



**Iluka Resources Limited (ASX:ILU)**  
**Business Briefing Session – Marketing, Technology and Development**  
**Sydney, 22 May 2015**

**Presenters:**

David Robb	Managing Director
Doug Warden	Head of Resources Development, Minerals Sands
Rob Hattingh	General Manager, Innovation, Technology and Sustainability
Matthew Blackwell	Head of Marketing, Mineral Sands
Simon Hay	General Manager, Zircon Sales
Robert Gibney	General Manager, TiO <sub>2</sub> Sales

---

**David Robb:** Good morning everybody. Apologies for my croaky voice. I think I'm going to buy a cream-coloured suit or something. As I look at the sea of dark suits and so on, I think it's - in the spirit of innovation and breaking moulds I might have to get myself a cream linen suit, and turn up in that one day. It would be very interesting to see what the effect on our share price would be. Thank you all for attending this briefing. Thanks UBS for your facilities. I am obliged to emphasise to you our disclaimer in relation to any forward-looking statements that we may make today. **[Slide 2 –Disclaimer, Forward Looking Statements]**

**[Slide 3]** Our products find their way into most people's lives every day in an increasing array of applications, and I am absolutely sure that there's more titanium dioxide and more zircon in your lives every day than you realise. **[Slide 4]** In my time as CEO of Iluka our objective has not changed. It is to create and deliver value for shareholders. We are, I believe, a shareholder-focused company, and our approach has three key aspects: first, flexing assets in line with demand; second, we try and preserve and advance growth opportunities; and we believe in acting counter cyclically where appropriate. Obviously where appropriate is a critical qualification.

**[Slide 5]** We hope today to give you a deeper insight into two key areas of our business, which I might summarise as marketing and technology. In doing so we will touch on some examples of the first part of our objective, the creation of value. Today is also an opportunity obviously for you to meet, both formally in the presentation and hopefully afterwards, some key executives of Iluka.

**[Slide 6]** We have strong opinions on what it takes to be successful in our industry, and if I might just work through this slide in a little bit of detail. You've heard us talk about balance sheet strength. We certainly believe, and we will cover in some more detail later, that in this industry you need very specific technical expertise. You need indeed to be relatively self-sufficient. We feel that market knowledge, access and reach are also pre-conditions to success. I mentioned self-sufficiency. At the very least I think self-sufficiency provides competitive advantage, and I think arguably it is actually essential for success.

Those of you who know this industry or have followed it for some time would know of examples of shareholder value destruction associated with a lack of detailed knowledge and understanding of ore body characteristics.

---

Mineral sands ore bodies are often very variable in nature, and clearly if you don't get the throughputs, the recoveries and so on, and a consistent quality to offer your customers, that too can be very problematic.

So in my time at Iluka, commencing in late 2006, we've had a focus on technology. I think we speak about it more now perhaps partly because we have some more transformative opportunities. Initially it was a focus on what we referred to as master of mineral sands, or "MOMS", and there was also a strong focus on project management. You may recall we had Jacinth-Ambrosia coming up. We had Murray Basin Stage 2 ahead of us. There had been some issues with project management in the first move into the Murray Basin. They were all areas of focus. They were obviously in their nature quite inward looking.

We have worked hard to build our bench strength in the areas listed here: geological, metallurgical and processing capabilities. We're quite happy to recruit and we're quite flexible geographically in that regard. The more recent focus as I alluded to, though, is I believe increasingly looking at innovation that can impact the industry as distinct from perhaps just our part of it. We are linking that directly to what we're doing in product development and the offer that we can make to our customers.

**[Slide 7]** I think increasingly in this industry intellectual property combined with first mover advantages can produce superior returns. Those of you who know us would know that we are not a set and forget business. We've developed a lot of mines. We've moved a lot of times, and you'll hear a bit more about that later also. As a result, perhaps out of necessity, we have developed good project development, project execution, and project delivery skills.

**[Slide 8]** Availability of equipment, utilisation of that equipment, and recovery performance in how it operates during what is a multi-stage mining and processing and concentrating and separating chain, is critical. Of course that drives unit cost efficiencies, and the effects of shortfalls in any area can be cumulative through the chain. So you multiply, if you like, the effect of low utilisation by the effect of low recovery, and you get to an unhappy place pretty quickly. So these are the kind of standards that we set for ourselves shown here on this slide.

