



# SAMPLE NICKEL MARKET INDICATORS

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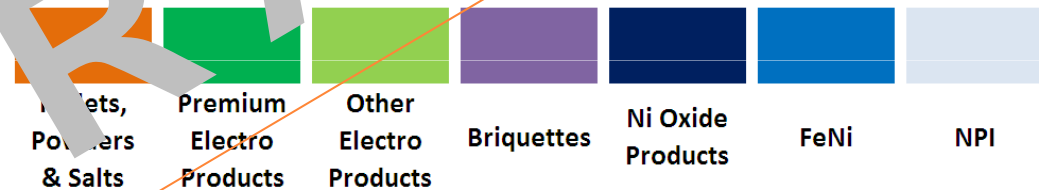
# MODULE 1: PRODUCT AND MARKET DYNAMICS

## GLOBAL SALES SPLIT FOR PRODUCTS, CUSTOMER SEGMENTS & REGIONS REVEALS CRITICALITY OF CATHODE SALES TO ASIAN SECTOR

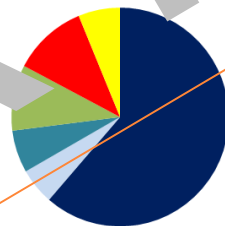
- Below we present a snapshot of how the market is structured. Here we identify the 7 different product groups identified for analysis – none of which has a dominant position in the market, and the 6 different customer groups of which stainless steel is the most important – but by no means dominant. The regional allocation shows that Asia now accounts for over half of the market for nickel, but Europe (and Africa) is still large, and the Americas cannot be ignored

Sales split by:

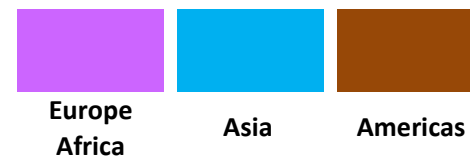
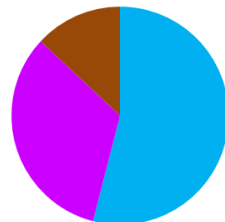
Products



Customer



Regions



# MODULE 1: PRODUCT AND MARKET DYNAMICS

*USE OF NICKEL PRODUCTS BY CUSTOMER GROUPS-SS CONSUMES EASILY THE MOST NICKEL AND THE WIDEST RANGE OF PRODUCT*

- Stainless steel's share of the market is around two-thirds. Some of the products of the nickel industry are destined almost exclusively to this market sector
- This applies to briquettes, nickel oxide products (including utility nickel and rondelles), ferro nickel and nickel pig iron
- Usage of the largest single product of the nickel industry – electrolytic cathode – is much more diverse. It is present in volume in all of the other customer group sectors
- The electro market can be split into “premium” and “standard” products. Also, there is a special pellets and powders market

Volume (kt)	Pellets, Powders & Salts	Premium Electro products	Other Electro Products	Briquettes	Ni Oxide Products	Ferro Nickel	Nickel Pig Iron	Total
Stainless Steel		1	195	150	137	274	90	847
Other Steel M...			59	5	3	5		74
Fou...		3	76	9				87
Nickel A...	36	68	32					135
Electroplati...	39	57	57					153
Other Uses	22	28	29		6			86
<b>Total</b>	<b>97</b>	<b>159</b>	<b>447</b>	<b>163</b>	<b>147</b>	<b>279</b>	<b>90</b>	<b>1382</b>

## Nickel Products & Customer Groups in 2007

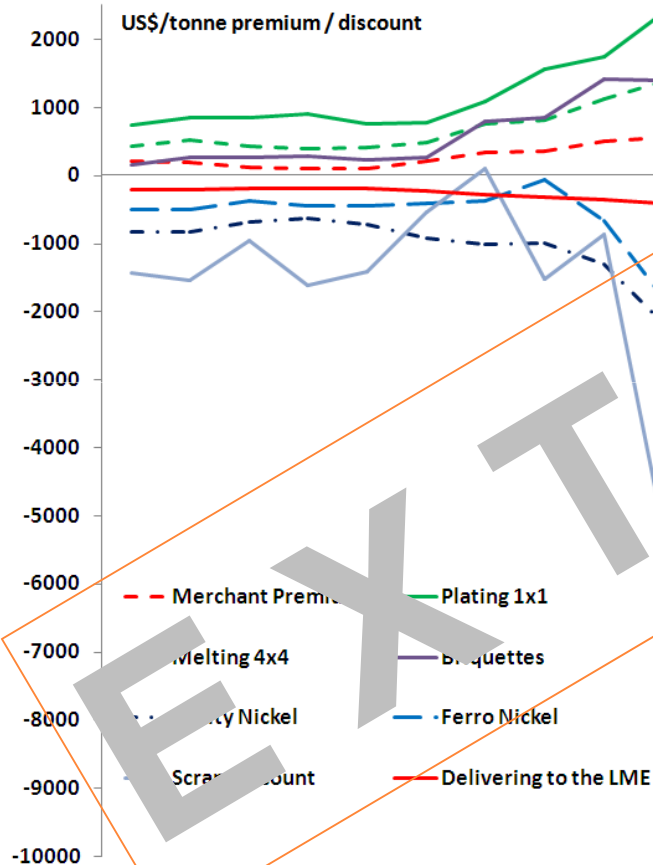
*The boxes outlined are selected for further analysis in the slides that follow*



# MODULE 1: PRODUCT AND MARKET DYNAMICS

## PREMIA ON AND DISCOUNTS OFF LME PRICE FOR Ni PRODUCTS

Q2 2008-THEY MOVE IN LINE WITH THE MARKET-AND SEPARATELY AS WELL



- The premia and discounts for the different products available in the market both tend to increase as the LME price for nickel increases. Also, the general level of pricing tends to increase shortly.

