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; 6 mo. = January to June; 9 mo. = January to September; conc. = concentrate.)

2004 mine production:	$3.3 billion
World rank:	Second (mine production)
2004 exports:	$4.3 billion

Canada	2004	2005 (f)	2006 (f)
		(000 tonnes)	
Mine production	187	166	220
Refined production (1)	152	142	165
Use/consumption (2)	9	9	10

(f) Forecast.
(1) Refined includes nickel in salts, oxides, etc. (2) Use includes nickel in scrap.

Nickel's resistance to corrosion, high strength over a wide temperature range, 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; nearly 50% of nickel used to make stainless steels comes from nickel in stainless steel scrap.

ANNUAL AVERAGE SETTLEMENT PRICES, LONDON METAL EXCHANGE

	2003	2004	2005 (f)	2006 (f)
US$/t	6 772	9 640	13 852	14 600
US¢/lb	3.07	4.37	6.28	6.62

(f) Forecast.

CANADIAN OVERVIEW

- The three most significant events for the Canadian nickel industry in 2005 were: the joint agreement whereby Inco Limited would acquire Falconbridge Limited, the start-up of Voisey's Bay, and the planned 50% expansion at the Fort Saskatchewan refinery.

- **Inco** offered to buy all **Falconbridge** shares, subject to regulatory approvals, to form the "new Inco" worth US$24 billion; the offer was set to close in late December 2005. Cost-cutting of US$350 million/y by 2007 was forecast at the combined companies' Sudbury operations. Combined Ni production was projected to increase from 333 000 t in 2005 to 447 000 t in 2009, including tolled production at Falconbridge's refinery in Norway.

- **Voisey's Bay Nickel** (owned by Inco) started up with milestones of: August 20, ore mining; September 12, mill processing; and October 20, start-up of the hydrometallurgical demonstration plant at Argentia. Concentrates left the mine in mid-November for Inco's smelters in Thompson and Sudbury. Thompson will receive over two thirds of the nickel in all concentrates. Voisey's Bay production was scheduled at 50 000 t of finished nickel in 2006, likely rising to 60 000 t in 2007. Over half of the projected output of Voisey's Bay in the 2007-09 period will represent "additional"

production, with the rest displacing purchased feed or reductions in Inco's output at existing mines. The start-up at Voisey's Bay let Inco agree to send 8300 t of Ni in concentrates to OMG in Finland for tolling from September 2005 to June 2006; a further 21 000 to 25 000 t/y of Ni in concentrates between July 2006 and June 2009 may follow.

- **Sherritt International** and the Cuban government each own half of Metals Enterprise. Feed from their Moa operation in Cuba was refined at their nickel-cobalt refinery in Alberta. Sherritt and Cuba agreed on a US$450 million expansion; mine and refinery output will be increased from 34 000 t/y Ni+Co to 49 000 t/y with each party funding 50% of the costs. Construction is scheduled to begin in early 2006, commissioning in November 2007, and production in the first quarter of 2008. In 9 mo. 2005, the refinery produced 24 100 t of Ni and 2574 t of Co in the same period. The Fort Saskatchewan refinery produced a quarterly record 8698 t of Ni and 906 t of Co in the second quarter of 2005.

- **Liberty Mines**, formerly Liberty Minerals, announced plans to re-open the Redstone mine near Timmins, Ontario. Liberty signed a contract to supply concentrates to Jilin Jien Nickel in China. In January, **Canadian Arrow** obtained permission from the Ontario government to mine the Alexo deposit. The mine shipped 8400 t of ore @ 1.81% Ni, 0.18% Cu, and 0.07% Co to Falconbridge's Strathcona mill in the first half of 2005. Open-pit mining was completed by September; the company intended to ship a further 6000 t of stockpiled ore before the end of 2005.

- **Noranda Inc.** successfully acquired Falconbridge Limited; the companies merged in mid-year under the name Falconbridge. **Falconbridge** operates three mines in the Sudbury basin in Ontario, the Raglan mine in northern Quebec, and the Montcalm mine near Timmins, Ontario. Shaft sinking at the Nickel Rim South advanced exploration project near Sudbury began in April. **First Nickel Inc.** started production at the Lockerby mine, bought from Falconbridge; ore deliveries to Falconbridge were to begin before year-end and production was scheduled to reach 700 t/d by the first quarter of 2006. In 9 mo. 2005, Falconbridge produced 40 100 t of Ni from its mines and 47 100 t of Ni in matte from its Sudbury smelter (including purchased feed from the Alexo mine).