**[Slide 9]** We are investing more than ever in marketing and in market development. We do get queried sometimes about why we do that, why we operate the way we do, and that will be covered later today also. We're very confident that the returns justify the investment, and we believe it provides us with a competitive advantage. Some of the activity areas are listed on this slide. In my time we've made, I think, great strides in terms of our intimate understanding of what happens downstream of us. We support industry research, for example through the Zircon Industry Association, which we founded.

Value-in-use is often specific to specific customers and specific products, so we have an individual focus. We've got dedicated teams. We've expanded our footprint so our market presence and our logistics flexibility that goes along with that has expanded. We believe in supplying direct, rather than through agents or distributors wherever practical. In 2014 I think quite an extraordinary achievement; we had zero non-conformances across the board, so all products delivered to within spec.

We're doing a lot more in the area of product development. You've heard us talk about some of those things, and obviously there are other things we don't yet talk about. We are focused on the emerging world, for

---

example a technical centre in China that we're looking to establish. You'll hear today a little bit more about what we refer to as our new zircon pricing and payments framework. So we believe in investing in marketing. We certainly believe in investing in technology, and you'll hear more of that from my colleagues.

**[Slide 10]** So let me introduce them. On the marketing side you'll hear from Matt Blackwell. Put your hand up, Matt. Matt Blackwell, who's the Head of Marketing. Matt's based in the US. Rob Gibney, who's our General Manager of Titanium Dioxide Sales, also based in the US. Simon Hay, General Manager of Zircon Sales, based in Singapore, and before that China. That's the marketing team you'll hear from. Then on the technology front Doug Warden, many of you would know, currently Head of Resource Development within Iluka, and from 1 June Doug will be CFO. Also Rob Hattingh, Rob Hattingh, General Manager of Innovation, Technology and Sustainability, all key areas for us. So with that introduction I'll now hand over to Doug. Thank you.

**Doug Warden: [Slide 11]** Thanks David and good morning everyone. I'll just start by providing a bit of context around the industry as we see it going forward, and that context I think is important for what Rob Hattingh, my colleague, will then talk about in terms of some of the technology and innovation work we're doing within Iluka. As David alluded to I'm about to move roles, and despite the fact that I might have convinced some of you otherwise, I don't have a technical background. I have a financial one. So I am going back to my roots.

**[Slide 12]** Just to elaborate a little bit on what David was saying around technical capability, I've headed this slide the Technical Capability Imperative in our industry, which I think is a valid statement. It's important to understand that it's very rare that you get two mineral sands deposits that are the same. The complexity in our industry is often underestimated by those who are new to the industry. Perhaps they're lulled into a sense of false security by the absence of any drill or blast or underground type operations from a mining perspective.

For those of you who've been following us for a while you'll understand I think that it's the geometallurgical aspects of our industry that are where the complexity lie and fair to say that there have been a number of technical failures. There's a couple mentioned there over history for those that have got that geometallurgical issue wrong in their characterisation in particular of ore bodies, and you'll notice the dot, dot, dot after Wemen which was a Murray Basin project that went not so well about 10 years or so ago. I guess we leave that there on the basis that industry commentary would suggest that the jury is still out on some more recent projects and their likelihood of success.

David alluded to the fact that we've moved many times. We're not a set and forget business; in fact I had one of our very experienced hands in the Geology Department go back through his corporate history and he came up with 32 separate deposits that we have developed over the last 20 years in his time in the organisation, including within that 18 separate concentrator moves if you can appreciate that. We've at times had various deposits feeding the one concentrator, hence the difference in the numbers there.

I would point out that we held our 60th AGM on Wednesday, so that's only 20 years of history. The numbers obviously would be much greater if you went back further.

It's fair to say that our expertise is not just of a home-grown nature. It's not just a West Australian. If you think about our roots, centric expertise from a technical perspective, we've had a number of our people from

---

competitors cross the Indian Ocean join us, and so much so that I think it's probably appropriate - we haven't done it yet but it's probably appropriate that we have Afrikaans as the second language in our organisation, because it's not uncommon for me to be greeted in Afrikaans. As yet my language skills in that regard are pretty poor, but I do respond in perfect English.