- The peak in premia and the trough in discounts in 2007 was quite exceptional

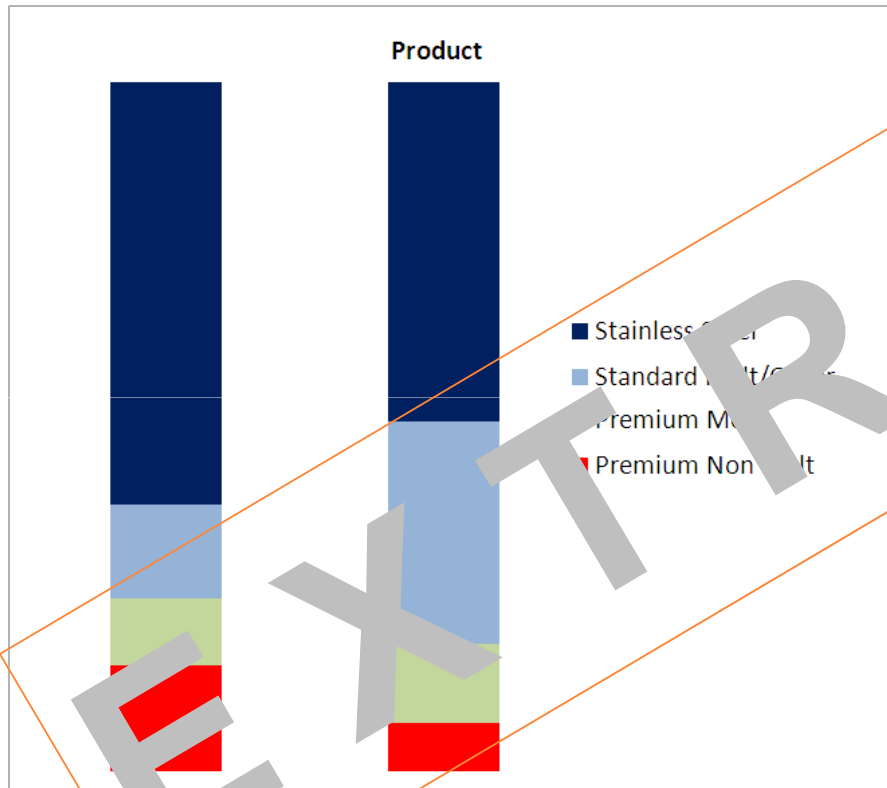
- The highest bar special products for batteries is normally paid for products used by electroplaters, and to a lesser extent nickel alloys. In a normal market, 1 x 1 cut cathode will achieve around US\$500-700/t. Considerably more than this (US\$1,000/t) may be paid for dedicated products for this market, such as Xstrata's "crowns". Standard melting products (like 4 x 4 cathode) achieve US\$200-300/t less

- Special products for stainless steel generally achieve less, although premia for briquettes rose considerably against the market average between 2005 and 2007. Ferro nickel did this earlier

- Prices for products not deliverable on the LME tend to be more volatile. This is especially true of FeNi, where pricing is against the benchmark of stainless steel scrap.

# MODULE 1: PRODUCT AND MARKET DYNAMICS

*IN THE MID-PRODUCT RANGE, THERE IS TOO MUCH PRODUCT CHASING TOO LITTLE MARKET*



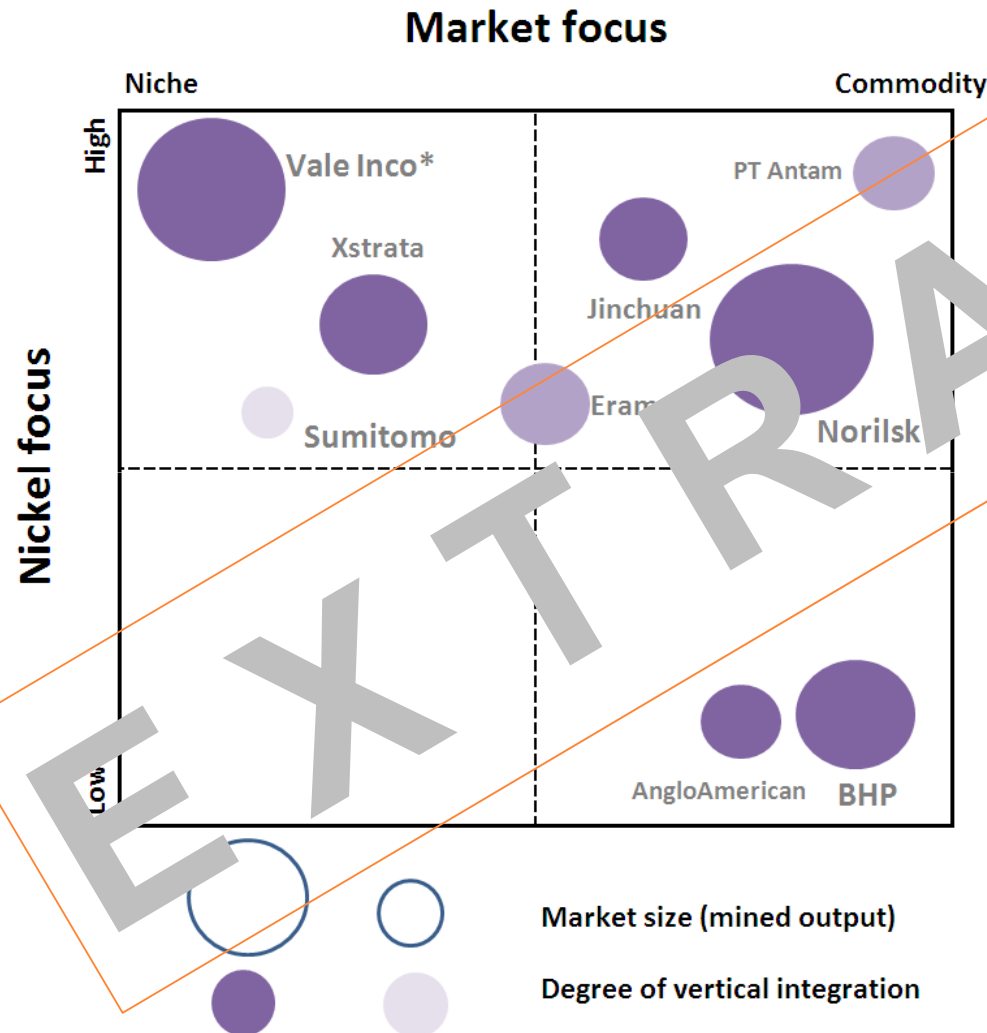
- The role of the marketing department of a nickel company is to place its product at the maximum price achievable while still ensuring continuity of business through serving long term customers