- In Sudbury, Ontario, **Inco** targeted finished Ni output from Sudbury at 98 000-100 000 t (including perhaps 40 000 t that is refined in the United Kingdom). During a maintenance shut-down, Inco installed concentrate handling facilities for Voisey's Bay feed and expanded the acid plant. Processing of external feed will drop once Voisey's Bay concentrate feed is processed. Expected recoverable Ni in external feed was forecast at 7700 t of Ni in 2006 and at between 6400 and 6800 t/y of Ni through to 2009. Inco forecast its cobalt production at 1725 t; in 2004, Sudbury ore accounted for 48% of Inco's by-product cobalt production, compared to 32% from Thompson ore.

- In Manitoba, the union at **Inco**'s Thompson operation negotiated a new three-year contract with Inco through mid-September 2008. Inco announced approval of the 1-D Lower project at the Thompson mine in late August. Development will begin in 2006 with first production starting in 2008. This US$34 million project will produce 90 000 t of Ni over eight years. When Thompson processes Voisey's Bay nickel concentrates, the need for Ni in external feed will decline to about 500 t/y. Thompson produced 37 000 t of refined Ni in 9 mo. out of a target of 49 400 t for 2005.

- In return for a 27% share in **FNX Mining**, **Dynatec** sold both its 25% share in **the Sudbury Joint Venture** (SJV) and its 50% share in Aurora Platinum to FNX Mining. Shaft sinking at the Podolsky deposit reached 238 metres by the end of July. Reconditioning of the Levack No. 2 shaft was under way. In the first half of 2005, SJV shipped 176 000 t of ore to Inco's Clarabelle mill, an increase of 36% compared to the same period a year earlier.

- **North American Palladium** produced Ni as a by-product from its palladium operation near Thunder Bay, Ontario. Development continued at the company's $52 million underground mine; when operational by the end of 2005, it will supplement production from the open pit.

- **URSA Major** commissioned a full feasibility study of its Shakespeare deposit located 70 km west of Sudbury, Ontario, for a 2900-t/d operation trucking ore to a Sudbury mill. URSA and North American Palladium negotiated an agreement whereby North American Palladium can earn a 60% interest in the property. Probable reserves were put at 7.3 Mt @ 0.37% Ni, 0.39% Cu, 0.024% Co and 0.97 g/t Pt+Pd+Au. The full feasibility study was expanded in September to examine a 4500-t/d mill at the deposit. The study was expected to be completed by the end of 2005.

- Many companies were involved in nickel exploration in Canada; the main areas of exploration were the Sudbury area in Ontario, the northern Ungava region of Quebec, northern Manitoba, and the Timmins area of Ontario. Canadian-listed companies with exploration activities were included in the 2004 nickel chapter of the *Canadian Minerals Yearbook*.

WORLD OVERVIEW

Australia

- **BHP Billiton**'s Ravensthorpe project costs rose by about 30%, to US$1340 million for the mine and leach plant in Western Australia and US$460 million for the Yabulu refinery expansion in Queensland. The original March 2004 cost estimate totalled US$1400 million for the mine, leach plant, and refinery expansion. Shipping mixed hydroxides from Ravensthorpe containing 50 000 t/y of Ni and 1500 t/y of Co should start in the second quarter of 2007 with metal production starting in the third quarter.

- **WMC Resources** (WMCR) reported that the last shipment of Mt. Keith concentrate to OMG was in March, the same month as the first matte shipment to Jinchuan in a six-year 120 000-t Ni in matte contract. After outbidding Xstrata, BHP Billiton completed its acquisition of WMCR and it was delisted.

- In 9 mo., **Minara** produced at an annualized rate of 27 300 t/y, slightly below its 2004 rate. Plans for a fifth autoclave costing US$450 million to boost production were deferred pending demonstrated stable plant operation.

- **OMG** planned to increase output in 2005 at its Cawse facility by 25% over 2004 output (unstated); the intermediate was sent to OMG's refinery in Finland. In addition to this, OMG sourced Ni concentrates from Black Swan (LionOre, 20% OMG) where a 50% expansion to 13 000 t of Ni in concentrates was announced.

