	(000 tonnes)		
Mine production	163	185	190
Refined production (1)	153	155	160
Use/consumption (2)	13	10	10

(e) Estimated; (f) Forecast.

(1) Refined includes nickel in salts, oxides, etc. (2) Use includes nickel in scrap; both plants of a large user of nickel in stainless scrap remained closed in 2004; if they were to be re-opened in 2005, nickel use could increase.

Nickel's resistance to corrosion, high strength over a wide temperature range, pleasing appearance, and suitability as an alloying agent make it useful in a wide variety of applications. Markets for primary nickel include stainless steel (65%), nickel-based alloys, electroplating, alloy steels, foundry products, batteries, and copper-based alloys. Nickel is intensively recycled; about 45% of nickel used to make stainless steels comes from nickel in stainless steel scraps.

## ANNUAL AVERAGE SETTLEMENT PRICES, LONDON METAL EXCHANGE

2000	2001	2002	2003	2004 (e)
(US\$/t and US\$/lb)				
8 641	5 948	6 772	9 640	13 500
3.92	2.70	3.07	4.37	6.12

(e) Estimated.

## CANADIAN OVERVIEW

- Falconbridge produced 36 800 t of Ni in conc. in 9 mo. from domestic mines and forecast 44 500 t for 2004. A feasibility study was under way at Raglan to expand nickel output by 5000 t/y. The Montcalm mine began shipping to the Kidd mill in Timmins for commissioning; capacity will be 8000-9000 t/y Ni. Advanced exploration at Nickel Rim South was approved. The US\$368 million project includes a shaft and underground development/drilling; for a mine a further US\$168 million is needed for 12 000-15 000 t/y Ni by 2010. In October, China Minmetals Corporation began negotiations to purchase Noranda, which owned 59% of Falconbridge.
- In November 2005, Inco intends to start shipping concentrate from Voisey's Bay to its hydrometallurgical demonstration plant at Argentia and to its Ontario and Manitoba smelters. Production is expected to be 2.4 Mt/y of high-grade Ni conc., 1.6 Mt/y of Ni-Cu conc. and 1.3 Mt/y of Cu conc. About half of the 50 000 t/y output from the US\$890 million Voisey's Bay project represents additional production and the other half will replace higher-cost Canadian mine output and imported feed from Australia. Average cobalt production is forecast at 2270 t/y. Inco forecast 123 000 t from Canadian mines and 32 600 t from purchased feeds in 2004.
- North American Palladium produces by-product Ni at its Lac des Iles palladium mine; it began developing an underground mine below the pit. Ore production is scheduled for early 2005.

- Sherritt International has a 50% interest in Metals Enterprise, which owns the Fort Saskatchewan nickel-cobalt refinery where production was 24 200 t of Ni and 2490 t of Co in 9 mo. 2004. A decision on whether to expand the refinery to 50 000 t/y Ni, as well as the mine and leach plant in Cuba, was expected by year-end 2004.
  - The Sudbury Joint Venture's (SJV) McCreeley mine in Sudbury officially started up January 1, reaching 900 t/d by April. SJV decided to proceed with a US\$30 million underground exploration program at the Norman (now Podolsky) deposit, including a ramp and shaft. In August, SJV decided to recondition the shaft at the Levack mine. All production was trucked to Inco's Clarabelle mill. SJV is owned by FNX Mining and Dynatec.
  - Canadian Arrow shipped ore from the Alexo mine near Timmins to Falconbridge's mill in Sudbury. The company intended to ship up to 20 000 t of ore while drilling continues. Inco has an option to earn up to 70% of Canadian Arrow's Redstone property near Timmins.
  - Crowflight Minerals completed a preliminary resource evaluation at the Bucko property in Manitoba for a 5000-t/y Ni operation. Nuinsco Resources completed a preliminary pit design at the Mel deposit in Manitoba based upon 2 Mt grading 0.76% Ni.
  - Interest in nickel in Canada increased due to high nickel prices. Some of the exploration and development companies and the names of the properties and projects in 2004 included:
    - Aurora Platinum at Nickel Lake and Foy Offset at Sudbury, Ontario, and properties in Temiscamingue, Quebec;
    - Blackstone Ventures at Kenbridge Nickel Mines in northwestern Ontario;
    - In the Thompson Nickel Belt of northern Manitoba, BHP Billiton Diamonds at Stephens Lake, Callinan Mines at Pine and Phillips lakes, Canadian Royalities at the Thompson Nickel Belt South property, Crowflight Minerals at the Bucko and Bowden deposits, Nuinsco Resources at the Minago project, and Donner Minerals at Rainbow and Stephens lakes;
    - In the Raglan area of northern Quebec, Cascadian International Resources and Novawest at the Norton property, and Knight Resources and Anglo American Exploration (Canada) at the West Raglan property;
    - Falconbridge at Konrad in the Voisey's Bay area of Labrador;
    - First Nickel at Dundonald near Timmins, Ontario;
    - Inspiration Mining at the Langmuir property near Timmins, Ontario;
    - Liberty Mineral Exploration at McAra Lake and the McWatters project in northeastern Ontario;
    - Limerick Mines 80 km north of Belleville, Ontario;
    - Mustang Minerals at Maskwa and Bannockburn, northeastern Ontario;
    - Platinum Group Metals at Lakemount, near Wawa, Ontario;
    - Randsburg International Gold at McClintock, near Huntsville, Ontario;
    - Starfield Resources at Ferguson Lake in Nunavut;
    - Teck Cominco/Altius Minerals at the Michikamau project in Labrador;
    - United Reef /CHS Resource Corporation at Nickel Offsets near Sudbury, Ontario;
    - URSA Major Minerals completed a prefeasibility study of its Shakespeare deposit, near Sudbury; and
    - Wallbridge Mining/Lonmin Canada at Worthington, Windy Lake and Wisner, near Sudbury, Ontario.
- (For more information, the reader can go to the corporate web sites [see Table 1]; note also the Standards for Disclosures for Mineral Projects at [www.ccpq.ca/guidelines/standards\\_disclosure\\_43-101-1.pdf](http://www.ccpq.ca/guidelines/standards_disclosure_43-101-1.pdf).)
- New federal regulations for SO<sub>2</sub> smelter emissions were proposed in September.

## WORLD OVERVIEW

### Americas

- In Brazil, Canico Resources tested a FeNi process in 2004 for its Onça-Puma property and received a preliminary environmental licence for its proposed mine/smelter.
- Mirabela Nickel focused on the development of a high-grade saprolite property in Brazil for direct shipping to FeNi smelters.
- CVRD continued to work on the Vermelho project with a feasibility study expected by March 2005.
- Rio Tinto completed the sale of its Fortaleza mine, mill and smelter in Brazil to Votorantim Metais, which also owns Companhia Niquel Tocantins.
- In Guatemala, Jaguar Nickel had positive results from tests of its atmospheric chloride leach process and continued drilling its Guatemalan properties.
- Skye Resources' negotiations continued with Inco to buy the Exmibal concessions and plant in Guatemala.
- In the United States, three projects under consideration were the Birch Lake project of Franconia Minerals, the



Eagle project of Kennecott Minerals, and the NorthMet project of Polymet Mining.

- In the Dominican Republic, Falcondo produced 22 300 t of Ni in FeNi in 9 mo. and was scheduled to produce 28 000 t in 2004.

## Africa

- Anglovaal Mining was restructured to African Rainbow Minerals, which held the Nkomati Ni- PGM operation.
- Rio Tinto reduced its share of Rio Tinto Mining Zimbabwe (RioZim), owner of the Empress refinery, in a restructuring agreement that gives Rio Tinto a greater share of the Murowa diamond mine.
- Production at Bindura Nickel, bought by Mwana Africa Holdings in 2003, was not reported.
- Maple Minerals may earn a 50% share in the Mt. Kakoulima sulphide property in Guinea.
- Dynatec spent US\$20 million to earn a 53% share in the Ambatovy project in Madagascar and was completing a bankable feasibility study of a 60 000-t/y Ni and 5000-t/y Co operation.
- Falconbridge and Barrick Gold continued negotiation of an agreement to allow the former to earn a 50% share in the Kabanga sulphide project (26 Mt grading 2.6% Ni).
- LionOre commissioned its Activox demonstration plant at its Tati operation in Botswana; success could lead to an expansion to about 18 500 t/y Ni at Tati.
- Zimplats will proceed with underground mine development and a mill at Ngezi in Zimbabwe.