**[Slide 13]** Just a brief into the industry dynamics. Some of you will have heard some of these themes before, but the ore bodies of the future, not surprisingly - as is the case in other commodities, we are no orphan in this regard - are more challenging. There is more trash, less RZ [rutile/zircon] and in certain instances they are deeper and the mineral size is often finer, making the geometallurgical issues that I talked about more challenging into the future.

There's also capital that is required in the industry which you would have heard us talk about, both ourselves and our competitors and to the extent there are newcomers to the industry them as well. That capital will need to be incentivised. Then you have the dynamic around Chinese pigment which has traditionally been sulphate but today increasingly moving towards chloride or at least attempting to. You will have heard us talk about the fact that we believe that is likely to happen sooner than people think, and require imported feedstocks which is in contrast to their recent history where to a large extent at least they have been self-sufficient with domestic ilmenites. That will not be the case or they will not be able to do that going forward with chloride production.

So what's the answer? Well obviously prices can go up and for much of the minerals industry that has been the history, but we're not simply relying on prices going up to save the day. We're also working on aspects of technology and of course exploration, so if you like a three-pronged answer I think is where it sits as far as we're concerned.

**[Slide 14]** We've used this slide before but just for those who haven't seen it I'll just walk you through it. This is Iluka's view of the global resource position going into the future, so the first bar is the current lie of the land. The second bar is those projects that are under active investigation. I would stress this is not just our portfolio; it is our view of the global resource base. The third bar is where information gets a bit sketchier. Perhaps the drilling is more scant and it's more our assessment of what little information is out there on those deposits that make up that bar.

If you look at the bars they represent cumulatively the HM [heavy mineral] grade of the deposit - deposits I should say - and if you look left for that, you'll see that there doesn't appear at face value to be a problem. What is the issue you might ask when HM grade is actually slightly increasing from that average of about 4% you see there, but if you look a little deeper and you look at the light grey at the top of each of those bars, that is part of the answer - is that sands ain't sands and specifically HM isn't HM and there is increasingly larger and larger amounts of trash - what we call trash heavy mineral in the composition of the deposits of the future. So these are things that report to heavy mineral in the processing facilities but have no value, and in fact in many cases we have to try and extract those to make saleable products.

The other part of the story is the line that you see there, the green line for which you need to look to the right-hand axis and that is the combined RZ or rutile zircon assemblage in those ore bodies, and that is effectively halving over time from the 13% you see in the current operations to around 6%. So as you know, they're the high value products and therefore make development of those ore bodies more challenging.

---

So as I said a three-pronged attack. One is prices which the market will determine to an extent; the others we can do something about which is the first one just the one slide on exploration. Clearly discovery will assist our discovery of ore bodies that are better than currently in the pipeline will assist in the issues that I raised on the previous slide.

**[Slide 15]** So Iluka has consistently funded its exploration program to the tune of about \$20 million a year, and for those of you familiar with other commodities, you might say well that doesn't sound like very much, but I would point out that drilling sand is a whole lot cheaper than drilling rock and generally we're drilling obviously a lot shallower holes than you would find in base metals or precious metals for example. So \$20 million goes a fairly long way and I'd like to think that we've built up an expertise in this area that is second to none, although David constantly reminds me that it's been a long time between drinks and those of you that have followed us for a while would know that Jacinth-Ambrosia was discovered in September 2004. So it has been, but nevertheless we see it as critical to our future and that of the industry.

We certainly have a gated approach in terms of exploration as you'd expect. We don't let geologists fall in love with projects. They have a habit of doing that. We try and churn through lots of projects on the basis that ultimately most of them will come up bare in terms of discovery. The stats show that clearly, so it's critical if you're going to run an efficient exploration program that you weed out those losers early and try and back the ones that look like they have promise.

We continue to explore in Australia. It is a relatively mature search base fair to say, but the application of new technology and adoption of techniques from other commodities has given us reason to continue I suppose, and I'm particularly talking about geophysical type technologies. Increasingly international focus moving into new search spaces as a result, and we have also a small focus on other commodities in and around or on and around our tenements where we see prospectivity there.