- **LionOre** produced Ni concentrates from its Emily Ann mine and shipped them to Inco's Canadian smelters. In late 2005, LionOre will start its nearby Maggie Hayes mine. Inco also sourced concentrates from **Jubilee**'s mine in Western Australia. With Voisey's Bay concentrates being sent to Inco's Thompson and Sudbury smelters in late 2005, Inco announced an agreement with OMG whereby the latter would toll Ni in concentrates starting in September 2005 (see below). LionOre bought the idled Bulong refinery and was expected to make a decision in 2005 on whether to refurbish it as a 20 000- to 40 000-t/y Activox refinery. **Tectonic Resources**' RAV 8 mine was mined out in September having delivered 456 000 t grading 3.47% Ni containing 15 800 t of Ni to the Kambalda mill during the life of the mine; the feasibility study had been based upon 165 000 t of ore @ 5.83% Ni containing 9600 t of Ni.

Indonesia

- Inco anticipated starting construction of a new 90-MW hydro-electric dam and generating facility in 2005. The dam construction is the key to **PT Inco**'s expansion to 90 700 t/y by 2009. PT Inco produces a matte containing 78% Ni and 2% Co that is sent to Japan for refining by Inco and Sumitomo. Inco announced plans to drill the Balodopi deposit in 2005 and then do metallurgical testing in 2006 for a pre-feasibility study of a 50 000-t/y FeNi operation. Inco also was considering a mine and 45 000-t/y Goro-type leach operation for its Pomalaa deposit. **PT Antam**'s FeNI II smelter was idled for six months for maintenance and repair; the company expected to produce 7400 t of Ni in FeNi, including 600 t of toll smelted by **Pamco** in Japan. Total ore production for the first nine months of 2005 was 2.5 Mt (wet) compared to 3.0 Mt (wet) for the same period in 2004.

- In November, **Weda Bay** announced a contract to update the 2002 pre-feasibility study of its Halmahera laterite project, complete additional drilling, and expand bench-scale metallurgical testing. Weda Bay's measured resources were 16 Mt @ 1.27% Ni and 0.18% Co; indicated resources were 139 Mt @ 1.47% Ni and 0.08% Co. Weda Bay terminated a supply contract with OMG and retired its debt to OMG by paying US$2.5 million in September.

New Caledonia

- Ore production to August totalled 3 Mt of garnieritic ore and 1.2 Mt of lower-grade lateritic ore. Garnieritic ore was either exported or used by **SLN** to make 8000 t of Ni in matte and 35 100 t of Ni in FeNi during the period. Lower-grade ore was sent to the Yabulu refinery in Queensland. SLN announced that it would not meet its forecast production of 65 000 t of Ni in FeNi and matte due to industrial discord; SLN produced at an annualized rate of 63 900 t/y for the first nine months.

- **Falconbridge** and **SMSP** were expected to make a decision before year-end on whether to proceed with the Koniambo project, a 60 000-t/y Ni in FeNi mine/smelter, although media reports in November suggested a delay of up to six months. In August, it was reported that while France was reportedly ready to provide tax benefits of US$630 million and loan guarantees of US$300 million for the Koniambo project, Falconbridge was seeking additional financing. The costs for the mine, smelter and infrastructure, including a 390-MW power plant, were projected at US$2200 million, with an additional US$500 million for financing, working capital and other costs. In June, the possibility of Chinese interests providing some financing in return for product off-take was raised.

- In April, **Sumitomo Metal Mining** and **Mitsui & Co.** purchased a 21% interest in **Inco**'s Goro project through a joint venture, Sumic Nickel Netherlands.

The US$1878 million Goro project plant is scheduled to start production in 2007, with output forecast at 52 000 t/y of Ni in nickel oxide in 2009. Capacity is projected at 60 000 t/y of contained Ni with Co output varying between 4300 and 5000 t/y. The three provinces of New Caledonia obtained a 10% share of Goro. In 2001, New Caledonia instituted a 15-year tax holiday followed by taxation at half of prevailing rates for metallurgical plants such as those at Goro and Koniambo. With respect to taxes, an Inco technical document completed in December 2002 about Goro filed on SEDAR stated France then levied only a 5% withholding tax on disbursements from France to Canada, and that dividends and other payments received from countries with which Canada has a Double Taxation Treaty were exempt from further taxation under Canadian law.