## Asia

- In China, Jinchuan Group continued its expansion, targeting 70 000 t Ni in 2004. Jinchuan will import matte from WMC Resources to augment increased nickel feed from Sally Malay, Rio Narcea and other operations. Jinchuan started up a new mill, doubling capacity to 10 Mt/y, to accommodate expansion of its Longshou mine; opened a new Co production line; and started construction of a 530 000-t/y H<sub>2</sub>SO<sub>4</sub> plant.
- Inco announced that it was considering construction of a refinery in China to process output from Goro, New Caledonia, where NiO production is expected in 2007.
- Korea Nickel shut its main furnace in June for repairs expected to take six months.

- In Kazakhstan, Oriel Resources completed a prefeasibility study of its Schevchenko project, a mine, and a FeNi smelter.
- European Nickel received environmental approval to proceed at the Çalda property in Turkey and began heap leach trials in mid-October. The plan is to produce 15 000 t/y of Ni in mixed hydroxide.
- Asian Mineral Resources continued exploration at its Ban Phuc deposit in Vietnam.

## Europe

- In Europe, Rio Narcea was building its €70 million mine and mill, with ore processing to begin before 2005 and concentrate to be shipped to Jinchuan in China.
- Falconbridge's Nikkelverk plant in Norway produced 51 000 t in 9 mo. 2004; the forecast for 2004 was 72 000 t Ni.
- OMG's Harjavalta refinery in Finland was expected to produce about 52 500 t in 2004.
- Blackstone Ventures worked at the Espedalen and Vakkerlein projects in Norway (optioned from Falconbridge).
- In Russia, Norilsk Nickel announced that 2004 sales would be 250 000 t of Ni, including 10 000 t from stocks; Norilsk produced 122 000 t in the first half of 2004. A €100 million SO<sub>2</sub> reduction program at the Polar Division will begin in 2005. The company releases reserve data in June.
- Ufaleynikel forecast its production at 5200 t Ni; the company's cobalt output will be 1850 t in 2004 as Norilsk reduced cobalt tolling at Ufaleynikel.

## Australia

Australian developments were numerous, including:

- BHP Billiton approved its US\$1 billion Ravensthorpe mine/leach plant (50 000 t/y Ni and 1400 t/y Co in hydroxides) and a US\$350 million expansion at Yabulu for start-up in late 2007.
- Fox Resources shipped Ni-Cu concentrate to Jinchuan from Radio Hill, while LionOre purchased the Bulong plant, negotiated an offtake agreement for the Forrestania project of Western Areas, started ore production at Maggie Hayes in August, and made a takeover offer for the nickel assets of MPI (80% of Black Swan operation and Honeymoon Well deposit).

- Although Minara completed an A\$100 million capital program in mid-2004, it was producing below an annualized rate of 30 000 t/y Ni and may install a fifth autoclave.
- Sally Malay started production in August, shipping concentrate to Jinchuan.
- WMC Resources produced 84 400 t of Ni in concentrate in 9 mo. 2004 and forecast 2004 production at 102 000 t; over 20 000 t of Ni in concentrates were processed from third parties at the Kambalda mill, receiving feed from Australian Mines, Lightning Nickel, Reliance Mining, Mincor, Tectonic Resources, and View Resources, with Sally Malay/Donegal production from Lafranchi likely in 2005.
- WMC Resources will start a prefeasibility study of its Yakabindie deposit, including trials for a new leach process for the high MgO ore. In late October, Xstrata plc made an offer to take over WMC Resources.
- Indonesia's PT Antam shut its FeNi II smelter for an overhaul and modernization while continuing to build its FeNi III smelter to raise the company's Ni in FeNi capacity to 26 000 t/y. Antam also exports high-grade ore to Japanese FeNi smelters and lower-grade ore to BHP Billiton's Yabulu refinery.
- Weda Bay continued test work and drilling at its deposit in Indonesia; a US\$700 million plant to produce mixed sulphides containing 52 800 t/y Ni and 3900 t/y Co is envisaged.
- Highlands Pacific and China Metallurgical Construction Corp. continued negotiations to develop a US\$790 million project in Papua New Guinea to produce 32 800 t/y Ni and 3200 t/y Co either in intermediates or as a final product; Chinese Metallurgical Construction Group Corporation (MCC) wanted 100% of the output.
- Inco announced a US\$250 million expansion at its PT Inco operation to 90 700 t/y, including a new dam to increase hydro-electric capacity.

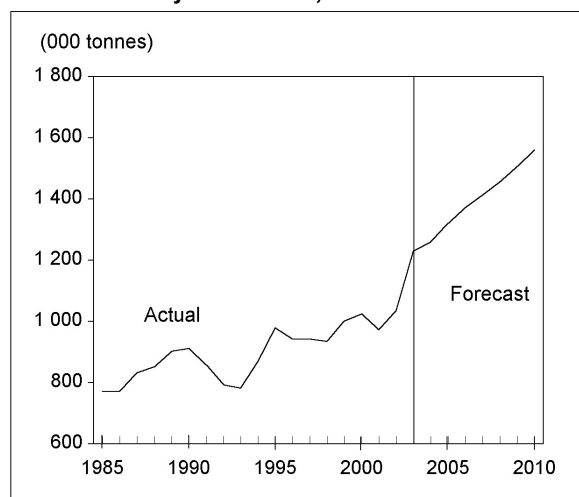
## Oceania

- In New Caledonia, Inco resumed work on its Goro project, halted from December 2002 to October 2004 due to rising costs. The renewed project targets 60 000 t/y Ni in oxide sinter plus 4300-5000 t/y Co by-product, with the first autoclave scheduled to start up in September 2007. The original project had been approved in April 2001 and was scheduled to produce in late 2004. Financial assistance of US\$350 million from the French government and a tax holiday of 15 years were negotiated. Sumitomo Metal Mining and Mitsui & Co., Ltd. were negotiating taking 11% and 10% shares, respectively, in Goro.
- Falconbridge was to complete its bankable feasibility study of the 60 000-t/y Koniambo project before 2005. Falconbridge would be a 49% owner of the joint venture with La Société Minière du Sud Pacifique and also expected to receive financial assistance from the French government and a tax holiday.
- Eramet completed a new furnace at its Doniambo smelter, part of an expansion to 75 000 t/y Ni in FeNi and matte; the company's matte refinery in France will be expanded to produce up to 15 000 t/y Ni and 300 t/y Co.
- Elsewhere in Oceania, Coral Bay Nickel began commissioning its leach plant in the Philippines. The plant will produce 10 000 t/y Ni in sulphide intermediates from stockpiled laterite ore, shipping the output to Sumitomo's refinery in Japan. MBMI Resources was assessing an option for a project to export laterite ore from Philippine properties in Palawan province.

## DEMAND OUTLOOK - WORLD

World demand for nickel was forecast by the International Nickel Study Group to reach a record high of 1.23 Mt in 2004 and to climb to 1.32 Mt in 2005. Such an increase would require continued robust economic growth, especially in China and in China's export markets. As Inco noted in various presentations in 2004, demand growth in

**Figure 1**  
World Primary Nickel Use, 1985-2010



Source: Natural Resources Canada.

Note: This is an average forecast; yearly actuals will differ from the trend.

2005 will be limited by supply. Demand for nickel is being negatively affected by high prices and substitution is occurring; some substitution will remain even after future nickel prices decline from the unsustainable high levels of 2004-05. High prices result in new nickel production capacity concurrently with substitution leading to weaker prices, although many uses of nickel are relatively insensitive to high prices, such as the growing aerospace applications. A long-term trend of 3%/y is forecast, but significant volatility about the trend is forecast due to economic cycles. The figure below shows a forecast to 2010, assuming demand peaks in 2005 due to sustained demand from China for primary nickel and stainless steel.