Another aspect - as well as continuing to fund exploration through the cycle is being an example of counter-cyclicality that we talk about. Taking advantage of others' position at this time of the cycle is something we look to do as well in the form of farm-ins and joint ventures. You can do on very favourable terms compared to where people's expectations were just a few years ago.

**[Slide 16]** With that I'll hand over to my colleague, Rob Hattingh, to drill down into a bit more detail around some of the work we're doing in the area of innovation technology. Thank you.

Rob Hattingh: G'day. I've been asked not to say g'day in Afrikaans. What our model of process specialists onsite supported by the central Technology Group has done: it's allowed us to get critical mass, it's allowed deeper specialisation in certain individuals and that has been a very big benefit for us in the last few years.

We have our dedicated metallurgical test facility in Capel, I think a world class facility. That is where we can mimic literally any part of the metal sands value chain, including some of the more unconventional deposits which we will talk about a bit later.

Not only do we get support from our internal laboratories but we also draw extensively on the excellent local and some international research facilities that are available to industry today; ANSTO, CSIRO are some that we mention here.

---

Our technical bench strength is not just home-grown; we have people working from a number of different industries as Doug alluded to and that has really helped us as well to make sure we don't become inbred in our thinking on especially some of the more innovative approaches that we'll be talking about later. It has also indirectly given us access to a number of technologies not necessarily currently in use in the company. We do have slag experts, we do have dredging experts; both of those are areas that we're not currently considering.

**[Slide 17]** In terms of the metallurgical testing facility, what we do there is much more than just mimic our value chain. We have the opportunity and ability to go into much detail on the different work horses that make up the metal separation and beneficiation process. Flotation for example is fairly new to Iluka, although it is fairly well established in other parts of other industries. We have generated the opportunity there to add that to our suite of processing capabilities which we haven't had before really.

Magnetic separation can be incredibly complicated. We could have wet or dry magnetic separation. You can separate using low, medium or high intensity magnets, so that simple phrase actually carries huge technology behind it. A classic work horse of course is gravity separation, so mineral sands operations inevitably have spirals somewhere. When we do routine evaluation of the metallurgical testing facility we use 24 sets of spirals for it and they each behave differently. So all of it is aimed at extracting the maximum value out of a specific resource and getting the best possible flow sheet.

**[Slide 18]** Pyro and hydrometallurgy on the downstream processing side, specifically on synthetic rutile, is primarily aimed at getting more sweat out of our assets - getting more out of what we have on the ground at the moment. We do that through looking at various ilmenite feed sources and their characteristics which help us give a better product suite or a different product suite, a more appropriate product suite, and also feed blend initiatives which I'll talk about later as well.

We do that through physical as well as dynamic and static kiln models and then of course we can do it on the ground, in pilot testing and bench top test equipment. We also focus on the co-product. Slag produces a pig iron as a co-product. We have activated carbon and obviously maximising value out of that is quite important to us.

The last instance then: we are also looking at developing further feedstocks to our downstream users and I'll talk about some examples there.

**[Slide 19]** From a tailings management perspective this is very, very often ignored and some of the failures mentioned earlier have had some of their roots in this. It can add significant cost if you're not careful. You do need to understand two key issues. The first one is what happens to those - to your flocculent consumption after recently seeing floc consumption ranging from 200 grams per tonne predicted going up to 1500 grams per tonne. So five or six or seven times one of the key cross drivers in the mining operation can make a huge difference. So we do actually quite a lot of fairly advanced work on that.

Settled density sounds like a simple term. What it really does is if you do not get the void calculation right, you have to start using above ground storage facilities which are incredibly expensive. So there's very a fine trade off here between getting an optimal financial outcome and meeting your rehabilitation standards and that's quite a big effort that we put into in terms of metallurgical testing facility.

---

**[Slide 20]** Synthetic rutile process improvements: we went back to basics. We realised that having had this technology for at least 30 or 40 years had made us a little bit complacent so - and that's what I alluded to earlier in terms of the deeper dive. Having enough critical mass to have people really specialising in aspects of this process I believe our understanding of synthetic rutile production today is better than it's ever been and some of the processes that we are really developing at the moment will be testimony to that. You improve the reaction kinetics and you improve your throughput and/or product quality.