Papua New Guinea

- In October, **China Metallurgical Construction Group Corporation** (MMC) agreed to take an 85% share in the Ramu project in **Papua New Guinea**. A resource of 143 Mt @ 1.01% Ni and 0.1% Co was expected to produce 33 000 t/y of Ni. All permits for the project were in place. **Jilin Jien Nickel** (see below) contracted to help MMC finance the project.

Philippines

- **Coral Bay Nickel** started up its plant in April; the plant will produce 7000 t of Ni in intermediates to be refined at Sumitomo's refinery in Japan. Coral Bay was built with a capacity of 10 000 t/y of Ni and 700 t/y of Co in intermediates, and plans were being examined to double capacity. **Crew Gold** signed an MOU with **Jilin Jien Nickel** for the Mindoro laterite deposit where further resource definition and a definitive feasibility study may be completed. A pre-feasibility study in 1998 examined processing Mindoro laterite ore by high-pressure leaching with a capacity of 40 000 t/y of Ni and 3050 t/y of Co with by-product production of 126 000 t/y of ammonium sulphate. **MBMI Resources** signed an MOU with **Zhejiang Huaguang Smelting Group** whereby the latter will invest in the MBMI laterite orebodies in the Philippines. Zhejiang operates FeNi plants in China.

Botswana

- BCL operated a mine, mill and smelter with production in 2004 of 2.5 Mt of ore. Smelter output in 2004 was 54 500 t of matte (including feed from Tati) containing 22 300 t of Ni, 223 t of Co, and copper. In February, the Mines Minister forecast that BCL's reserves would last at least until 2012. **LionOre** announced an expansion from 3.6 Mt/y to 5 Mt/y at its 85%-owned Tati operation in Botswana that will raise output to 14 600 t/y of payable Ni effective in the third quarter of 2006. Tati's concentrate was sent to BCL's smelter. LionOre continued pilot testing of its Activox process, which produced Ni and Cu metal; LionOre also continued its study of a plant to produce 20 000 t/y of Ni at Tati. This process may have possible application at the Nkomati operation in South Africa (see below) as well as in Australia (see above).

Madagascar

- **Dynatec** acquired **Phelps Dodge**'s interest in the Ambatovy project in January. In February, Dynatec released the results of the feasibility study of the US$2250 million Ambatovy project in Madagascar (including infrastructure, contingency and owner's cost) that could produce 60 000 t/y of Ni and 5600 t/y of Co with 186 000 t/y of by-product ammonium sulphate. In May, **Impala** and Dynatec agreed to jointly develop the project on a 50:50 basis. In August, an agreement was announced whereby **Sumitomo** would take a 25% share of the project with Impala and Dynatec each retaining 37.5%.

South Africa

- **LionOre** purchased a 50% share of the Nkomati operation. LionOre and **African Rainbow Minerals** were evaluating plans to expand production to 17 000 t/y of Ni metal using the Activox process being piloted at Tati in Botswana with PGMs in a leach residue to be sent to PGMs producers for recovery.

- **Falconbridge** and **Barrick** finalized a JV for the Kabanga deposit planning US$50 million in work, including drilling and studies. The inferred resources as of April 2005 were 26 Mt @ 2.6% Ni. The announcement of the JV noted a possible production rate of 2 Mt/y of ore producing 30 000-35 000 t/y of concentrates, with at least 50% of the concentrates processed at Falconbridge's Sudbury smelter. Falconbridge reported that drilling was two thirds completed and engineering studies were nearly half done for a scoping study due in early 2006.

Americas

- **CVRD** announced in July that it would proceed with the Vermelho project, a nickel laterite mine and high-pressure acid leach plant to be built in the Carajás region of Brazil. The US$1200 million operation will produce 46 000 t/y of Ni and 2800 t/y of Co starting in the fourth quarter of 2008. Vancouver-based **Canico Resource Corp**. received permission to build its Onça-Puma project located in Pariá state. A favourable feasibility study was announced in August for a US$762 million single-line FeNi mine/plant starting up in early 2008 followed by a second US$352 million

line two years later. Both lines would be fed by 2.6 Mt/y of ore from proven plus probable reserves of 78 Mt ore grading 1.8% Ni. Planned output was targeted at 30 500 t of Ni in FeNi in year three (after the start-up of the first line), reaching 53 000 t/y by years six and seven. In mid-September, CVRD made an offer to acquire Canico; in November, CVRD increased its offer.