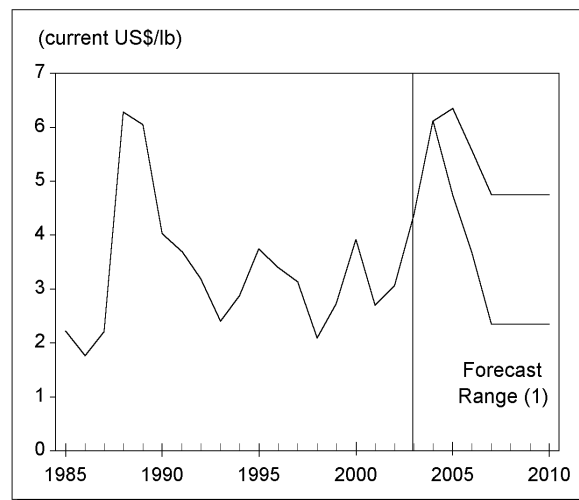
## PRODUCTION OUTLOOK - CANADA

Canadian exports of nickel products in 2004 are forecast at \$4.3 billion with major items, such as nickel in matte (25%), nickel oxide sinters (15%) and unwrought nickel, accounting for over 50% of exports. Canadian nickel imports in 2004 are forecast at \$1.1 billion, of which over \$660 million will be nickel in concentrates (mostly from Australia) and nickel in residues (from Cuba). Canadian mine production in 2005 is projected at 190 000 t, including output from Montcalm and Voisey's Bay and increased output from Raglan. "Refined" nickel production for 2005 is projected at 155 000 t, assuming that Inco makes up production to be "lost" during its 2005 maintenance shut-down in Sudbury. Production from Voisey's Bay is scheduled to increase Inco's Canadian output by 35 000 t in 2006, estimated to total about 155 000-160 000 t of Ni. Inco projected its Canadian production in 2009 at 172 000 t (note that this total includes output from Inco's U.K. refinery). Increasing prices sheltered domestic nickel producers from the higher value of the Canadian currency; as nickel prices decline, cost pressures will increase on existing and potential producers and cutbacks may occur. Costs to comply with SO<sub>2</sub> reductions and climate change regulations will add to financial pressures due to higher energy costs.

## PRICE OUTLOOK

To November 11, the LME settlement nickel price averaged US\$13 840/t (US\$6.28/lb). Prices are expected to average US\$13 900/t (US\$6.30/lb) for 2004. They are projected to peak in 2005 at US\$14 000/t (US\$6.35/lb). Thereafter, the price of nickel will also be affected by the value of the U.S. currency. If the U.S. currency is "weak" at about US\$1.50/SDR (the SDR, or Special Drawing Right, is the International Monetary Fund's currency basket), the long-term forecast is predicted to be within the range of US\$2.57 to US\$5.21/lb. The graph at the right shows a projected range of \$1.71 to \$3.47 SDR/lb and a U.S. currency exchange rate of US\$1.37/SDR. Since 1986, two thirds of monthly exchange rates fell within a range of US\$1.28 to US\$1.45/SDR. The manner in which

**Figure 2**  
Nickel Prices, 1985-2010  
Annual LME Cash Settlement



Source: Natural Resources Canada.  
(1) US\$5200/t to US\$10 500/t.

prices decline to the projected long-term range will depend upon how, when and how fast the world economy slows. It will be instructive to see the nickel producers' long-term price forecasts used to value their ore reserves in forthcoming annual reports.

*Notes: Information in this review was current as of November 11, 2004. Many significant nickel events were not shown due to space limitations; further detail can be found on the corporate web sites (see Table 1). Note that data may be rounded; see corporate documents for exact data.*

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Adelaide Resources	<a href="http://www.adelaideresources.com.au">www.adelaideresources.com.au</a>
African Rainbow Minerals	<a href="http://www.arm.co.za">www.arm.co.za</a>
Albidon	<a href="http://www.albidon.com">www.albidon.com</a>
Allegiance Mining	<a href="http://www.allegiance-mining.com.au">www.allegiance-mining.com.au</a>
Altius Minerals Corporation	<a href="http://www.altiusminerals.com">www.altiusminerals.com</a>
Anglo American	<a href="http://www.angloamerican.co.uk">www.angloamerican.co.uk</a>
Anglo American Platinum	<a href="http://www.angloplatinum.com">www.angloplatinum.com</a>
Apex Minerals	<a href="http://www.apexminerals.com">www.apexminerals.com</a>
Asian Mineral Resources	<a href="http://www.asianminres.com">www.asianminres.com</a>
Aurora Platinum	<a href="http://www.auroraplatinum.com">www.auroraplatinum.com</a>
Austminex	<a href="http://www.austminex.com.au">www.austminex.com.au</a>
Australian Mines	<a href="http://www.australianmines.com.au">www.australianmines.com.au</a>
Bell Resources Corporation	<a href="http://www.bellresources.com">www.bellresources.com</a>
Belvedere Resources	<a href="http://www.belvedere-resources.com">www.belvedere-resources.com</a>
Blackstone Ventures	<a href="http://www.blv.ca/s/Home.asp">www.blv.ca/s/Home.asp</a>
Boliden AB	<a href="http://www.boliden.com">www.boliden.com</a>
Breakaway Resources	<a href="http://www1.breakawayresources.com.au">www1.breakawayresources.com.au</a>
Callinan Mines	<a href="http://www.callinan.com">www.callinan.com</a>
Canadian Arrow Mines	<a href="http://www.canadianarrowminesltd.com">www.canadianarrowminesltd.com</a>
Canadian Royalties	<a href="http://www.canadianroyalties.com/en">www.canadianroyalties.com/en</a>
Canico Resource Corp.	<a href="http://www.canico.com/s/Home.asp">www.canico.com/s/Home.asp</a>
Compass Resources	<a href="http://www.compassnl.com">www.compassnl.com</a>
Consolidated Minerals	<a href="http://www.consminerals.com.au">www.consminerals.com.au</a>
Cornerstone Capital Resources	<a href="http://www.cornerstoneresources.com">www.cornerstoneresources.com</a>
Costamin Resources	<a href="http://www.costaminresources.com">www.costaminresources.com</a>
Cougar Minerals	<a href="http://www.cougarmetals.com.au">www.cougarmetals.com.au</a>
Cream Minerals	<a href="http://www.creamminerals.com">www.creamminerals.com</a>
Crew Gold Corporation	<a href="http://www.crewgroup.com">www.crewgroup.com</a>
Crowflight Minerals	<a href="http://www.crowflight.com">www.crowflight.com</a>
Cullen Resources	<a href="http://www.cullenresources.com.au">www.cullenresources.com.au</a>
Discovery Nickel	<a href="http://www.discoverynickel.com.au">www.discoverynickel.com.au</a>
Donner Minerals Ltd.	<a href="http://www.donner-minerals.com">www.donner-minerals.com</a>
Dynatec Corporation	<a href="http://www.dynatec.ca">www.dynatec.ca</a>
East West Resources	<a href="http://www.eastwestres.com">www.eastwestres.com</a>
Eramet Group	<a href="http://www.eramet.fr">www.eramet.fr</a>
European Nickel	<a href="http://www.enickel.co.uk">www.enickel.co.uk</a>
Falcon Minerals	<a href="http://www.falcon.indigo.net.au">www.falcon.indigo.net.au</a>
Falconbridge	<a href="http://www.falconbridge.com">www.falconbridge.com</a>
First Narrows Resources	<a href="http://www.uno.ca">www.uno.ca</a>
First Nickel Inc.	<a href="http://www.firstnickel.com">www.firstnickel.com</a>
FNX Mining Company	<a href="http://www.fnxmining.com">www.fnxmining.com</a>
Fox Resources	<a href="http://www.foxresources.com.au">www.foxresources.com.au</a>
Franconia Minerals	<a href="http://www.franconiaminerals.com">www.franconiaminerals.com</a>
Geostar Metals	<a href="http://www.geostarmetals.com">www.geostarmetals.com</a>
Goldmarca	<a href="http://www.goldmarca.com">www.goldmarca.com</a>
Hallmark Consolidated	<a href="http://www.hallmarkconsolidated.com">www.hallmarkconsolidated.com</a>
Heron Resources	<a href="http://www.heronresources.com.au">www.heronresources.com.au</a>
Highlands Pacific	<a href="http://www.highlandspacific.com">www.highlandspacific.com</a>
Impala Platinum Holdings	<a href="http://www.implats.co.za">www.implats.co.za</a>
Inco Limited	<a href="http://www.inco.com">www.inco.com</a>
Independence Group	<a href="http://www.independencgold.com.au">www.independencgold.com.au</a>
Jaguar Nickel	<a href="http://www.jaguarnickel.com">www.jaguarnickel.com</a>
Jervois Mining	<a href="http://www.jervoismining.com.au">www.jervoismining.com.au</a>
Jilin JIEN Nickel Industry Co.	<a href="http://www.jlnickel.com.cn">www.jlnickel.com.cn</a>
Jinchuan Group	<a href="http://www.jnmc.com">www.jnmc.com</a>
Jubilee Mines	<a href="http://www.jubileemines.com.au">www.jubileemines.com.au</a>
Kennecott Minerals	<a href="http://www.kennecottminerals.com/Eagle-Project">www.kennecottminerals.com/Eagle-Project</a>
Knight Resources	<a href="http://www.knightresources.ca">www.knightresources.ca</a>

