

# Nickel

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1999 mineral production: \$1.8 billion<sup>P</sup>  
 World rank: Second  
 1999 exports: \$1.7 billion

Canada	1999	2000 <sup>e</sup>	2001 <sup>f</sup>
	(000 t)		
Mine production	205	205.5	195
Refined production	133	132	140
Consumption	15	15	15.5

<sup>e</sup> Estimated; <sup>f</sup> Forecast; <sup>P</sup> Preliminary.

Notes: Mineral production refers to recoverable content in concentrates shipped, whereas mine production refers to metal content in concentrates produced.

"Refined" production refers to "primary" nickel production, which includes refined nickel, nickel in nickel oxide sinter, and nickel in nickel chemicals. Abbreviations used: Ni = nickel; PAL = pressure acid leach plant.

**N**ickel'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 include stainless steel (65%), nickel-based alloys, electroplating, alloy steels, foundry products, batteries, and copper-based alloys. Nickel is intensively recycled; nickel in stainless steel scrap accounts for about 45%, on average, of nickel input to stainless steel-making.

## ANNUAL AVERAGE SETTLEMENT PRICES, LONDON METAL EXCHANGE

1996	1997	1998	1999	2000 <sup>e</sup>
(US\$/lb)				
3.40	3.14	2.09	2.73	4.01

<sup>e</sup> Estimated.

## CANADIAN OVERVIEW

- At Voisey's Bay in early January, Inco and the Government of Newfoundland and Labrador ceased negotiations to develop Voisey's Bay, but exploration work continued. Inco proposed a US\$500 million mine/mill project, a US\$65 million underground exploration project, and a US\$125 million R&D program to prove up a proprietary hydrometallurgical process.
- At Inco's producing areas, new projects and exploration continued. Inco announced a US\$48 million deepening of the Birchtree mine in Thompson, extending the mine life by 15 years. The mining rate will be nearly doubled to 3175 t/d by 2004 by accessing 13.6 Mt grading 1.79% Ni. In Ontario, a labour strike was averted. Work continued on the Kelly Lake deposit (10.5 Mt grading 1.77% Ni, 1.34% copper and 3.6 g/t platinum group metals) and an economic feasibility study of the Totten deposit (8.4 Mt grading 1.42% Ni, 1.90% copper and 4 g/t platinum group metals). The US\$33 million McCreedy East mine work program will increase production to 21 000 t/y by 2004 from 8 Mt/y grading 1.88% Ni, 0.84% copper and 0.91 g/t platinum group metals.

- Workers at Falconbridge's Sudbury operations went on strike on August 1. The smelter continued running at half capacity, principally using feed from the Raglan mine, which reached a rate of 1 Mt/y by September. Falconbridge will evaluate Outokumpu's Montcalm property (7.75 Mt grading 1.48% Ni and 0.7% copper) by 2003. Noranda continued to purchase Falconbridge stock, owing 51.6% by November.
- Sherritt's 50%-owned Metals Enterprise produced 20 400 t of Ni and a record 2136 t of cobalt at the Fort Saskatchewan refinery in Alberta in the first nine months of 2000, using feed from Moa Bay in Cuba.
- Canmine began modernizing its hydrometallurgical cobalt-nickel refinery near Cobalt, Ontario. Purchased material, stockpiled near the refinery, will allow production of 300 t/y of cobalt and 100 t/y Ni, both as higher-valued powders. Canmine's Werner Lake mine project in Manitoba will subsequently feed the refinery.