- **Moa Bay** in **Cuba** will expand production by 50% to provide 49 000 t/y of recoverable Ni+Co in sulphide residues to the Fort Saskatchewan refinery; both facilities were owned equally by Sherritt and the Cuban government. Cuba and **China Metallurgical Construction Group** signed an MOU to invest US$600 million to build a FeNi smelter and mine at Las Cararimocas to produce 68 000 t/y of FeNi. Cuba forecast national Ni+Co production for 2005 as 76 000 t (including Moa Bay production). The government stated that a new conveyor system at the René Ramos Latour plant would raise production capacity from 10 000 to 17 000 t/y (presumably contained Ni+Co).

- **Skye Resources** started a feasibility study of its Fenix project located at the former Exmibal property in **Guatemala** to examine a 22 700-t/y Ni in FeNi plant targetting production for 2008. Nickel laterite resources were 63 Mt @ 1.84% Ni. Skye filed a patent application for an atmospheric sulphuric acid leach process to produce an intermediate NiCo hydroxide from nickel laterite ore. Phase 2 of pilot testing of the process was expected to finish in 2005. **Jaguar Nickel** conducted drilling programs and got additional exploration licences for properties, also near the former Exmibal plant. Jaguar was planning a FeNi operation after pilot plant testing showed unfavourable economics for a chloride leaching process.

- **PolyMet Mining** completed the acquisition of the ore processing plant of LTV Steel Mining Company, a former iron ore producer in Minnesota, U.S.A. Metallurgical testing on a bulk sample using the company's hydrometallurgical process was completed and a full feasibility study was expected by March 2006. The project is based upon flotation of a bulk concentrate and processing by the PlatSol process to yield about 7800 t/y of by-product Ni in hydroxides that will also contain Co. **Franconia Minerals** continued work on its Birch Lake deposit, also in Minnesota, where inferred resources were 51 Mt @ 0.675% Cu, 0.211% Ni and 0.01% Co, plus 1.65 g/t Au+Pd+Pt. The company commissioned bench-scale pressure leaching tests of flotation concentrate using the Platsol process. Franconia acquired the Beaver Bay JV located 3 km from its Birch Lake deposit and planned to drill the Maturi target. A preliminary economic assessment of Birch Lake looked at an underground mine with a concentrator and hydrometallurgical facility producing 2250 t/y of by-product Ni plus Cu, and precious metals. **Kennecott** may invest US$100 million in its Eagle project. The company intended to complete a prefeasibility study and start a feasibility study in 2005; total resources at Eagle were stated in 2004 as 5 Mt @ 3.68% Ni, 3.06% Cu and 0.1% Co.

Eurasia

- Jilin Jien Nickel in China will increase capacity from 8000 to 15 000 t/y if it can obtain sufficient feed. Jilin signed an MOU with Crew for the development of the Mindoro laterite deposit (see above) and agreed to provide China Metallurgical Construction Corp. with funding of about US$23 million towards the development cost of the Ramu deposit in Papua New Guinea (see above). Jilin signed an agreement with Liberty Mines for concentrates from the Redstone mine near Timmins, Ontario (see above). In July, **Jinchuan Group** opened new smelting facilities (1 Mt/y of concentrates); Jinchuan targeted 93 000 t of Ni production in 2005, 102 000 t of Ni in 2006, and 150 000 t/y of Ni and 10 000 t/y of Co by 2008. The increases will require increasing mining and mineral concentration capacity from 5.5 Mt/y to at least 10 Mt/y and the construction of a new Ni smelter. **Ausmelt Limited** of Australia won a contract for the new smelter (1 Mt/y of concentrates). In July, Jinchuan Jinchuan imported nickel in matte from WMCR, now BHP Billiton (see above), as well as concentrate from **Rio Narcea** in Spain and from **Sally Malay** and **Fox Resources**, both in Australia.

- The **Ferronikeli** mines and FeNi smelter based in Glogovac in Kosovo were sold to a subsidiary of Eurasian Mineral Resources, a private company, for €30.5 million. The sale included minimum staffing and investment provisions and was to be finalized by mid-January 2006. Production could possibly begin in the second quarter of 2006. In 2004, the Kosovo Trust Agency put capacity as 12 000 t/y of Ni in FeNi.