We've also I think now beaten one of the classic bugbears of the industry which is concreting formation colloquially referred to as boulders or Volkswagens because that's about the size of these things. In kilns you can imagine that they can almost smash everything to pieces. We know how to control and manage those today, something that are unfortunate because it's never really mastered.

**[Slide 21]** So the bottom line is to be able to generate more out of our existing assets, getting a more diverse range of these and getting improved value for our customers downstream. We have started dabbling in or getting a better understanding of what happens when our product gets into the market specifically around chlorination. Synthetic rutile and natural rutile we believe behave very differently or very similarly and perhaps we needed to understand how we could convey that better. So we've been doing some fundamental work on this as well and Rob Gibney will talk a little bit more about chlorination later.

**[Slide 22]** Acid soluble synthetic rutile we've been talking about this for a little while. In fact what not many people know is that this synthetic rutile kilns were developed initially to actually produce this product in the 1940s and 1950s which was seen as the Holy Grail to produce a product that is acid soluble but a high Ti grade. Subsequent to that, smelting developed and the SR kilns out of this never really produced ASSR. However, we really only understand this process now. We have produced not only at the bench scale but we've produced at a pilot scale 50 or 60 tonnes of this material. The interesting thing is we understood it so well that we produced on spec material within 24 hours of that pilot kiln starting which I think was quite a remarkable achievement in terms of supporting the fundamental approach rather than an empirical approach.

At the moment we've got customers assessing the product suitability for this and our key focus here is at the moment is not just producing ASSR but under two conditions. The first we would like to do it with any source of ilmenite we possibly can to allow us to have more options in terms of how we put the product together but also in such a way that we do not interrupt production in an SR kiln. In other words we want to do it with the same infrastructure and with minimal switch over interruption from SR to ASSR giving us a swinging kiln option.

**[Slide 23]** Doug alluded to the many mine moves and concentrator moves. It goes much beyond that. With some of these high grade deposits they are small but very high value. Of course you do need to move every now and then but that means you pick up the entire mine and move it and I think that the relocation of the Murray Basin Kulwin to WRP [Woorack, Rownack, Pirro] is a very good example. It was designed as a modular process but you've got to bear in mind you have this massive pre-concentrator plus a magnetic separation unit in a building plus the concentrator itself plus all the thickeners and associated infrastructure. To move that entire process without interrupting business unduly was a mammoth task. I think it is a

---

remarkable achievement to have done that within 88 days from feed off to feed on. That is absolutely I think unparalleled in our industry.

**[Slide 24]** Murray Basin ilmenite has always been seen as a waste product, so giving it to the clever people in Capel, we said play with this and do something about it. We can't just throw this stuff away. The key problem has been chrome - chrome contamination. We developed further processing technology and methods to reduce that chrome presence so we can produce SR at a premium specification and that was done successfully. So basically we've taken a waste product and converted that to something that is valuable. We only did that because we went right back to the fundamentals. So looking at any feedstock we possibly can. We have a much better understanding now how we can process that material.

**[Slide 25]** We used kiln modelling at one stage to look at performance improvement through our existing assets. We realised that there were quite a few things we could do to make a difference and the direct volumetric capacity modification we executed resulted in about 16% increase in throughput. Altogether of a nameplate capacity of 39 tonnes per hour in SR2 at the moment to running it at around 40 to 44 tonnes an hour which is almost well not quite but almost heading towards double of original intent.

**[Slide 26]** Lastly, I'll talk a bit about Tapira. As a geochemist something I've always been interested in is the carbonatite deposits or alkaline intrusive deposits. They're not at this stage considered in Mineral Sands as a feedstock. So we entered into the joint venture with Vale Fertilzantes and Vale S.A. on the Tapira deposit. A titanium and rare earth mineralisation effectively occurs in an overburden to the existing phosphate mine and as you can see on the bottom left hand side there it looks like brown earth. It's basically deeply weathered carbonatite or bebedourite to be more technically correct.