TABLE 1 (cont'd)

Company	Web Site Address
Liberty Mineral Exploration	<a href="http://www.libertymineral.com">www.libertymineral.com</a>
LionOre Mining International	<a href="http://www.lionore.com">www.lionore.com</a>
Maple Minerals	<a href="http://www.mapleminerals.com">www.mapleminerals.com</a>
MBMI Resources	<a href="http://www.mbmresources.com">www.mbmresources.com</a>
Metallica Minerals	<a href="http://www.metallicaminerals.com.au">www.metallicaminerals.com.au</a>
Minara Resources	<a href="http://www.minara.com.au">www.minara.com.au</a>
Mincor Resources	<a href="http://www.mincor.com.au">www.mincor.com.au</a>
Mirabela Nickel	<a href="http://www.mirabelanickel.com.au">www.mirabelanickel.com.au</a>
Mithril Resources	<a href="http://www.mithrilresources.com.au">www.mithrilresources.com.au</a>
MMC Norilsk Nickel	<a href="http://www.nornik.ru/en">www.nornik.ru/en</a>
Mondo Minerals	<a href="http://www.mondominerals.com">www.mondominerals.com</a>
MPI Mines Ltd	<a href="http://www.mpimines.com.au">www.mpimines.com.au</a>
Mustang Minerals	<a href="http://www.mustangminerals.com">www.mustangminerals.com</a>
Nickel Australia	<a href="http://www.nickelaustralia.com.au">www.nickelaustralia.com.au</a>
Noranda Inc	<a href="http://www.noranda.com">www.noranda.com</a>
North American Palladium	<a href="http://www.napalladium.com">www.napalladium.com</a>
Nuinsco Resources	<a href="http://www.nuinsco.ca">www.nuinsco.ca</a>
OM Group	<a href="http://www.omgi.com">www.omgi.com</a>
Oriel Resources	<a href="http://www.orielresources.com">www.orielresources.com</a>
Pacific North West Capital	<a href="http://www.pfncapital.com">www.pfncapital.com</a>
PacRim Resources	<a href="http://www.pacrim-resources.com">www.pacrim-resources.com</a>
Pearce Matheson Group	(unknown)
Pioneer Nickel	<a href="http://www.pioneernickel.com.au">www.pioneernickel.com.au</a>
Platinum Group Metals	<a href="http://www.platinumgroupmetals.net">www.platinumgroupmetals.net</a>
Polymet Mining	<a href="http://www.polymetmining.com">www.polymetmining.com</a>
PT Antam Tbk	<a href="http://www.antam.com">www.antam.com</a>
Randsburg International Gold Corp.	<a href="http://www.randsburgdiamonds.com">www.randsburgdiamonds.com</a>
Reliance Mining	<a href="http://www.reliancemining.com.au">www.reliancemining.com.au</a>
ReLode Limited	<a href="http://www.relude.com.au">www.relude.com.au</a>
Resolute Mining	<a href="http://www.resolute-ltd.com.au">www.resolute-ltd.com.au</a>
Resource Mining Corporation	<a href="http://www.resmin.com.au">www.resmin.com.au</a>
Ressources Appalaches	<a href="http://www.ressourcesappalaches.com">www.ressourcesappalaches.com</a>
Rio Narcea Gold Mines	<a href="http://www.rionarcea.com">www.rionarcea.com</a>
Rio Tinto plc	<a href="http://www.riotinto.com">www.riotinto.com</a>
Rox Resources	<a href="http://www.roxresources.com.au">www.roxresources.com.au</a>
Sally Malay Mining	<a href="http://www.sallymalay.com">www.sallymalay.com</a>
Sherritt International Corp.	<a href="http://www.sherritt.com">www.sherritt.com</a>
Sino Mining International	<a href="http://www.sinogold.com.au">www.sinogold.com.au</a>
Skye Resources.	<a href="http://www.skyeresources.com">www.skyeresources.com</a>
Starfield Resources	<a href="http://www.starfieldres.com">www.starfieldres.com</a>
Sultan Minerals	<a href="http://www.sultanminerals.com">www.sultanminerals.com</a>
Tectonic Resources	<a href="http://www.tectonicres.com.au">www.tectonicres.com.au</a>
Tenant Creek Gold	<a href="http://www.tennantcreekgold.com.au">www.tennantcreekgold.com.au</a>
Thundelarra Exploration	<a href="http://www.thundelarra.com">www.thundelarra.com</a>
Titan Resources	<a href="http://www1.titanresources.com.au">www1.titanresources.com.au</a>
Ursa Major International	<a href="http://www.ursamajorminerals.com">www.ursamajorminerals.com</a>
Valgold Resources	<a href="http://www.valgold.com">www.valgold.com</a>
View Resources	<a href="http://www.viewresources.com.au">www.viewresources.com.au</a>
Voisey's Bay Nickel Company	<a href="http://www.vbnc.com">www.vbnc.com</a>
Votorantim Metais	<a href="http://www.vmetais.com.br/homecnt.htm">www.vmetais.com.br/homecnt.htm</a>
Wallbridge Mining	<a href="http://www.wallbridgeminig.com">www.wallbridgeminig.com</a>
Weda Bay Minerals	<a href="http://www.wedabay.com">www.wedabay.com</a>
Western Areas	<a href="http://www.westernareas.com.au">www.westernareas.com.au</a>
Westonia Mines	<a href="http://www.westoniamines.com.au">www.westoniamines.com.au</a>
WMC Resources	<a href="http://www.wmc.com">www.wmc.com</a>
Zimbabwe Platinum Mines	<a href="http://www.zimplats.com">www.zimplats.com</a>

# The Canadian and World Economic Situation and Outlook

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In the third quarter of 2004, the Canadian economy (real gross domestic product) grew by 3.2% annualized, following increases of 3.9% in the second quarter and 2.7% in the first quarter. The third-quarter increase, while still relatively strong, was less than generally expected. (By way of comparison, the economy grew by 2.0% in 2003 and 3.4% in 2002.) The economy ended the quarter on a weak note with no growth in September. Strong domestic demand and a 1.1% advance in business investment (quarter to quarter) were offset by a decline in exports. For 2004, the Canadian economy is expected to expand by about 2.7% with real gross domestic product (GDP) growth to average about the same in 2005 and about 3% in 2006.