A simple comparison of premium markets with the premium products available would suggest that there is a shortage of product and thus it is easy to achieve a full premium. As electroplaters and alloyers use some lower grade product, however, it is not always possible to achieve the maximum premium, product being sold in a lower order market

- This is even more the case for standard melt products, that are better than the stainless steel market requires. Try as they might, the sellers of these products will have to put them into stainless steel, where pricing is normally little above LME flat
- Ensuring sale in an oversupplied market is important, even if it is only to stainless steel, as there is a cost in delivering to the LME. This is not only financial cost. For the premium product producer there is the danger of lower priced LME stocks competing with your own sales

# MODULE 2: COMPETITOR ANALYSIS

## HIGHLY CROWDED COMMODITY MARKET: TOP 9 PRODUCERS DOMINATE

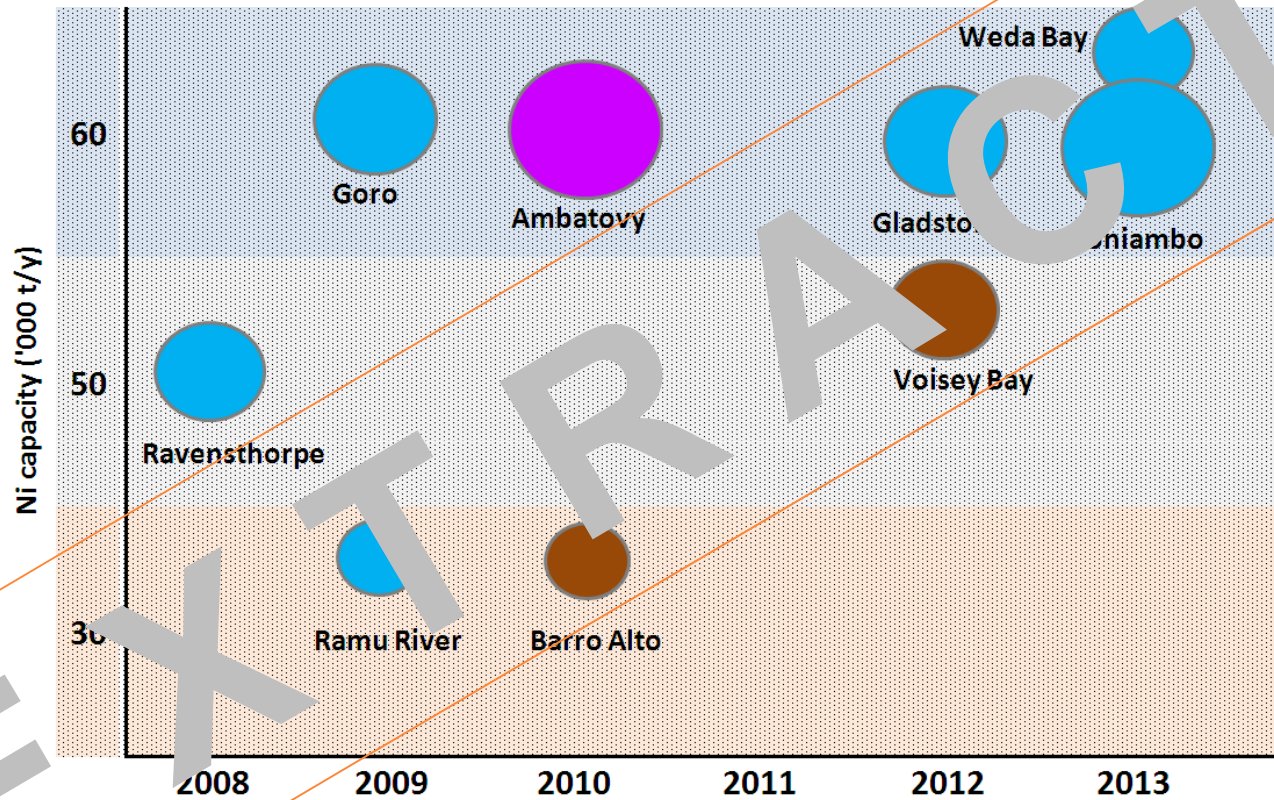


- The commodity market segment is highly crowded with the majority of top 9 nickel producers having a presence
- The niche market is dominated by metal giants like Vale (with the acquisition of Inco) and by Xstrata (with the acquisition of Falconbridge). Whether these companies will choose to continue being active in this market segment is not yet clear
- Other multi metal giants like BHP and Anglo have a significant position in the commodity market segment. Despite their low focus on nickel business, nickel allows them to offer a complete product portfolio to their stainless steel customers