The minerals we're looking at include anatase. Anatase is effectively rutile with a different crystal structure. There's no major difference between them. They're both  $TiO_2$  but there's also ilmenite, monazite and crandallite. Crandallite is one of the phosphates. It contains REOs in quite significant numbers. Phase 1 of our agreement with Vale is to look at the geological and technical evaluation, conduct a market assessment and pilot plant design and for subsequent phases beyond this year we potentially include a PFS and DFS if there is life in this deposit for us.

**[Slide 28]** We have recently completed our drilling about 3000 metres of diamond core. Very comprehensive mineralogical and geochemical evaluation is underway. I was asked to take out all the acronyms for the techniques we use because they said you would not be interested but if you are, I'll talk to you later. As I explained to Chris Cobb who is part of this project, what I do is simply just use a random letter generator and you add 'ite' at the end and you can invent your own names as you go. So on the bottom left there I think it's always useful to explain these photographs.

On the bottom left there that's what the original host rock looked like. So in the outlining truth of perovskite, calcium titanium oxide is the host mineral and then over time that weathers in that overburden to anatase  $TiO_2$  and then on the right hand side you can see what it looks like using mineral analysis technology, a particle map. The green is typical of what anatase would look like and then the most important gained mineral here is Goethite. That there is brown - looks brown. Very different to mineral sands but I believe we probably have the



---

best crack at it because of our deep technical bench strength that we have in our organisation. I'm going to hand over back to Doug on Metalysis.

**[Slide 28] Doug Warden:** Thanks Rob. Just a few slides to recap on the Metalysis investment and a brief update. We can't say too much on where we've got to in terms of the technical work we've been doing with Metalysis. So back in February last year in 2014, we announced that we'd taken an 18.3% stake in the UK technology company Metalysis. We see it as a potentially disruptive technology in terms of lowering the cost of titanium metal and metal powder production to significantly broaden the market. Not so much to attack existing markets for titanium but to look at markets of other metals as many of you would have heard us talk about.

You would have also heard us talk about how we see it in terms of three buckets of value if this is successful and commercialised. It has been proven at a pilot technical scale but is yet to be commercialised. That's what we're working on well the company is working on at the moment I should say. We see that our shareholding will be worth a lot more to the value of the 18%. It would be worth a lot more, increase the demand for our feedstocks on the basis that this process can use rutile and as we've shown in recent times synthetic rutile and we also have access to the first titanium metal licence that Metalysis should issue as well as the right of first offer over any future titanium metal licences for this technology.

**[Slide 29]** So what are benefits? You see there the comparison of the Metalysis process to the 80 year old Kroll process which is the mainstay of the titanium metal industry currently and has been for many decades. You see from that that there's two steps as opposed to about six in the Kroll process, much less energy intensive and a much smaller environmental footprint as a result.

**[Slide 30]** Just a bit of an update on where we've got to in recent times - what does Iluka bring other than a cheque book? We've certainly had some significant progress in relation to the use of SR in this process and we're very excited about some of the in-house IP that we've been developing in conjunction with Metalysis in this area. I think we might have mentioned to some of you in past conversations that previously up until our investment, they had proven that they could use rutile in their process but effectively they had no idea about the characteristics of that rutile product. They'd bought it from a trader and despite the fact that they have significant knowledge around their process from a technical perspective; knowledge around our feedstock was very limited. So I think we have brought significant expertise in that regard and we're very pleased with the results to date.

**[Slide 31]** So this is a Metalysis slide. Quite a lot of information on it but essentially what it says is that they are going to pursue a strategy of capital light if you like - a licensing model as opposed to building the plants themselves. You see from the household names there that they've been talking to a range of automakers as well as Boeing and Airbus around the use of their products. Importantly, in terms of licensing that product, what they're working on at the moment is what they refer to as the DC3 technology so that they have a production capability to sell with that licence, if you like. But the end game, which is on the far right of the slide, is to get to a continuous process which will obviously dramatically reduce the unit cost, or that's the aim and the technology that they're looking at there is not dissimilar from the aluminium smelting technology.

---

**[Slide 32]** So to sum up, the areas you just heard Rob and myself speak about, three points that I'll leave you with. The future of mineral sands deposits are certainly more challenging in reference to the grade - not so much the grade but the trash components and the declining rutile zircon assemblage. It's a small industry, as you've heard David talk about; there are no Ghostbusters to call. You have to be self-sufficient and technically capable and we are starting to apply Iluka's in-house expertise to what we see as potentially disruptive projects in the form of Tapira and Metalysis.