The U.S. economy grew at a 3.9% annualized rate in the third quarter of 2004, compared to a robust 4.5% real growth rate in the first quarter and a 3.3% increase in the second quarter. The acceleration in real GDP in the third quarter primarily reflected gains in personal consumption expenditures, increased exports, and reduced imports, the latter two indicators reflecting the lower value of the U.S. dollar relative to other major currencies. Growth for 2004 is expected to reach about 4.5%. Rising interest rates will likely moderate growth in the United States over the next two years to somewhere in the 3 to 3.5% range.

Factors affecting Canada's economy in 2004 included a marked recovery in world economic growth; increasing commodity prices; higher energy costs; the growing presence of China, India and other major emerging-market economies; and, most importantly, a major appreciation of the Canadian dollar relative to the U.S. currency.

The appreciation of the Canadian dollar, reaching over US\$0.84 in November, compared to about US\$0.77 at the end of 2003, finally seems to be having an impact on the Canadian international merchandise trade situation. The value of Canadian exports declined by 0.5% in the third

quarter, the first quarter-over-quarter decline since the third quarter of 2003. Merchandise exports declined in September for the third consecutive month to \$36.1 billion (excluding services) as a result of lower exports to the United States, Japan and the European Union. While the recent decline in the value of Canadian exports is a concern, the figures must be kept in perspective. The value of exports of goods and services in the third quarter of 2004 was \$468.7 billion (seasonally adjusted at annual rates), more than 7% above year-ago levels. Exports continue to be a major contributor to economic growth. In 2003, exports contributed more than 40% to Canada's GDP and this level is being maintained so far in 2004.

Benefiting from the appreciating dollar, imports of goods and services rose 3.1% in the third quarter compared to the second quarter. Third-quarter imports, at \$446.3 billion, are more than 11% above year-ago levels. Merchandise imports in September remained virtually unchanged from the month earlier at \$31.0 billion. The combination of lower exports and higher imports has reduced the trade surplus, thus reducing the rate of growth of the GDP. The rise in imports is a reflection of strong domestic demand and has contributed to solid gains in business inventories, production levels and investment levels.

Corporate profits slowed considerably in the third quarter to 2.1% following two consecutive quarters of more than 7%. While mining, oil and gas profits benefited from higher prices, manufacturing profits were hurt by weaker exports. Expectations are that real business investment growth will increase by about 5% this year and by close to 7% in 2005, and will therefore be a key driver for the economy.

Somewhat slower growth at the end of 2003 and early 2004, combined with a core inflation rate below the Bank of Canada's target rate, prompted the Bank to lower its target overnight interest rate a total of 75 basis points from 2.75% at the end of 2003 to 2.0% by April 2004. With Canada's economy expected to remain near its production capacity through 2005 and in an effort to maintain the core inflation level at around 2%, the Bank began raising rates gradually, increasing the target rate by 25 basis points in both September and October of 2004. Downward risk factors such as weaker U.S. demand, declining commodity prices, weakness in Canadian housing markets, or a

continuing strong Canadian dollar will likely forestall rate increases until the latter half of 2005. The November jobs data (see below), combined with the third-quarter economic data, resulted in the Bank of Canada leaving the benchmark overnight interest rate unchanged in December.

Consumer spending increased by 0.7% in the third quarter compared to 0.5% in the second. Domestic demand continues to be rooted in favourable fundamentals – low interest rates, record employment levels, and high commodity prices, personal incomes and corporate profits.

The third-quarter personal savings rate dropped to zero, the lowest level since 1936. So, while consumer spending remains robust, it is at the expense of personal savings. Higher interest rates would likely curtail consumer spending, dampen residential construction activity and encourage personal savings, although rate increases appear unlikely over the next several months.

The “All items” Consumer Price Index (CPI) increased by 2.3% in October 2004 (year over year), mainly because of significantly higher gasoline prices. The CPI, excluding food and energy, increased by 1.0% in October compared to 1.2% in September, 1.2% in August and 1.6% in July. These levels of inflation are not yet indicating price pressures and, with the strong Canadian dollar tempering future price pressures, the CPI is expected to remain below 2% in 2005 and at about 2% in 2006.

Over the first 11 months of 2004, employment has grown by 195 000. All of this increase is a result of full-time employment gains. The number of people employed in Canada (both full- and part-time) surpassed 16 million earlier in 2004 and, as of November, stood at 16 115 000, the highest level in Canadian history. After two months at 7.1%, the unemployment rate in November increased to 7.3%. The modest number of jobs created (an increase in part-time employment was offset by a slight decline in full-time employment) was offset by a higher number of people entering the labour market. One somewhat worrying statistic did emerge from the November data. Employment fell by 18 000 in manufacturing, bringing job losses in the sector since July to 52 000 (-2.2%).

Canadian manufacturers are facing challenges as the Canadian dollar has strengthened relative to the U.S. dollar (it is at its highest value in over a decade). Also a concern to manufacturers is the price of crude oil and its impact on production costs, although crude prices have fallen recently as mild weather in parts of the United States has tempered demand.

The Canadian dollar has been strengthening steadily since early 2002 when it traded at under US\$0.63. For the first time since March 1993, the monthly average exchange rate for the Canadian dollar exceeded US\$0.80 (in October 2004). In November it surpassed US\$0.84 before settling

back to the US\$0.81-\$0.82 range during the last month of 2004. In addition to the weakness being exhibited by the U.S. dollar, the Canadian dollar’s strength relative to the U.S. dollar is due to strong domestic growth and the interest rate differential between Canada and the United States. This differential, however, decreased as the United States raised its benchmark rate by 25 basis points in December. High commodity prices resulting from global economic strength has also contributed, as has potential foreign investment in Canada’s resource sector. While there may be some uncertainty regarding future resource price movements, indications are that the Canadian dollar will retain its value through 2005, although it will be subject to short-term volatility. The assumption regarding the dollar’s strength will be an important determinant with respect to the overall growth in the Canadian economy. If the Canadian dollar weakens appreciably, Canada’s growth rate is likely to be stronger than that forecast above.

Growth in the U.S. economy should approach a robust 4.5% in 2004, which is much improved over the 3.0% achieved in 2003 and 1.9% in 2002. The economy grew at an annualized rate of 3.9% in the third quarter of 2004 following increases of 3.3% in the second quarter and 4.5% in the first. In addition to personal consumption expenditures, increased exports, and reduced imports, contributions to third-quarter growth included government expenditures, equipment and software, and residential fixed investment. Fourth-quarter growth will likely remain above 4%.

The U.S. labour market has created a respectable average of about 185 000 jobs through the first 11 months of 2004, although the November total of 112 000 was disappointing. This brought the number of people employed to 140.3 million, the first time the employment level has surpassed 140 million. The unemployment rate has hovered around 5.4-5.5% through the last half of 2004 and will likely average about 5.5% for 2004 as a whole. Next year, the unemployment rate is expected to decline slightly from the 2004 average.

The weakness of the U.S. dollar is a major factor affecting the current economic situation and prospects for the future. Except for those countries whose currencies are tied to the U.S. dollar, the weak dollar makes U.S. exports less expensive. Conversely, imports to the United States tend to be more expensive, again except for imports from dollar-pegged countries such as China, Hong Kong or Malaysia, or those who sell their products in U.S. dollars, such as Japan or Korea. Lower export prices encourage higher export levels, while the more expensive imports tend to discourage imports, thus helping to reduce the huge U.S. international current account deficit currently running at about US\$650 billion, or about 6% of U.S. GDP. As weak as the dollar currently is, prospects are good that it may fall even further. Its value is being supported by heavy intervention by Asian central banks in order to keep the value of their exports relatively cheap in

order to support rapid growth in their countries. The U.S. Federal Reserve is expected to gradually but steadily increase interest rates in order to make investing in the dollar more attractive and to reduce inflationary pressures. The December 25-point increase in the federal funds rate brought it to 2.25% at the end of 2004. But if Asian banks decide to reduce their holdings of U.S. dollars, if some of those countries unhitch their currencies from the dollar, or if they decide to invest in other currencies, such as the euro, the U.S. dollar could fall even further.

