

**Metal Bulletin Alumina and Bauxite Conference
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Slide 1 – Cover Slide

- My name is Marius Kloppers and I look after BHP Billiton's non-ferrous businesses which include our Aluminium and Alumina businesses. I guess that they let me register for this conference on the basis that I spent the formative part of my career in our aluminium business, and on the basis of me being an electrochemist by training. Therefore, I am very happy to be able to say a few words to you today.
- As you may have seen, the topic of my talk today is - What future for the import-based refinery in higher-cost, lower-price alumina market? As will become evident during my talk – at least the second part of this title is provocative.
- They say that you should always answer not the question that is asked – answer instead the question that you want to answer. I will not disappoint today in this regard! I hope to convince you of two things today (and therefore will not stick to the title of the talk 100%). Those two things are:
 - The non-integrated refinery will be continued feature of the industry, and that in fact we may see new non-integrated capacity.
 - The evolution of the cost curve in the industry will force a de-linking of the metal and alumina price and force alumina prices in the long run to be more reflective of the investment and operating economics of alumina as product (and not implicitly of metal – which is the case when you link prices). The de-linking topic is of course a soap box that we as a company have stood on for many years, and we believe that given cost developments it is especially relevant today.

Slide 2 - Disclaimer

- The data that forms the basis of my presentation today is in the public domain, nevertheless there is no quality guarantee (either explicit or implicit), and nothing that we will discuss today should be taken as a recommendation or forecast.

Slide 3 - BHP Billiton Equity Production

- So - continuing to apologise - I believe that it is customary that the speaker is allowed a certain modicum of advertising. I will limit it today to a quick description of the BHP Billiton Aluminium asset base.
- We have the core of our aluminium production base in our Southern African smelting system, the core alumina production in Western Australia, and other important assets in Brazil and Suriname. It should be noted that at both the Worsley and Alumar assets expansions are currently underway.

Slide 4 – Alumina Production – A history of Integrated and Non-Integrated Supply

- BHP Billiton, over the last few years has steadfastly maintained that the minerals industry finds itself in a fundamentally higher demand scenario (driven primarily by Chinese industrialisation and urbanisation, but lately also by better growth in Japan, US and Europe). 20 million people per year moving from rural to urban areas and entering the industrial economy is an unprecedented event.
- Additionally we believe that we may find ourselves in a situation where for a protracted period of time, supply additions may lag demand. These supply additions are slower as a result of multiple bottlenecks– including availability of trucks, shovels, engineering capacity etc.; for example - trucks cannot be had if you try and order them for new projects; neither can tyres.
- So - lets look at the history of the integrated versus non-integrated alumina assets. New capacity decisions (that is integrated or non-integrated) - have been

largely shaped by the availability of local ore, investment climate, and government policies. As you would expect, these variables change over time, sometimes making non-integrated projects more attractive.

- The alumina industry as we know it today began in the 1940s, with local demand being met by local production. The infant industry did not want to and did not need to venture from its smelting customer base in Europe and the US.
- With increasing volumes of alumina required to meet the post-war demand boom, it became apparent local marginal-grade deposits were no longer sufficient to meet growing demand and that offshore supply was required. Initially, it went in search of bauxite as opposed to new refining locations. The US refining industry moved en-mass to the Gulf coast to process imported Caribbean bauxite. This, along with cheap locally-sourced gas, which we will touch on later, was the genesis of the current US alumina refining capacity.
- The 1950s, however, also saw the first real moves towards in-situ alumina refining, in the Caribbean and Africa. By the 1960s, the promise of lower operating costs appeared to signal an end to the non-integrated refinery. While US production continue to grow through brownfield and creep expansions, the last greenfield US plant was built in 1958.
- The 1970s signalled a turning point for commodities, and alumina was no different. Growing nationalism increased the uncertainties of investing abroad. This encouraged a return of alumina refining investment to Europe, and the development of the traded bauxite market as we know it today. Additionally alumina import taxes, tax and fuel rebates, increased the attractiveness of Europe. The last greenfield expansion in Europe, however, came on stream in 1983 – and believe me since it was a project in which Billiton was involved – that one was definitely too late into the gap.

Slide 5 – Chinese Imports

- China, given its relatively poor resource base, and already a major importer of refined bauxite, will continue to rely on foreign ore demands. This slide shows how the share of overseas bauxite (either as bauxite or in alumina) has increased as its demand has exploded.
- Chinese companies, dealing with a resource shortfall, currently have the same three options once faced by their US and European counterparts.
 - They can source alumina from third-parties sellers such as BHP Billiton!
 - They can go it alone, and venture overseas and participate in integrated alumina developments, if available.
 - Alternatively, they can ship bauxite to a coastal Chinese location for further refining.

Slide 6 – Will China facilitate a larger Bauxite market?