Now we do have a Q&A session at the end, but if any of you have any burning questions that you'd like to ask now, happy to take them.

**Question:** Just when you're talking about exploration and products alongside the current mineral assemblage, can you talk a little bit more to what products you're looking at?

**Doug Warden:** From an exploration perspective?

**Question:** Yes.

**Doug Warden:** We define it as targeting tier 1 and so we're not that fussy about in what form they come, so we look for both traditional strand deposits, which tend to be higher grade and higher rutile and zircon assemblage, as well as dunal ore type deposits, although it is fair to say that dunal deposits tend to be lower grade and therefore for them to be economic, they really need to be at surface. So I often refer to the fact that the chances of finding, for example, another Richards Bay at surface in the world is unlikely because it would have already been walked over by now, chances are.

So we're not that fussy. It's important, obviously, that you have a high rutile zircon content, so we do look at the assemblage in the first pass. If something is ilmenite dominated and very low levels of rutile zircon and you can tell that from samples that you pick at surface when you go to prospective areas, then we probably wouldn't continue unless there was evidence of just massive mineralisation at an ilmenite level. But size and high value assemblage is, probably if you had to narrow it down to two things.

**Question:** Some of the slides there about Brazil you mentioned the anatase a fair bit. My recollection of anatase is it's the more orangey or yellowy kind of light that you get as opposed to the blue light from the chloride process and in the past there's been some emphasis on that. Is this a move into a separate product or is this something else that you're doing? I mean why would you chase anatase?

**Doug Warden:** I've become a reasonably good bush geologist, but my metallurgical skills are not as refined, so I will hand that one to my colleague, Rob Hattingh and hopefully his mic has been switched on.

**Matthew Blackwell:** Yes, look what I would say is that part of that and what you're hearing is actually because anatase is often a sulphate pigment and it reflects the lower grade, more simplistic pigment production that you may have seen coming out of less developed markets. Anatase in itself, as Robert mentioned, is actually a crystalline structure of the rutile, so you can produce very good quality pigment with an anatase ore, if you do it the right way.

**Doug Warden:** Okay, Matt answered that on Rob's behalf, thank you.

---

**Question:** Question on the sulphate ilmenite pushing through the SR kilns, seems like this could be a bit of a game changer for high grade  $\text{TiO}_2$ . Just interested to know how close are you to commercialisation of that process? Do you have to batch it separately through the SR kiln, separate to chloride ilmenite and also interested to know of the parameters,  $\text{TiO}_2$  grade,  $\text{FeO}/\text{Fe}_2\text{O}_3$  ratios and also impurities; what is driving the commercialisation process? Thanks.

**Rob Hattingh:** Which of the 20 questions would you like answered first?

**Question:** All of them.

**Rob Hattingh:** Just a step back on the sulphate ilmenite, it's not a true sulphate ilmenite, so there is a sweet spot in a higher grade but not quite a chloride ilmenite, so we are looking at a number of different options there. I would love to do a big trial on the SR2, but I've just got to get my marketing colleague to stop selling product so I could get an opportunity. We are earmarking a trial as soon as we get some chance in there.

I think the retention time in the kiln would become the big driver in differentiating the two products. So basically it will be probably no more than 9 to 15 to perhaps 24 hours before you switch from one to the other, but we do need to confirm that through our physical trial work. Theoretical knowledge, even in our private kiln where we have trialled at about 150kg/hour rate is not sufficiently representative of a big kiln to make an adequate prediction at the moment.

Then you had questions about contaminant levels. So in terms of...

Right.  $\text{FeO}/\text{Fe}_2\text{O}_3$  relationship is going a little bit by the wayside here. It is really important in SR using chloride ilmenite because effectively the kiln is, as you know, an ilmenite - an iron reducing agent, it's all you do in there. Here it's more important to understand some of the contaminants because they actually are part of a story and it's not so much the  $\text{Fe}_2/\text{FeO}$  or  $\text{FeO}$  - not so much the Fe ratio that's a driver as the specific contaminant. I don't want to talk too much about that. We have some proprietary technology there that we are in the process of formalising.