The U.S. Consumer Price Index rose 0.5% in October 2004 compared to September. The October level of 190.9 (1982-84=100) was 3.2% higher than in October 2003. The compound annual rate for the three-month period ending in October was 3.4%. Energy costs, which declined in each of the preceding three months after advancing sharply in the first half of the year, increased 4.2% in October, accounting for over half of the advance in the overall CPI. The index for all items less food and energy increased at a much more modest pace of 0.2% in October. During the first 10 months of 2004, the CPI rose at a 3.9% seasonally adjusted annual rate (SAAR) compared to 1.9% for all of 2003. The index for energy advanced at a 22.5% SAAR in the first 10 months of 2004. This compares to 6.9% in 2003. Inflation is likely to moderate in 2005. As interest rates rise and the demand for durable goods subside, consumer spending is expected to moderate. In addition, oil prices have recently dropped significantly from around US\$55 a barrel to about US\$43 in early December.

In an effort to slow the pace of economic growth in China, the People's Bank raised lending rates for the first time in more than nine years in 2004 from 5.31% to 5.58%.

While this modest increase will not, on its own, have a significant impact on growth, it sends a clear message that authorities are determined to slow the rapid expansion of their economy to a more sustainable level. Other rate hikes are possible, as is the possibility that China may consider allowing its currency, the yuan, to float against the U.S. dollar. After growing at a real rate of about 9% in 2004, China's growth is expected to moderate to a still very robust 7.5% in 2005.

In Japan, GDP grew very strongly in the first quarter of 2004, with exports and business fixed investment being the main driving forces. Second-quarter growth, however, was weaker, primarily on account of a sharp drop in inventory accumulation and a larger-than-expected decline in public investment. Third-quarter data indicate that the Japanese economy is moving into a slower, but more sustainable, growth path. Employment dropped in October for a second straight month, increasing the jobless rate to 4.7%. Household spending also fell in October for the fifth time in six months. Growth for 2004 should come in around 4.4%, declining in 2005 to about 2.3%.

India's strong economy appears to be slowing somewhat. Smaller harvests are reducing incomes and spending,

although strong export gains in manufacturing are underpinning activity. After growing by about 6.5% in 2004, the Indian economy should still post gains of over 6% in 2005.

Growth in other emerging Asian economies continues to be strong, despite the adverse impact of higher oil prices, supported by overall global demand, renewed demand in the information technology sector, generally supportive macroeconomic policies, and strong domestic demand growth. Average growth for the ASEAN-4 (Indonesia, Thailand, the Philippines and Malaysia) is expected to reach about 5.5% in 2004 and to rise at about the same rate in 2005, while for other newly industrialized Asian economies growth is expected to reach 5.5% in 2004 before moderating to about 4% in 2005.

Sharply higher world prices and demand for crude oil and metals have added to already strong growth in the Commonwealth of Independent States (C.I.S.). Buoyant export growth has increasingly been supported by strong domestic demand. Growth is expected to be around 8% in 2004 before moderating to a more sustainable rate of about 6.5% in 2005.

The United Kingdom, benefiting from accommodative fiscal and monetary policies, is enjoying robust economic growth in 2004. Also supporting this growth is the labour market with the unemployment rate falling to its lowest level since 1975. The Bank of England has, however, begun tightening its monetary settings, thereby reducing expected growth in 2005 to about 2.5%, close to its potential.

Other countries in the Euro area are not faring as well. High unemployment levels of about 9% in 2004 and only slightly less in 2005 have resulted in weak domestic demand, especially in Germany where domestic demand actually contracted in the first half of the year. The European Central Bank (ECB) benchmark rate (2.0%) has remained unchanged since June 2003. It is unlikely that the rate will be lowered in an attempt to stimulate economic activity. The ECB also seems reluctant to raise rates despite its concerns regarding near-term inflation. Raising rates would also encourage further appreciation of the euro. Because of the strength of the euro, exports will not likely make a significant contribution to economic activity in 2005. Expansion in the euro area in 2004 is expected to be about 2.2% with growth prospects for 2005 reduced to 2% or less.

In Latin America, economic activity is rebounding from 2003 when growth rates averaged about 2%. Growth in 2004 is expected to average about 5% before slowing to about 4% in 2005. The recovery, however, is uneven. In 2005, growth rates are expected to vary from a high of 4.7% in Chile to lows of 3.5% in Brazil, Venezuela and Uruguay.



Global growth is expected to approach 5% in 2004, its best performance in four years. This robust growth has been spurred on by economic expansion in the United States and China, as well as in much of the rest of the industrialized and emerging market nations. High energy prices and more restrictive monetary policies are expected to slow the acceleration of global expansion in 2005 to a still very respectable 4.3%. The current global current account imbalances, illustrated by the huge U.S. current account deficit, need to be addressed. The United States should boost savings and reduce its reliance on imported goods, thereby helping to reduce the deficit; structural reforms to improve growth prospects in countries outside the United States are necessary and more flexible exchange rate policies in Asia need to be implemented.

*Note: Information in this article was current as of mid-December 2004.*

Sources: Bank of Canada; International Monetary Fund; RBC Financial Group; Statistics Canada; Scotiabank Group; *TD Economics*; Comments and reports on aspects of the Canadian and world economic situation and outlook in *The Globe and Mail Report on Business* and *The Financial Post*.

#### **NOTE TO READER**

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# The St. Petersburg Workshop on Enhancing Metals Recycling in Developing Countries: Outcomes From a Joint Study Group Initiative One Year On

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The International Non-Ferrous Metals Study Groups are three independent intergovernmental organizations set up within the UN system to exchange information between metals producing and consuming countries to ensure market transparency. They provide a continuous flow of information to the marketplace on supply and demand developments in copper, nickel, lead and zinc through the monthly publication of high-quality statistics and in-depth economic studies. The Study Groups also organize international sessions and special conferences, bringing together industry and governments to discuss matters of concern in the copper, nickel, lead and zinc sectors. The International Lead and Zinc Study Group (ILZSG) was founded in 1959 and has 28 member countries. The International Nickel Study Group (INSG) followed in 1990 and has 13 member countries. The International Copper Study Group (ICSG) began in 1992 and comprises 22 member countries.

In 2000, the member countries of the three Study Groups convened a Consultative Forum on Non-Ferrous Metals and their Contribution to Sustainable Development (NFMSD). The NFMSD was a multi-stakeholder process involving the member countries of the three Study Groups, other interested countries, industry, international organizations, and non-government organizations, including civil society. It was designed to address issues related to the mining, production, use and recycling of nonferrous metals. The Forum agreed to a common vision for the future that highlighted the actions necessary to enhance the contribution that nonferrous metals make to society (for more information, please visit [www.nfmsd.org](http://www.nfmsd.org)). Integral to this common vision was the desire to reduce barriers to recycling. With this purpose in mind, in September 2003, the Study Groups convened a recycling workshop in St. Petersburg, Russia, to examine the challenges and benefits of metals recycling, giving special attention to the needs of developing countries and economies in transition.

## **WORKSHOP THEMES**

The St. Petersburg workshop had three main themes:

- Recycling Policy and Practices – with emphasis on policy drivers, exploring different national approaches and the role of environmentally sound management;
- Recycling Markets and Information – with focus on scrap markets, examining case studies and assessing recycling rates;
- Recycling Technology and Innovation – including the concept of best available technology, and design for recycling and processing technologies for the developing world.

Break-out groups composed of government, industry and NGO participants were formed to tackle these issues and to make recommendations.

## **WORKSHOP FINDINGS**

The workshop highlighted that developing countries rely heavily on metal recyclables as essential resources and that these should be defined as input materials, not waste. It also recommended that international efforts to regulate and harmonize waste management should take into account the need to facilitate trade in recyclable materials.

Discussion on recycling markets resulted in agreement that metal/scrap prices and waste regulation (such as export bans and fiscal measures) were negatively affecting the recycling business in developing countries. Workshop participants recommended that existing recycling trade data should be developed. They agreed that the Study Groups' work on defining recycling rates was a precursor to properly describing the current recycling situation. In particular, the Study Groups' Recycling Efficiency Rate (RER), which identifies the proportion of metal recycled at the end of product life from the total supply available for recycling, was recognized as a good indicator of sustainability.

