16th International Bauxite and Alumina Seminar
Alumina Industry Evolution

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Miami, March 30th 2010
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Alumina Industry Evolution

- Overview: Aluminium within BHP Billiton
- Historical trends
- Pricing dynamics in other commodities
- Why a change to the alumina pricing system is inevitable
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Aluminium within BHP Billiton

**Aluminium**
- #4 global producer of bauxite and #4 aluminium company based on net third party sales

**Energy Coal**
- One of the world’s largest producers and marketers of export thermal coal

**Metallurgical Coal**
- Produce and market high quality hard coking coals for the international steel industry

**Base Metals**
- #3 global producer of copper, silver and lead

**Iron Ore**
- One of the world’s premier suppliers of iron ore

**Stainless Steel Materials**
- #3 global nickel producer

**Petroleum**
- A significant oil and gas exploration and production business

**Manganese**
- Operations produce a combination of ores, alloys and metal

**Diamonds & Specialty Products**
- EKATI Diamond Mine is one of the world’s largest gem quality diamond producers

Note: Ranking based on production volumes. Location of markers indicative only.
Aluminium: Part of a Balanced Portfolio

<table>
<thead>
<tr>
<th>Steelmaking Materials</th>
<th>Non-Ferrous Products</th>
<th>Energy Products</th>
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<tbody>
<tr>
<td>Iron Ore</td>
<td>Copper</td>
<td>Petroleum</td>
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<tr>
<td>Metallurgical Coal</td>
<td>Aluminium</td>
<td>LNG</td>
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<tr>
<td>Manganese</td>
<td>Nickel</td>
<td>Energy Coal</td>
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<td></td>
<td>Diamonds</td>
<td>Uranium</td>
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Global Bauxite Reserve Base
Three-basin strategy

World’s top 10 bauxite deposits (By country)

Source: USGS
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• Pricing dynamics in other commodities
• Why a change to the alumina pricing system is inevitable
Aluminium demand growth has exceeded nearly all other commodities

Commodity demand growth
% cumulative increase in global markets (2000 to 2009)

Source: BHP Billiton, EIU, USDA, CMAI, MEPS, Brook Hunt, IEA, EIA. Estimates are used for coal and PVC consumption in 2009.
Alumina production has had to grow rapidly

- Alumina previously a slow-growth industry
  - Economics relatively stable
  - Limited investment required
- China boom has meant rapid growth was required to meet metal demand
- Alumina industry has now reached a significant level of materiality (>USD$25 BN)
- Industry now as large as nickel, lead or zinc

Smelter grade alumina demand (M tonnes)

Source: CRU, James King
Emergence of Chinese refining has fundamentally changed the industry

- Impact of Chinese expansion:
  - Global industry hugely reliant on Chinese alumina supply/demand
  - Shorter cycle of investment, production, consumption
  - A liquid spot market for alumina in mainland China

- Other developments:
  - Decoupling of the value chain continues (accelerated development of Middle East and Chinese smelting base)
  - Long-term shortages of high quality bauxite becoming a key driver of the Alumina industry

Source: CRU, James King
Chinese markets are now the major driver of global spot market

• LME price link developed in the 1980’s when growth rates were sluggish and the industry was in oversupply

• Historically the price link provided stability across the industry in a low growth environment

• Industry growth and emergence of China has created dynamics specific to alumina:
  - The booming spot market induced high cost capacity development
  - China is the major contributor to the global spot price
Limited greenfield alumina expansion outside China

- Surging demand for more low-cost, sustainable alumina capacity
- Industry is running out of competitive brownfield options
- Greenfield locations tend to be in new geographies with different investment and risk characteristics
- Traditional LME based pricing has not supported investment in low cost capacity
- Investment in refining capacity is capital intensive

Source: CRU, James King, BHP Billiton
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Alumina lags other commodities

- Factors similar to those observable in the alumina market have led to a shift in pricing structures in other markets e.g. thermal coal, iron ore
  - A sharp rise in demand led to the development of a spot market
  - Emergence of new entrants, with flexible but high cost positions
  - Sharp divergence in spot contracted prices, driving the evolution of a new pricing structure

- Outcome for industries involved has been positive:
  - Lower cost supply has been generated
  - Greenfield basins have been opened up
  - Supply outcomes have become more equitable
  - Increased ability to hedge exposures
  - Increased transparency
  - Attracted new market participants providing liquidity
  - Pricing closer to market reduces contract performance issues
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The future

• Other economies e.g. India and Brazil are expected to follow China and add significant incremental demand for aluminium

• To underpin the aluminium industry growth path, greenfield investments in competitive and sustainable refining capacity will be required

• Refining industry will retain its different drivers from smelting
  - main value driver for smelting is competitive power
  - main value driver for refining is size, quality and proximity of bauxite reserve

• Security of supply and production should not be compromised
  - Long term contracts are still common
  - Alumina supply and demand balance sets price

• For buyers and sellers a market clearing price ensured: the right volumes, the right quality, the right price, the right time, the right cost, the right location
Conclusions

- Alumina industry needs to become increasingly flexible in response to changing market dynamics (led by China)

- The right outcome for industry is the development of greenfield refineries in low opex locations, rather than high marginal cost Chinese production with unknown sustainability

- A price reflecting true supply/demand fundamentals of alumina would support these investments

- Pre-conditions are in place for alumina pricing off its own market characteristics

- Ideally the industry needs a clearing price against which long term contracts settle

*The process will be an evolution…..but economics will make it inevitable*