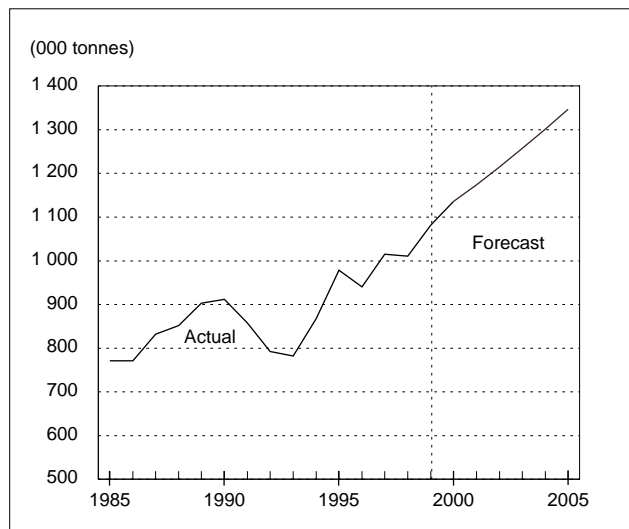
## WORLD OVERVIEW

- RAO Norilsk Nickel said its exports will decline by 20% in 2000 due to increased domestic demand. Eight-month exports were 115 000 t, down 26 500 t from the same period in 1999.
- The three Australian PAL producers, Murrin Murrin, Cawse and Bulong, produced a total of 17 500 t of Ni by the end of September. The properties continue to experience financial or technical problems that continue to deter the financing of similar projects elsewhere. Comet and QNI continued work on the A\$720 million Ravensthorpe project (35 000 t/y of Ni and 1300 t/y of cobalt) with final recovery at QNI's Yabulu refinery.
- Australian concentrate producer Jubilee will send 8600 t/y of contained Ni to Inco's Thompson smelters; the first shipment left in July. Inco agreed to buy 30 000 t of Ni in concentrate from the future Cosmos Deeps project. Inco will also assist LionOre Australia in developing the Emily Ann sulphide deposit, providing a US\$16 million loan to Emily Ann and an agreement to buy at least 6000 t/y of Ni in concentrate.
- Outokumpu sold its nickel refinery in Finland to OM Group in January; OMG will build a green-fields nickel powder plant at the refinery by the second quarter of 2001, while Outokumpu will complete a study of converting its nickel smelter to process only copper. OMG is working with Weda Bay, in Indonesia, to advance development of a 30 000-t/y Ni and 3000-t/y cobalt PAL plant to supply OMG's refinery in Harjavalta. PT Aneka Tambang owns 10% of Weda Bay.
- At Inco's Asian properties, PT Inco, after an expansion that was completed in 1999, expects to produce 61 000 t/y of Ni in matte in 2000 compared to 45 000 t/y in 1999. In New Caledonia, pilot work continued at Goro where Inco is testing a proprietary process for a possible 55 000-t/y nickel oxide and 5000-t/y cobalt operation.
- Anglo American sold its portion of the Kabanga/Kagera sulphide nickel project in Tanzania back to Barrick Gold; a 17 000-t/y output was planned from 21 Mt grading 2.18% Ni.
- Philnico and Impala signed a memorandum of understanding to advance development of a PAL plant at Nonoc in The Philippines to produce 41 000 t/y of Ni and 4000 t/y of cobalt, both as intermediates. Impala's refinery in South Africa could be expanded to 60 000 t/y to handle new feed. Philnico needs financing of US\$1 billion to proceed.
- In Cuba, WMC withdrew from its Pinares de Mayari West project; Norilsk resumed negotiations, which had been suspended in 1999, with the Cuban government to develop the Las Camariocas deposit.

## CONSUMPTION OUTLOOK

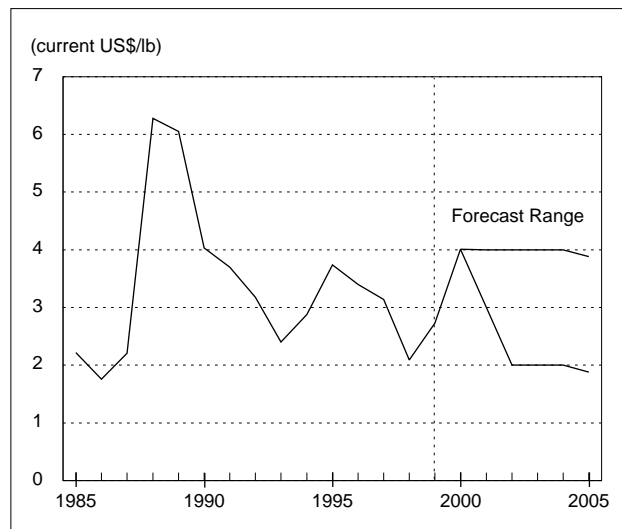
The world nickel market was forecast by the International Nickel Study Group (INSG) as a deficit for 2000 and a surplus for 2001. In October, the INSG 2000 forecast was demand of 1.136 Mt and refined production of 1.127 Mt; the forecast for 2001 was demand of 1.174 Mt and refined production of 1.209 Mt. Macquaries forecast stainless steel production to increase to 19.5 Mt in 2001, up from an estimated 17.3 Mt in 2000. Nickel in scrap supplied an increasing share of feed to stainless steel plants in 2000. World stainless demand paused in the third quarter as mills destocked, unconcerned about low London Metal Exchange (LME) stocks of Ni, perhaps because of inventories built up prior to the potential strike at Inco that did not materialize. Medium-term consumption is expected to trend at about 3%/y assuming past economic growth rates continue. Economic indicators, correlated to stainless use, showed slower growth of industrial activity in the OECD in the third quarter, partly resulting from higher oil prices, while U.S. stainless inventories continued significantly above "normal" levels.

**Figure 1**  
World Nickel Consumption, 1985-2005



Source: Natural Resources Canada.

**Figure 2**  
Nickel Prices, 1985-2005  
Annual LME Settlement



Source: Natural Resources Canada.

## PRODUCTION OUTLOOK

Canadian production of nickel in concentrate in 2000 is forecast at 194 000 t; the strike at Falconbridge's Sudbury operations reduced the previously forecast production for 2000. Canadian production is forecast to rise to 202 000 t in 2001 (assuming no strikes or unforeseen production interruptions). Voisey's Bay negotiations ceased in January 2000 and had not resumed as of November. Depending upon prices, permitting and studies, new production in the medium term includes: Canmine's Maskwa deposit, the Montcalm deposit, the Totten deposit, or Voisey's Bay. Because of the relative size of Voisey's Bay and the associated uncertainty, a yearly forecast of Canadian nickel production is not presented. Finished nickel production in Canada is estimated at 135 000 t in 2000; this is forecast to rise to 140 000 t in 2001.

## PRICE OUTLOOK

Nickel prices continued the increase that began in late 1998, buoyed in 2000 by increased stainless demand and lower-than-projected production from Australian PAL projects. Hence, prices for 2000 should average just over US\$4/lb (my forecast in November 1999 for prices in 2000 was US\$3/lb). A surplus of nickel in 2001 is expected by many; however, such forecasts may be based upon optimistic production projections and may not allow for labour disputes, weather or technical problems. Nickel stocks on the LME declined in 2000 from 47 000 t to 11 000 t in early November, concurrent with the

trend of decreasing prices in 2000; while this should continue, a serious production interruption in 2001 could result in a sharp price spike. A price of US\$3.50/lb is forecast for 2001, in the upper portion of the long-term forecast range of US\$2-\$4/lb (in current dollars). Subsequent years are expected to see prices decline in this range. If Murrin Murrin operates reliably at capacity, then a potential second wave of PAL projects is likely, which would bring on sufficient capacity to depress medium- to long-term prices.

*Note: Information in this review was current as of November 8, 2000.*

### NOTE TO READERS

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