- Production at **OMG**'s nickel refinery at Harjavalta, Finland, was limited by the availability of Ni feed (see WMCR note above). In 2005, OMG cut planned production from about 45 000 t to 41 000 t of Ni, or to less than 75% of capacity (55 000-57 000 t/y) compared to 50 000 t of Ni produced in 2004. As noted above, OMG received new feed from the Black Swan expansion, increased intermediates from Cawse, and 8300 t of Ni in concentrates to be tolled for Inco between September 2005 and June 2006, with an agreement in principle for OMG to toll refine 21 000-25 000 t/y of Ni in concentrates on behalf of Inco from July 2006 to June 2009. OMG was expected to operate its refinery at capacity, or at about 56 000 t/y of Ni, by mid-2006. Boliden smelts concentrates for OMG's refinery; it processed 204 000 t in 2004.

- **Norilsk Nickel** was the largest nickel producer; its nine-month production totaled 181 000 t of Ni, maintaining is 2004 rate of Ni output. During 2005, Norilsk received permission to publish PGMs production data. Norilsk's production target for 2005 was 240 000-250 000 t of Ni, 96 t of Pd and 23 t of Pt, plus copper and cobalt excluding production from its American Stillwater subsidiary.

- **European Nickel** started a heap leach test in October 2004 at its Çaldag deposit in Turkey. By June, recovery of Ni and Co in an intermediate hydroxide had surpassed 50%. The company targeted construction of a full-scale plant beginning in early 2006 with first production in early 2007. Mineable reserves were increased by nearly 30% to 36 Mt @ 1.3% Ni, thereby allowing targeted output of 21 000 t/y of contained Ni. **BHP Billiton** was the largest shareholder and had the right to 50% of the output from the project; BHP Billiton can process the intermediates at its Yabulu refinery.

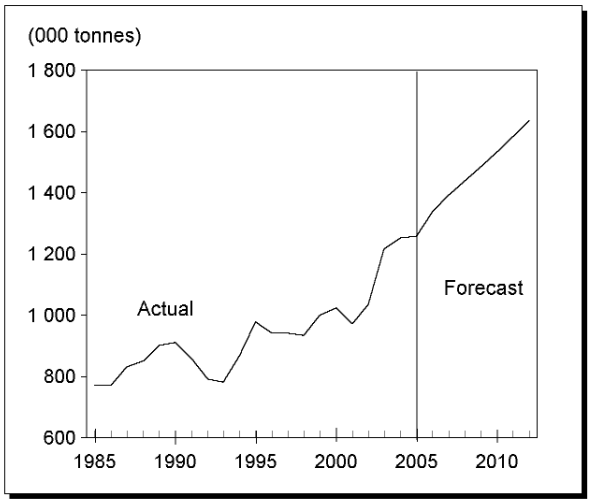
- **Oriel Resources** completed a JORC compliant resources estimate of its Shevchenko project in Kazakhstan. Resources were 107 Mt @ 0.84% Ni laterite ore using a 0.6% Ni cut-off. A feasibility study was delayed and was expected to be completed by the first quarter of 2006. Metallurgical testing of bulk samples indicated that FeNi grading about 20% Ni could be produced from the deposits. Capital cost estimates were about US$375 million for a project to produce about 31 000 t/y of Ni in FeNi. **Bekem Metals** bought **Kyzjl Main Mamyt LLT**, a Kazak company that owns the Kempirsai laterite deposit.

- **Asian Mineral Resources** reached an agreement to increase its ownership of the Ban Phuc sulphide property in Vietnam to 90%. A preliminary assessment showed five-year production of 21 000 t of Ni in concentrate based upon processing of 1 Mt grading 2.47% Ni and 1.08% Cu.

DEMAND OUTLOOK

The International Stainless Steel Forum forecasted 2005 stainless steel production at 25 Mt, an increase of 1.8% over 2004. Over half of the projected production will come from Asia, with Western Europe accounting for 36%. Inco presented a forecast in its third-quarter 2005 teleconference that 75% of stainless production would be austenitic with scrap providing over 49% of Ni used in making stainless steels. Inco forecast Ni use in stainless production at 1.48 Mt, of which 749 000 t was from primary sources and 731 000 t was from scrap, compared to 1.45 Mt used in 2003, of which 804 000 t was from primary material and 650 000 t was from scrap. Higher costs for austenitic stainless have prompted substitution away from traditional stainless grades for certain applications. In 2004, over 80% of primary nickel was used in metallurgical alloying, including making stainless steels. While long-term trends can be projected, actual demand will be determined by world industrial production and affected by the adjustment to higher oil prices. A long-term growth rate of over 3%/y is forecast. Nickel use in Canada is expected to remain in the 9000- to 12 000-t/y range, including scrap.