Rather than promote the idea of one best available technology, the workshop recommended the development of a framework to identify appropriate technology for developing countries that was affordable and economically and environmentally sustainable. It was suggested that environmentally sound management should be defined as a key element within every business plan.

## THE CHALLENGE

The findings of the workshop presented a number of challenges to the Study Groups and their member governments, including:

- The need to address and resolve trade distortions such as bans in cross-boundary movements of recyclable raw materials;
- The need to improve the quality of data collected on metals recycling;
- The need to increase technical proficiency and to exchange technical information on recycling between countries; and
- The need to improve and strengthen dialogue on recycling between all social partners and increase general awareness.

## FOLLOW-UP ACTIONS

In the year following the St. Petersburg workshop, the International Lead and Zinc Study Group has been responding actively to the challenges for action that were identified:

### 1. Trade Distortion

The most significant issue of concern for developing countries that rely on imported recyclable materials as a source of raw material is the possible adverse impact of the ban on trans-boundary movement in hazardous materials resulting from the Basel Convention. If ratified, the Basel ban amendment could, for example, severely restrict developing countries' access to secondary lead. To address this concern, in March 2004, the Secretary-General of ILZSG participated in a meeting of the Basel Convention's Technical Working Group, where he presented the findings of the workshop to signatory governments of the Convention.

### 2. Improvements in Recycling Data

Following the St. Petersburg workshop, the Study Groups have been collaborating with the international nonferrous

metals industry associations to standardize recycling indicators. Work has focussed on assessing scrap usage against theoretical availability, opening the way to estimating an end-of-life recycling efficiency for each metal. This has resulted in agreement on how to calculate an End-of-Life Recycling Efficiency Rate (EOL RER).

The EOL RER is defined as:

$$\frac{\text{Metal Recycled/Metal Available for Recycling (old scrap only)}}{\text{Metal Recycled/Metal Available for Recycling (old scrap only)}} \times 100$$

The Study Groups have also recognized that in cases such as zinc, where there is substantial recycling of new scrap such as drosses and galvanizing processing scrap, a recycling rate including new scrap is useful. This has resulted in agreement on an Overall Recycling Efficiency Rate (Overall RER).

The Overall RER is defined as:

$$\frac{\text{Metal Recycled/Metal Available for Recycling (old scrap + new scrap)}}{\text{Metal Recycled/Metal Available for Recycling (old scrap + new scrap)}} \times 100$$

An accurate estimation of recycling efficiency depends on tracking flows of recyclable material. The Study Groups and industry associations have therefore begun to look into collection and recovery processes for old scrap. This has resulted in agreed-upon definitions for collection and recovery rates. In the case of zinc, data on historical metal production, consumption and end uses have been gathered. An evaluation has been made of new scrap generation during metal processing and quantities of old scrap available at product end-of-life have been estimated. Collection rates have been assessed and assumptions regarding product life times have been agreed to by the Study Groups.

### 3. Improving Technical Efficiency and Exchanging Information

ILZSG has chosen to promote technical efficiency and information exchange on recycling in the developing world through participation in the development of the Green Lead Initiative. Green Lead is the vision of the mining, smelting, manufacturing and recycling sectors of the lead industry and is being designed to demonstrate environmentally sound management, competent occupational health care, and responsibility towards local populations. It will establish standards and procedures to minimize adverse impacts associated with the lead risk and will encourage new ways of thinking to increase productivity. The initial focus will be on the lead-acid battery recycling loop, with special reference to the battery industry located in the developing world. ILZSG will act as the administrator of the Green Lead development fund.

## 4. Strengthening Dialogue

The Study Groups have worked to strengthen dialogue on recycling through wide dissemination of the workshop's findings. In addition to distribution to the workshop participants, members, and United Nations observer organizations, the workshop findings have been publicized in the international recycling industry press and through Study Group newsletters. Agreement has also been reached with the Common Fund for Commodities (CFC) to distribute the findings to all of the CFC's 106 member governments.

For further information on the findings of the St. Petersburg workshop and the work of the International Lead and Zinc Study Group on recycling issues, please contact Ian Burrell via e-mail at [ian\\_burrell@ilzsg.org](mailto:ian_burrell@ilzsg.org).

*Note: Information in this article was current as of November 30, 2004.*

### NOTE TO READER

**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.**

# Import and Export Tables

**TABLE 1. CANADA, VALUE OF MINERALS AND MINERAL PRODUCTS  
(STAGES I TO IV), IMPORTS BY COMMODITY, 2002-04**

	2002	2003	2004 (a,e)
	(\$000)		
<b>METALS</b>			
Aluminum	5 024 704	4 542 752	3 829 251
Antimony	9 040	8 279	8 736
Barium	4 800	4 788	4 070
Beryllium	794	612	443
Bismuth	1 388	1 255	1 654
Cadmium	1 591	1 236	1 337
Calcium	55 790	48 829	37 668
Chromium	66 574	54 319	40 687
Cobalt	24 509	28 788	50 107
Copper	1 592 695	1 578 524	1 745 950
Gallium	55	44	59
Germanium	8 870	4 601	2 903
Gold	1 000 974	1 052 672	1 166 550
Hafnium	146	297	226
Indium	849	715	3 380
Iron and steel	16 313 975	15 217 412	13 235 954
Iron ore	381 173	326 448	317 688
Lead	392 483	334 516	289 077
Lithium	59 480	69 038	66 200
Magnesium and magnesium compounds	183 605	176 643	170 324
Manganese	221 432	255 534	261 938
Mercury	3 990	3 347	1 803
Molybdenum	53 574	59 069	88 536
Nickel	405 151	465 505	514 906
Niobium	18 537	17 850	15 120
Platinum group	306 716	297 800	249 941
Rare earth	11 702	13 124	9 312
Rhenium	177	25	44
Selenium	816	1 234	2 659
Silicon	72 915	100 153	74 274
Silver	186 996	190 735	280 252
Strontium	1 466	1 173	669
Tantalum	807	803	641
Tellurium	259	359	610
Thallium	-	-	1
Tin	54 486	49 480	49 441
Titanium	80 357	61 518	55 591
Tungsten	10 352	9 127	7 551
Uranium and thorium	236 456	216 509	249 530
Vanadium	17 821	15 607	19 397
Zinc	216 849	284 935	243 335
Zirconium	50 914	42 174	38 986
Other	11 609 073	10 657 524	8 430 688
<b>Total metals</b>	<b>38 684 341</b>	<b>36 195 353</b>	<b>31 567 489</b>
<b>NONMETALS</b>			
Abrasives	421 472	387 977	305 981
Arsenic	519	416	417
Asbestos	106 589	104 580	90 285
Barite and witherite	7 130	9 921	6 551
Boron	39 199	33 538	21 854
Bromine	2 696	2 166	2 315
Calcium (Industrial minerals)	5 499	5 207	5 148
Cement	238 800	240 106	188 455
Chlorine and chlorine compounds	79 497	61 387	54 108