# MODULE 3: VALUE CHAIN & PROCESS OPTION ANALYSIS

## SUMMARY OF PROJECTS BY START UP DATE, CAPEX & CAPACITY



Planned earliest/ official date to go on stream

Several projects are expected to be delayed or on-hold



# MODULE 3: VALUE CHAIN & PROCESS OPTION ANALYSIS

## PROJECT HIGHLIGHTS - GORO

Orebody	Laterite
Reserves	Proven 200 mio t Ni (1.60%)
Ni capacity ('000 t/y)	60
Process	HPAL
Value Chain	Fully integrated
Products	NiO Co Carbonate
Equity	Vale Inco: 100%
CAPEX	US\$3.2 bn

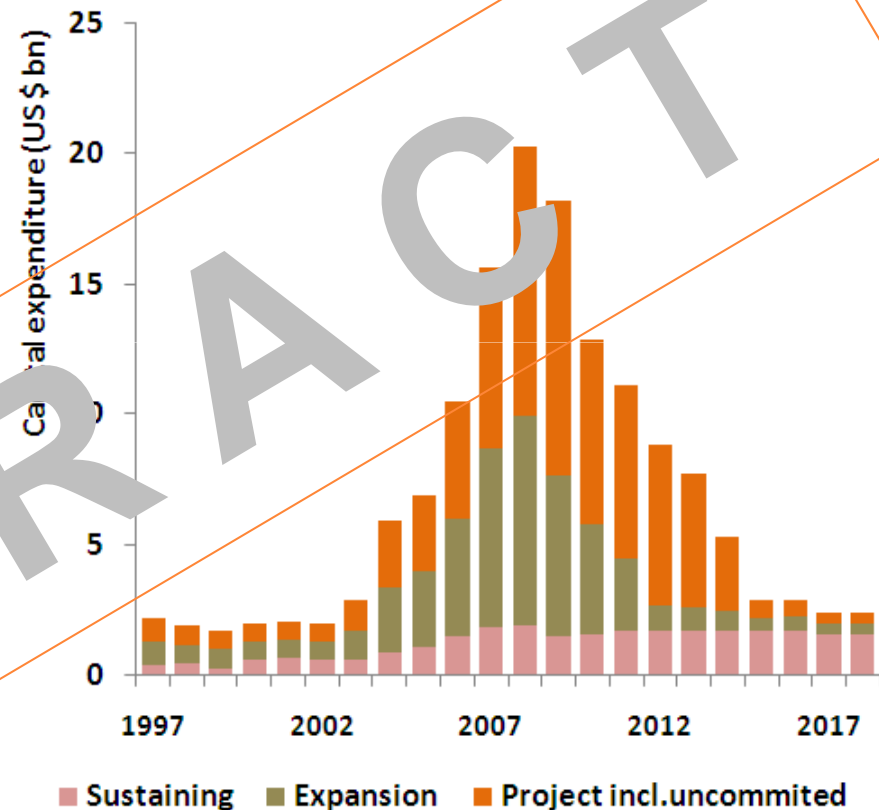
- Project status: start up expected early 09, capacity 60 kt/a Ni and 14 kt/a Co (17 kt Ni budgeted for 2009)
- Product/process route adopted HPAL at higher temperature than others (270 degrees C) then only Ni Oxide (70% to 80% Ni) for further processing abroad
- Reasons for choice of HPAL: proprietary process developed 20 years ago by Amax and BRGM after extensive test work on Goro laterites carried out by Vale Inco
- Favourable LT power supply contract with Enxco / Enercal through two 50 MW generators
- Tax holiday 15 years at 100% / 5 years at 50%
- Reason for quasi-single product NiO: Vale Inco's model of overseas JV to penetrate growth markets in Asia- KNC in Korea, TNRC in Taiwan, JNMC in China
- Long delay due to local environmental pressure and difficulties with Bechtel, not so much process itself which fully proven through US \$55 mn pilot plant
- Product will be Co carbonate tailor made for one single client in Japan (producer of Ni Li hydroxides for Li Ion batteries) drawing on Inco's battery expertise
- Goro's cash cost was est. to approx US\$1.00/lb Ni in 2002 after Co credits – BH latest estimate US\$1.51/lb (in 2006 US\$)
- Vale Inco long term view of Ni prices: being in lowest quartile with Voisey's Bay and Goro, will continue to strive for being the lowest cost producer, consistent with Vale's philosophy



# MODULE 4: DEMAND, SUPPLY AND PRICE ANALYSIS

## ON THE BRINK OF THE ABYSS?

- Whatever else one may want to say about the nickel market right now, one thing is certain – times are exceptional.
- Brook Hunt's 2007 chart of committed and probable spending on capacity by the industry shows quite clearly that investment is running at well over 5 times the historical average. Much of the uncommitted spending listed at that time has turned into committed.
- Even if demand turns out to be strong, the addition to capacity anticipated between 2007 and 2012 would be difficult to absorb.
- In the short term, a cyclical upturn in stainless steel may save the day – although this is now doubtful.
- We should be especially concerned that there is little sign of the move of the stainless steel industry away from 300 series product – the mainstay of the nickel industry – being reversed by anything but small measure.