Figure 1
World Primary Nickel Use, 1985-2012



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

CANADIAN PRODUCTION OUTLOOK

More than half of the Voisey's Bay production will represent additional Canadian mine output. Much of the imported concentrates will be displaced to Finland (see above). Falconbridge continued a program to increase capacity at its Raglan operation. Manitoba's nickel production may face increasing challenges once the Thompson smelter can no longer use Voisey's Bay concentrates as feed. The challenge will be compounded by the imposition of new lower sulphur dioxide emission limits, given the distance from acid markets. Figure 2 shows a forecast for Canadian nickel mine production, drawing upon a forecast given by Inco and Falconbridge in October.

PRICE OUTLOOK

Production cuts by stainless steel producers in the second half of 2005 resulted in rising inventories on the LME. Prices in 2005 remained well above long-term averages,

even with the decline in the second half of the year. The longer the period of higher prices, the greater will be the incentive for substitution away from important nickel uses compounded by increasingly attractive investment opportunities in nickel production. Together these trends will bring back a cycle of lower nickel prices. Prices for 2006 are projected to average US$13 250/t (US$6/lb) ± about US$650/t as the effect of stainless steel cutbacks and scrap supply continue to dominate in the first half of the year. Nevertheless, new capacity investments are expected to continue and prices are expected to decline thereafter.

Note: Information in this article was current as of November 18, 2005.

Note to Readers

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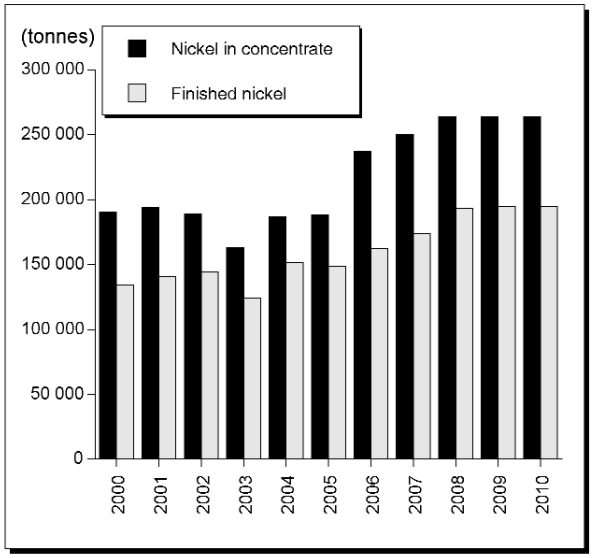
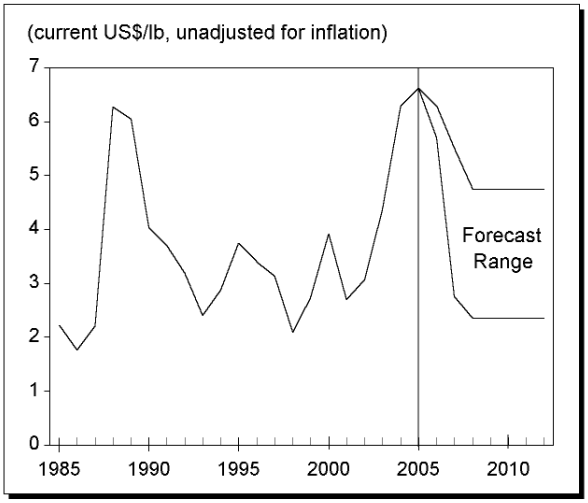
Figure 2
Canadian Nickel Output, Historical and Projected, 2000-2010



Source: Natural Resources Canada.

Figure 3
Nickel Prices, 1985-2012
Annual Average LME Cash Settlement



Source: Natural Resources Canada.

TABLE 1. COMPANY WEB SITES FOR FURTHER INFORMATION

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

TABLE 1 (cont'd)

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