- I believe that all three the above options will be required in order to meet the Chinese demand. We have already shown that the conditions that give rise to investment change over time, and I believe that the emergence of an industrialised China is another discontinuity.
- In the same way the low capital (our studies show that depending on the type of project, projects can be up to 2/3 cheaper) and low labour costs facilitated the rapid emergence of the smelting industry in China, they will also play a role in refining. In fact – given that alumina is more capital intensive (traditionally almost half of the NPV of cash outflows sunk at the project stage), the incentives if any, for Chinese to invest locally are greater than in smelting. The cost of shipping bauxite can be offset if your facilities cost only half as much to build.
- Like Europe before it Beijing's policies may also lend a helping hand. Any refinery project developed to run on imported ore is more likely to receive the necessary backing from a government publicly committed to conserving limited ore reserves at home. The import duty on alumina also encourages the import of bauxite. The parallels with a Europe of thirty years ago can not be overlooked.
- Up until now there has been a bit of the "better the devil you know" by the Chinese, resulting in domestic production based on low-grade bauxite, but we

may, more than twenty years after the industry thought it had seen its last greenfield non-integrated refinery, and to the surprise of some observers, see domestic Chinese capacity based on imported ore.

Slide 7 - Demand & The Cost Curve – Part 1 - Utilisation Rates

- Now lets start tying the preceding piece to the second topic that I asked you to believe – namely that the alumina price needs to de-link from metal price.
- In the '70s alumina capacity consistently came on only to meet non-existent demand (the post war reconstruction had ended). This overcapacity directly resulted in the metal price linked contracts that we have.
- As a result of overinvestment in the 70's, an investment drought followed in the 80's and 90's, and this has meant falling levels of spare alumina capacity since that low-point in the mid-1980s. With our view of continuing high demand growth, and high current operating rates, the conclusion is that we need green field capacity in order to supply the market.
- I started off this talk by stating that BHP Billiton's view is that it is not improbable that demand will continue to be strong, and that supply will continue to lag demand. One of the elements that we have stressed to our investors is that the industry may overestimate the sustainable operating rate of assets. Indeed in another of our commodities – copper – this has manifestly been the case. Again this would argue for more greenfield capacity being required to meet demand.
- Certainly there is no scenario in the near future that can be envisaged in which the alumina from non-integrated refineries is not needed in order to meet demand.

Slide 8 – The effect of LME price linkage

- The next slide shows that real metal prices have gone down. Given the intense cost inflation in the main alumina production areas (for example more than 100% capital inflation in WA in the last three years) and the previously illustrated need to build new greenfield capacity (not only brownfield), we believe that the recent relative lack of investment reaction to demand can at least partly be explained by the pegging alumina price to metal price.

Slide 9 – Greenfield Needed

- Why do we think this?
- We think that greenfield refineries will be needed to meet demand. But herein lies the rub - simply put – given the capital intensity of alumina refining – projects just don't work if you keep long-run pricing constant and double capital costs! We have seen cases where producers do not invest in the best options in the industry.
- Therefore - linking the two prices gives imperfect signals for capacity addition, raising near term prices, and ultimately failing the customer. Hence - it is not a surprise that the alumina market is more steeply backwarddated than any other product. At some point something has to give. Higher prices will be needed to induce greenfield capacity.

Slide 10 - Rising refining costs

- But there are more factors at work than just inducement arguments that point at different long run prices - A number of factors conspire to give a steeper alumina cost curve.
- Firstly – the non-integrated refineries (which we earlier concluded are required to satisfy demand), are generally not in the lower part of the cost curve, and neither is much of the new capacity that is being added in China. Irrespective of when it was commissioned, non-integrated capacity typically resides at the top-end of the industry cost curve. Not surprisingly in light of (the) last comment, the cost differences are largely structural, leaving the individual refining operation very little scope to reduce unit running costs.
- There are even some arguments that cost increases may differentially impact on the (European) top end of the cost curve – freight, vanishing fuel rebates in Europe, carbon taxes, increased environmental costs etc.

- Secondly - the entire refining cost curve has shifted upwards on the back of rising freight, caustic soda and energy prices. Additionally one may ask how long the fuel or energy rebates and import duties on some sources of alumina that some European refineries enjoy
- At full capacity – the natural clearing price with a steep cost curve will be different. Once again this points at pressure on the linking between metal and alumina prices.

Slide 11 & 12 - Costs

Slide 13 - To recap – main conclusions:

- Far from seeing the demise of the non-integrated refinery, this constituent of supply has never been as important to the overall health of supply as it is now.
- The Chinese, as a result of capital efficiency considerations, may well construct more import-based refineries.
- Refining operating costs have and will continue to rise, putting pressure on the traditional link between metal and alumina prices.
- Rapidly escalating capital costs and the need for greenfield refinery investment will likewise require the linkage of metal and alumina price to be broken in order to facilitate investment.
- Therefore - we believe that the forward price setting mechanism for alumina should be based on the supply demand of that commodity, and be more reflective of the economics of the alumina refining industry.
- Alternatively, failing that the pricing of alumina adjusts as outlined above, we will see that producers will make appropriate risk-return tradeoffs on how much to sell spot versus term (the reward of spot being so much higher), and the market will be forced into a greater percentage of spot sales – in our eyes a suboptimal outcome for consumers.