# MODULE 4: DEMAND, SUPPLY AND PRICE ANALYSIS

*% MARKET GROWTH BY 2015, AND A FURTHER 50% BY 2028*

## Products and customer groups (kt market volume)

**2015**

Volume (kt)	Pellets, Powders & Salts	Premium Electro Products	Other Electro Products	Briquettes	Ni Oxide Products	Ferro Nickel	Nickel Pig Iron	Total
Stainless Steel		1	300	247	184	382	152	1266
Other Steel Mill		2	83	8	3	7		102
Foundry		2	98	12				111
Nickel Alloy	49	99	45					192
Electroplating	47	88	84					218
Other Uses	30	43	40					121
<b>Total</b>	<b>126</b>	<b>233</b>	<b>649</b>	<b>267</b>	<b>196</b>	<b>389</b>	<b>152</b>	<b>2011</b>

**2028**

Volume (kt)	Pellets, Powders & Salts	Premium Electro Products	Other Electro Products	Briquettes	Ni Oxide Products	Ferro Nickel	Nickel Pig Iron	Total
Stainless Steel				413	225	497	312	1852
Other Steel Mill			134	14	5	11		164
Foundry			138	20				158
Nickel Alloy	50	173	88					329
Electroplating	39	165	173					377
Other Uses	33	77	80		16			206
<b>Total</b>	<b>140</b>	<b>415</b>	<b>1019</b>	<b>446</b>	<b>246</b>	<b>507</b>	<b>312</b>	<b>3085</b>

Turning to demand, here we illustrate the appointment of new nickel use by product and by customer group when La Sampa is done on stream (in 2015) and 13 years later (2028).

Based on a continuation of existing trends, we anticipate some changes to market structure, but not dramatic ones.

From just over 1.3 Mt/a in 2007, the total market is expected to grow to over 2 Mt/a by 2015, and to top 3 Mt/a by 2028.

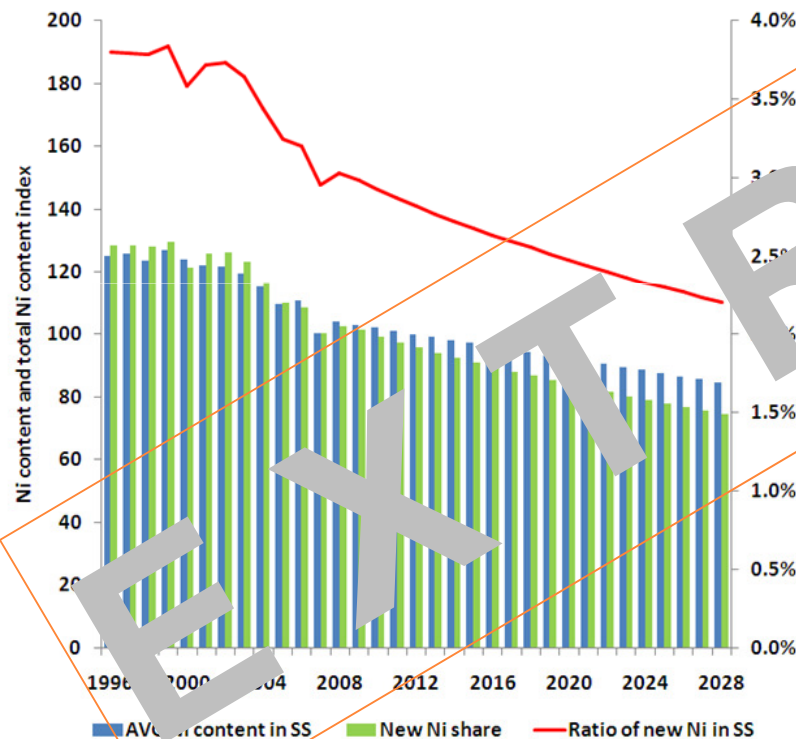
Stainless steel will continue to account for well over 60% of demand. Its product range will remain diverse, though the share of briquettes is expected to increase (bar further environmental concern) and ferro nickel should decrease – facing further competition from NPI on the one hand and stainless scrap on the other.

Growth demand for premium electro should exceed the market average

# MODULE 4: DEMAND, SUPPLY AND PRICE ANALYSIS

## *SLOWER GROWTH IN DEMAND FOR NEW NI FROM STAINLESS STEEL*

*Lower nickel content and higher scrap in stainless mean a smaller market for new nickel*