**TABLE 1 (cont'd)**

	2002	2003	2004 (a,e)
	(\$000)		
<b>NONMETALS (cont'd)</b>			
Clay and clay products	1 116 375	1 113 308	872 719
Diamonds	602 733	522 649	413 927
Dolomite	7 886	7 491	6 023
Feldspar	304	229	199
Fluorspar	58 296	52 327	36 687
Glass and glassware products	2 695 188	2 413 769	1 857 539
Granite	78 420	88 251	71 400
Graphite	415 423	410 910	319 989
Gypsum	84 385	85 146	66 916
Iodine	12 755	14 610	10 085
Lime	9 704	9 914	6 233
Limestone flux and other limestone	29 210	25 195	16 086
Marble, travertine and other calcareous stones	67 004	73 150	60 544
Mica	15 643	14 012	9 174
Mineral pigments	175 557	160 630	130 216
Nepheline syenite	17	21	45
Nitrogen	176 366	284 172	153 276
Olivine	821	994	572
Pearls	23 357	19 399	16 143
Peat	2 936	2 010	1 543
Perlite	17 205	17 144	13 136
Phosphate and phosphate compounds	384 743	422 519	298 459
Potash and potassium compounds	40 170	38 959	26 066
Salt and sodium compounds	306 877	283 564	210 327
Sand and gravel	18 422	15 221	10 802
Sandstone	3 347	3 098	2 969
Silica and silica compounds	196 401	172 267	119 486
Slate	12 519	13 022	11 310
Sulphur and sulphur compounds	23 073	28 337	17 581
Talc, soapstone and pyrophyllite	26 125	20 174	14 523
Titanium oxides	250 792	274 792	202 998
Vermiculite	10 533	8 929	5 383
Other nonmetals	599 941	582 057	470 858
Other structurals	93 648	84 673	72 544
<b>Total Nonmetals</b>	<b>8 457 577</b>	<b>8 108 241</b>	<b>6 200 872</b>
<b>FUELS</b>			
Coal	1 195 656	1 028 907	813 407
Coke	92 526	105 892	146 864
Natural gas	602 081	1 821 715	1 929 890
Natural gas by-products	70 755	101 845	88 234
Petroleum	15 394 152	17 986 613	15 005 685
Other	565 237	520 860	420 212
<b>Total fuels</b>	<b>17 920 407</b>	<b>21 565 832</b>	<b>18 404 292</b>
<b>Total mining imports (including fuels)</b>	<b>65 062 325</b>	<b>65 869 426</b>	<b>56 172 653</b>
<b>Total nonfuel mining imports</b>	<b>47 141 918</b>	<b>44 303 594</b>	<b>37 768 361</b>
<b>Total mining imports (including coal and coke)</b>	<b>48 430 100</b>	<b>45 438 392</b>	<b>38 728 632</b>
<b>Total economy imports</b>	<b>348 718 144</b>	<b>335 806 211</b>	<b>265 508 145</b>

Sources: Natural Resources Canada; Statistics Canada.

– Nil; (e) Estimated.

(a) First nine months of 2004.

Note: Numbers may not add to totals due to rounding.

**TABLE 2. CANADA, VALUE OF MINERALS AND MINERAL PRODUCTS  
(STAGES I TO IV), TOTAL EXPORTS BY COMMODITY, 2002-04**

	2002	2003	2004 (a,e)
	(\$'000)		
<b>METALS</b>			
Aluminum	8 515 975	8 200 283	6 741 890
Antimony	67 018	937	749
Barium	424	1	-
Beryllium	4	-	-
Bismuth	906	522	2 881
Cadmium	3 943	4 339	2 671
Calcium	2 417	1 842	1 623
Chromium	25 000	18 607	14 062
Cobalt	171 030	181 916	376 642
Copper	2 232 591	2 075 942	2 252 441
Gallium	-	-	-
Germanium	737	1 253	1 030
Gold	2 790 659	2 848 474	2 380 357
Hafnium	-	-	-
Indium	-	-	-
Iron and steel	11 418 009	10 279 250	9 236 425
Iron ore	1 092 520	1 045 899	723 396
Lead	239 311	202 437	208 639
Lithium	532	2 728	3 533
Magnesium and magnesium compounds	289 814	206 497	136 411
Manganese	13 400	19 580	14 686
Mercury	22	48	12
Molybdenum	102 204	135 210	191 623
Nickel	2 369 342	2 516 397	3 108 747
Niobium	62 040	53 692	42 740
Platinum group	221 132	62 602	55 005
Rare earth	37	208	83
Rhenium	-	-	-
Selenium	3 288	3 665	4 725
Silicon	90 437	86 401	77 559
Silver	466 984	452 262	335 820
Strontium	-	19	-
Tantalum	169	328	277
Tellurium	1 428	2 309	2 181
Thallium	-	-	-
Tin	7 187	8 598	11 899
Titanium	19 166	21 288	20 607
Tungsten	23 897	28 182	9 739
Uranium and thorium	918 996	836 265	594 315
Vanadium	112 653	83 662	87 524
Zinc	1 300 691	1 060 509	970 342
Zirconium	18 184	17 892	10 623
Other	5 468 733	5 194 002	4 085 360
<b>Total metals</b>	<b>38 050 880</b>	<b>35 654 046</b>	<b>31 706 617</b>
<b>NONMETALS</b>			
Abrasives	224 891	226 581	180 950
Arsenic	-	-	-
Asbestos	247 265	188 502	125 329
Barite and witherite	931	606	999
Boron	634	761	525
Bromine	130	85	54
Calcium (Industrial minerals)	-	25	13
Cement	855 894	789 929	592 904
Chlorine and chlorine compounds	161 200	177 574	138 454
Clay and clay products	44 709	49 891	53 414
Diamonds	906 714	1 607 253	1 164 826
Dolomite	40 465	34 932	27 187
Feldspar	283	88	-



**TABLE 2 (cont'd)**

	2002	2003	2004 (a,e)
	(\$'000)		
<b>NONMETALS (cont'd)</b>			
Fluorspar	62 370	57 804	52 438
Glass and glassware products	1 163 371	1 081 972	835 953
Granite	89 574	79 798	62 023
Graphite	65 302	81 769	67 453
Gypsum	200 347	173 676	154 912
Iodine	6 972	8 505	5 316
Lime	23 456	21 071	16 505
Limestone flux and other limestone	25 827	26 301	20 729
Marble, travertine and other calcareous stones	21 892	15 584	13 467
Mica	14 232	11 337	8 646
Mineral pigments	128 818	124 400	106 264
Nepheline syenite	64 322	60 257	46 888
Nitrogen	957 041	931 849	845 769
Olivine	—	—	—
Pearls	2 187	2 704	3 178
Peat	285 214	257 897	187 623
Perlite	—	—	—
Phosphate and phosphate compounds	35 133	18 000	31 217
Potash and potassium compounds	2 386 496	1 934 269	1 578 414
Salt and sodium compounds	567 646	557 438	397 691
Sand and gravel	56 736	54 138	37 112
Sandstone	150	85	62
Silica and silica compounds	34 966	29 650	28 795
Slate	15 946	20 036	16 839
Sulphur and sulphur compounds	227 756	284 971	357 081
Talc, soapstone and pyrophyllite	29 128	26 608	21 176
Titanium oxides	176 748	179 812	131 891
Vermiculite	—	—	—
Other nonmetals	475 471	423 373	350 615
Other structurals	183 436	156 479	132 822
<b>Total nonmetals</b>	<b>9 783 653</b>	<b>9 696 010</b>	<b>7 795 534</b>
<b>FUELS</b>			
Coal	1 830 071	1 672 814	1 329 195
Coke	11 757	14 043	32 878
Natural gas	18 359 522	26 085 808	21 087 606
Natural gas by-products	1 611 286	2 017 201	1 535 162
Petroleum	26 976 188	30 512 647	27 746 414
Other fuels	352 390	373 866	316 386
<b>Total fuels</b>	<b>49 141 214</b>	<b>60 676 379</b>	<b>52 047 641</b>
Total mining domestic exports (including fuels)	96 975 747	106 026 435	91 549 792
Total mining exports (including fuels)	99 234 955	108 236 747	93 056 358
Balance of trade	34 172 630	42 367 320	36 883 696
Total non-fuel mining domestic exports	47 834 533	45 350 056	39 502 151
Total non-fuel mining exports	49 192 144	46 759 355	40 784 496
Balance of trade	2 050 227	2 455 760	3 016 128
Total mining domestic exports (including coal and coke)	49 676 361	47 036 912	40 864 224
Total mining exports (including coal and coke)	51 052 200	48 449 770	42 159 358
Balance of trade	2 622 101	3 011 377	3 430 719
Total economy domestic exports	365 292 640	354 078 362	290 663 365
Total economy exports	396 379 041	380 846 388	311 164 996
Balance of trade	47 660 897	45 040 176	45 656 851

Sources: Natural Resources Canada; Statistics Canada.

— Nil; (e) Estimated.

(a) First nine months of 2004.