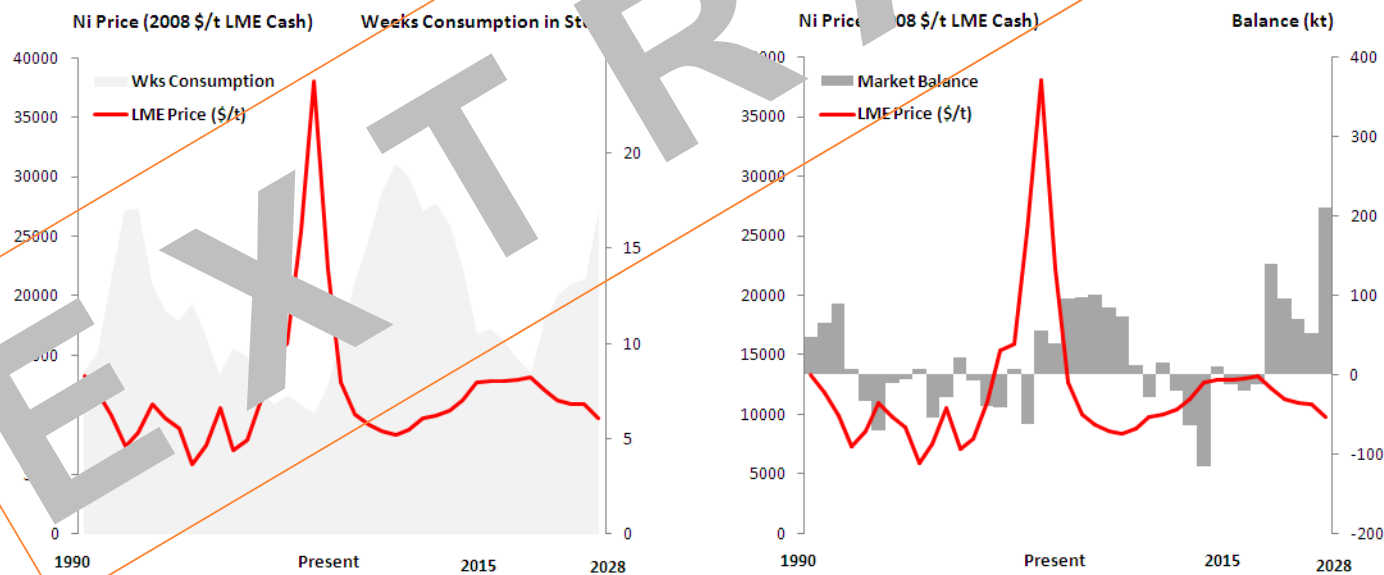
- Stainless steel output growth greatly exceeded growth in GDP as stainless steel gained share against substitutes. This growth is expected to slow slightly.
- From around 2005, the share of 300 series stainless began to fall against 400 series more or less without nickel, and more recently a new range of low nickel (2% Ni) 300 series product came to prominence in the market. This means less nickel per unit of stainless.
- The substitute grades are cheaper (normally even at a low nickel price), as nickel is expensive. Once the substitution has taken place it is difficult to reverse.
- The emerging Asian suppliers – China and India – have been the main suppliers of 200 and 400 series product. Although both are likely to produce more value added product over time, their increasing dominance is bad for overall nickel use.
- Another trend is the increasing role of scrap in stainless. Scrap suppliers consider that they will be able to provide sufficient material to cover 6% p.a. growth in stainless.
- If stainless output fails to achieve 6% p.a. growth, it is highly probable that the share of scrap in stainless will increase.
- This is likely to affect the emerging Asian markets first, as end-of-life scrap becomes available
- The net result will be a continuous erosion in the amount of new Ni per unit of stainless. This trend is already established.

# MODULE 4: DEMAND, SUPPLY AND PRICE ANALYSIS

## *REPEATED MARKET SURPLUS – RISING STOCK – LOWER PRICING*

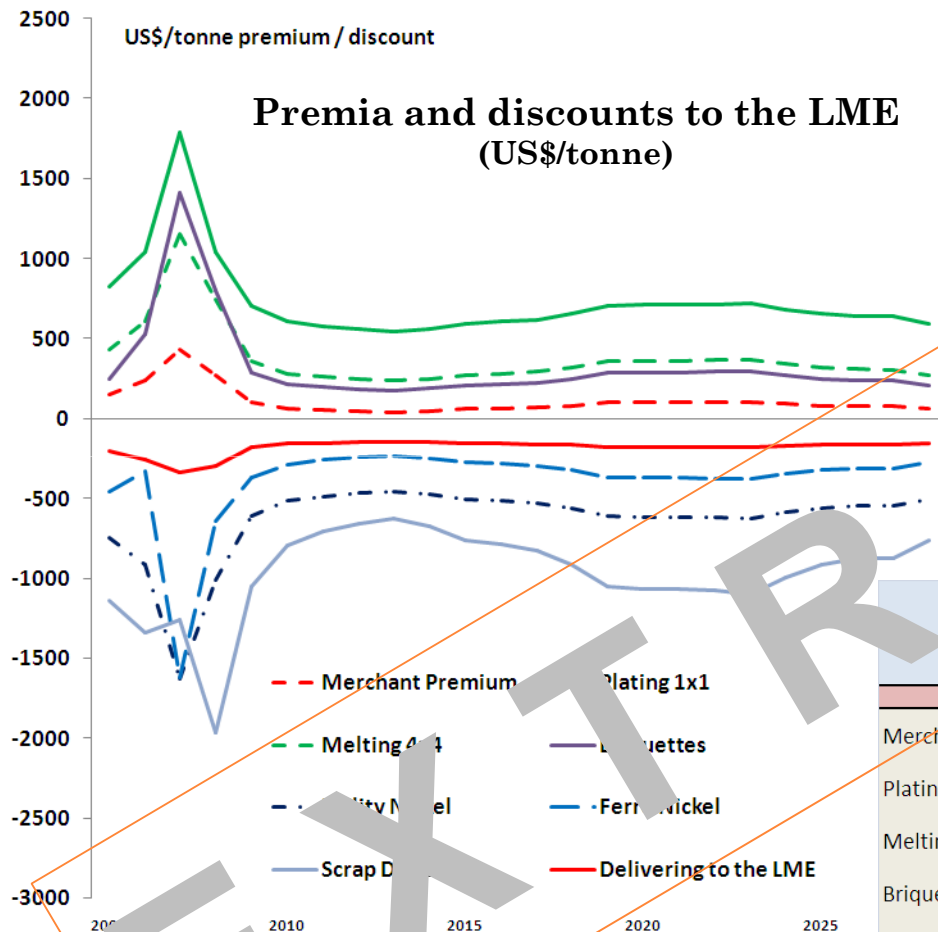
- The anticipated relationship between annual market balance, accumulated stocks and pricing is shown in the two charts below. Although a lot else was going on, it is clear that low and falling stocks were partly instrumental in the nickel price rise that took place in the years up to 2007, and very low stocks in the first half of that year was one reason for the unprecedented price spike at that time.
- Now we are seeing the reverse side of the coin. Accumulated stocks are likely to rise to historical highs in coming years, and pricing to respond accordingly.
- Longer term, a price related starvation from investment could lead once again to low stocks and high prices. Whether it will stay that way is open to question. A backlog of existing projects could lead to renewed over-investment (as in our Base Case).

**Market balance, weeks consumption in stock and prices 1990-2028**



# MODULE 4: DEMAND, SUPPLY AND PRICE ANALYSIS

## PROSPECTS FOR PREMIA – QUITE LOW AND LITTLE CHANGE

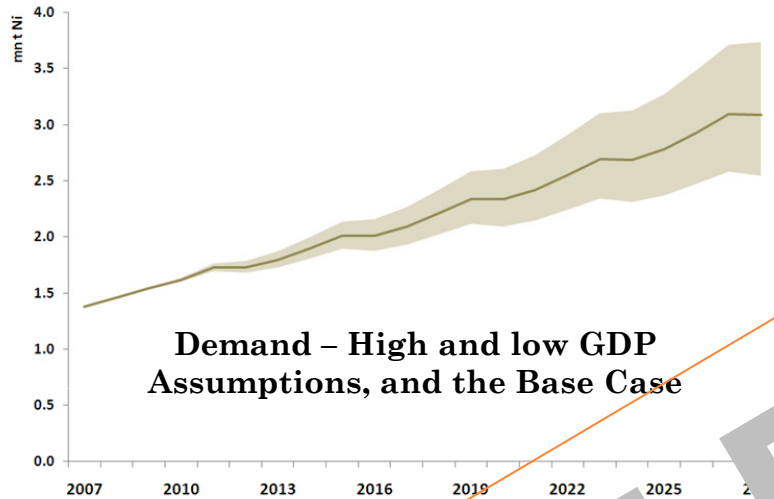


- Our forecasts for premia and discounts are shown in the chart opposite and tabulated below
- Bar major change in product alignment, we see little reason why premia should diverge from their current structure, the absolute level falling with LME prices
- Those products not deliverable on the LME will continue to be most vulnerable to price shocks
- For other products nickel pig iron sells at 80-95% of LME price and for intermediates, matte sells at 75-85% and base metal products at 70-80% with MHP likely to be lower than MSP

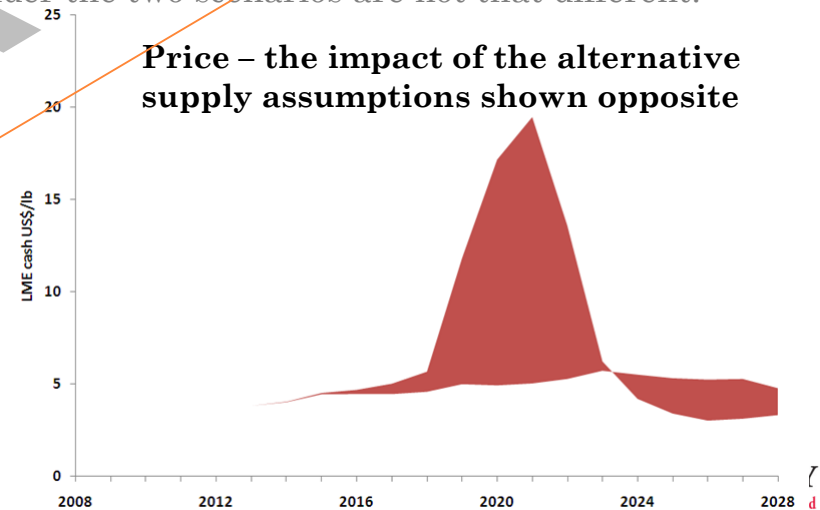
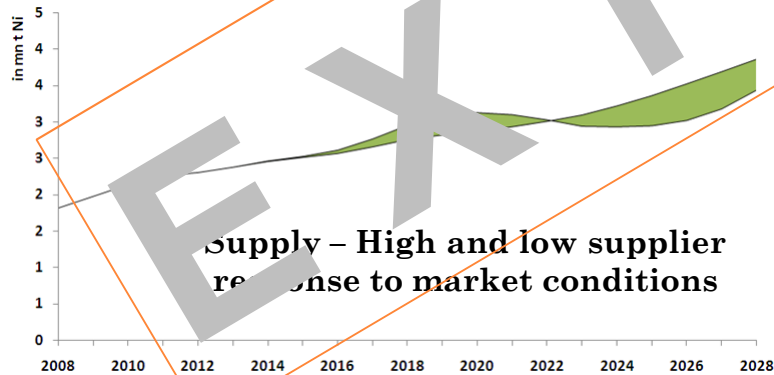
US\$/tonne	Data				Average		
	2007	2015	2020	2028	07-15	15-20	20-28
Merchant Premium	435	62	103	62	126	84	88
Plating 1x1	1791	598	712	598	778	660	671
Melting 4x4	1158	277	363	277	425	324	332
Briquettes	1409	213	291	213	410	255	263
Utility Nickel	-1627	-506	-614	-505	-684	-565	-575
Ferro Nickel	-1620	-276	-370	-275	-463	-327	-336
Scrap Discount	-1262	-761	-1067	-760	-943	-927	-957
Delivering to the LME	-339	-153	-174	-153	-189	-164	-166

# MODULE 4: DEMAND, SUPPLY AND PRICE ANALYSIS

## ALTERNATIVE SCENARIOS – DIFFERENT NUMBERS, SAME BASICS



- In order to test the range of possibility, we tested various alternative demand and supply scenarios. Two examples of the results we came up with are shown on the left hand side of the slide.
- Against some of the scenarios, we also forecast price. The range of prices of the alternative supply projections shown is indicated below.
- This price chart does show that, given the right conditions, prices for nickel have the potential to spike upwards. It also shows that, if they do, an adverse rebound is highly likely. Average prices under the two scenarios are not that different.



# MODULE 4: DEMAND, SUPPLY AND PRICE ANALYSIS

## FORECASTING METHODOLOGY – ALTERNATIVE DEMAND ASSUMPTIONS

*Long term demand, supply and price model (work in progress)*

### Factors Applied to Forecasts

Scenario **Base Case**

Insert "Y" to activate scenario

[See Notes below for instructions](#)

	Base Case	Detail
<b>Macroeconomics</b>		
Impose Economic Cycle	<input type="checkbox"/>	Base Case forecast adjusted: Yr 1 = +0%, Yr 2 = +1.5%, Yr 3 = +3%, Yr 4 = +1.5%, Yr 5 = -1.5%, Yr 6 = -1.5%, Yr 7 = -3%, Yr 8 = -1.5%, Yr 9 = +0% etc.
Lower GDP growth	<input type="checkbox"/>	Minus 1% p.a. Against Base Case GDP forecast
Higher GDP growth	<input type="checkbox"/>	Plus 1% p.a. Against Base Case GDP forecast
China Lower Growth	<input type="checkbox"/>	Minus 3% p.a. To 2010, plus 2% thereafter against to Base case GDP forecast
Japan, Taiwan, Korea Lower	<input type="checkbox"/>	Minus 0.5% Japan, minus 1% p.a. S. Korea and Taiwan combined against Base Case GDP forecast
<b>Stainless Steel</b>		
Impose SS output cycle	<input checked="" type="checkbox"/>	Base Case forecast includes cyclical adjustment Yr 1 = +3%, Yr 2 = -3%, Yr 3 = +3%, Yr 4 = -3%, Yr 5 = +3%
Increasing Scrap Use	<input type="checkbox"/>	Trend increase of 1% p.a. Against Base Case forecast
Increasing Ni content	<input type="checkbox"/>	Trend increase of 1% p.a. Against Base Case forecast
Lower SS Output	<input type="checkbox"/>	Trend decrease of 1% p.a. Against Base Case forecast
Higher SS Output	<input type="checkbox"/>	Trend increase of 1% p.a. Against Base Case forecast
<b>Non Stainless Markets</b>		
Higher Growth	<input type="checkbox"/>	Non SS Steel +1% p.a., Foundries +1% p.a., Alloys +1% p.a., Electroplaters +1% p.a., Other +2.5% p.a.
Lower Growth	<input type="checkbox"/>	Non SS Steel Minus 1% p.a., Foundries -1% p.a., Alloys -2% p.a., Electroplaters -2% p.a., Other -1% p.a.
<b>Ni Product Markets</b>		
Low NiO, Briquette	<input type="checkbox"/>	Minus 1.5% p.a. for both against Base Case forecast
Low Premium Product	<input type="checkbox"/>	Minus 1% p.a. Against Base Case forecast, applied to Pellets, Powders & Salts, and Premium Electro
High Premium Product	<input type="checkbox"/>	Plus 1% p.a. Against Base Case forecast
Low NPI	<input type="checkbox"/>	Minus 7% p.a. Against Base Case forecast
High NPI	<input type="checkbox"/>	Plus 3% p.a. Against Base Case forecast



# MODULE 4: DEMAND, SUPPLY AND PRICE ANALYSIS

## FORECASTING METHODOLOGY – ALTERNATIVE SUPPLY AND PRICE ASSUMPTIONS

*Long term demand, supply and price model (work in progress)*

### Factors Applied to Supply and Price Forecasts

	Scenario		Detail
	Higher	Lower	
<b>Supply</b>			
Price Response of Finished Product Output	<input type="checkbox"/>	<input type="checkbox"/>	Responsiveness to changes in market balance, stocks, under-utilised capacity and project delay / force majeure adjusted
Refinery Project Threshold	<input type="checkbox"/>	<input type="checkbox"/>	Adjusts market conditions (prices, stocks, demand growth) at which projects go ahead
FeNi Project Threshold	<input type="checkbox"/>	<input type="checkbox"/>	Adjusts market conditions (prices, stocks, demand growth) at which projects go ahead
Intermediate Project Threshold	<input type="checkbox"/>	<input type="checkbox"/>	Adjusts market conditions (prices, stocks, demand growth) at which projects go ahead
Mine Project Threshold	<input type="checkbox"/>	<input type="checkbox"/>	Adjusts market conditions (prices, stocks, demand growth) at which projects go ahead
<b>C1 Costs and LME Prices</b>			
Base C1 Cost	<input type="checkbox"/>	<input type="checkbox"/>	Adjusts Base C1 Cost (set level of \$3.00/lb (High \$4.25/lb), Low \$2.75/lb)
Trend Change in C1 Cost	<input type="checkbox"/>	<input type="checkbox"/>	Trend change in C1 Cost (+/- 0.5% p.a.)
Responsiveness of Costs to Prices	<input type="checkbox"/>	<input type="checkbox"/>	Adjusted sensitivity of C1 costs to changes in LME prices
Level of C1 / Price Multiplier	<input type="checkbox"/>	<input type="checkbox"/>	Adjusted absolute level of the C1 cost / LME price multiplier
Tight Market Price Sensitivity	<input type="checkbox"/>	<input type="checkbox"/>	Reduced sensitivity of price as stocks fall below 8 weeks consumption

Y Insert "Y" to activate scenario

Scenario **Base Case**

*See Notes below for Instructions*  
*Base Case set with no "Y" Values*

EXTRACT



# ABOUT BME

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