**David Robb:** I think the key opportunity message, though, is as you would all know, we have idle assets. An ability to use those assets to address 100% of the market rather than half of it is a big opportunity. Certainly we now believe that we can actually swing production in the same kiln, as Rob said, with a very short, i.e. hours, changeover time. You hear us talk a lot about flexibility. This is an industry where there are peaks and troughs, surges and drop-offs in different product spaces and we're building a business model that can follow that quickly. So the ability to use one kiln to produce either, that's a big plus.

SR2 was a demand following decision and we need to produce the product we've committed to produce out of it, so there's an internal tension now about people who are wanting some time in that kiln to produce the ASSR to give to customers who are keen to get bigger volumes of it to trial, but we've also got commitments that we've made about chloride feedstocks coming out of it. So hopefully we can get a window of opportunity to produce some ASSR, but I don't think that's going to be likely this year.

---

**Question:** Just still on ASSR, what's the benefit for the customer? Is it increased throughput for the plant, is it lower waste disposal cost? What economics do you need for them to use it rather than the plentiful supply of sulphate that's available at the moment?

**Rob Hattingh:** It's a natural competitor for slag, not for ilmenite. So we are looking - so our specification, our internal specification which still needs to be confirmed with our various customers, is a product that's very similar to sulphate slag, so we're looking at, at least, 88% TiO<sub>2</sub> in there and at least I have a certain solubility profile. So the benefit to the sulphate producers is obviously the fact that they do not have massive amounts of iron sulphate to deal with, obviously to deal with in the disposal areas. It's also for the same plant throughput capacity; you're given immediate bang for your buck by using a feedstock that's got double the Ti content of the normal sulphates that we sell.

**Rob Gibney:** So China obviously under pressure environmentally, under pressure in terms of domestic feedstock quality and some declining trends that are evident. So we think a high grade sulphate feedstock is a nice thing to have in our armoury, Clarke.

**Doug Warden:** Maybe time for one more question and we'll get onto marketing, if you've got any others.

**Question:** Just on the timing of the IPO for Metalysis.

**Doug Warden:** Look it continues to be a focus for the other shareholders, being largely venture capital base shareholders. So for them to provide a means of liquidity in due course, that is important. I think it's still scheduled for later this year.

**David Robb:** It's really now just when's the right market window, as distinct from anything internal to the company as to timing.

**Doug Warden:** Alright, if you can hold any other questions until after the marketing section, I'll hand over to my colleague, Matthew Blackwell.

**[Slide 33]**

**Matthew Blackwell:** Thanks Doug. Ladies and gentlemen, thanks for your time today here in person and online. I appreciate your attendance and thanks Heidi too for getting us organised and here on time, so appreciate that. I'm very pleased to have the opportunity to talk a little bit today about and provide some insight into Iluka's unique marketing proposition and the journey that we have taken and continue to take as we differentiate ourselves from our competitors.

**[Slide 34]** If you know anything about Iluka, you'll know that our objective is to create and deliver value for shareholders. In marketing, we contribute to that objective through a focus on the customer value proposition. Customer value proposition means many things to many people. Today, Simon, Robert and I will outline some of Iluka's offering, an offering we believe is unique for a mining company and it's most certainly unique in the mineral sands industry. We describe our customer value proposition in terms of benefit, cost and price.

---

**[Slide 35]** Benefit to the customer, be that reliability of supply, the product ranges that we offer, giving them what they want when they want, repeatedly, and more so, more than ever, providing technical support, both at home and in their plants, to help them use our products in the most efficient manner.

Clearly, cost is important. You need to be able to offer that product from a cost-competitive position, and so efficient operations are important, efficient delivery. We've gone a long way to removing intermediaries such as agents, and we continue to look for ways to bundle our products to provide more economies.

Now, at the end of the day, we are not the lowest priced seller of mineral sands, but we are competitive and we - Simon will cover a little bit today our new zircon pricing and payments framework, which goes to providing some increased transparency for our customers and their customers around zircon. We found our discussions in analysis, and we generally sell our products based on the relative economic value of those products, the economic value that the customer gets by region and by the inherent physical characteristics that they have.

**[Slide 36]** To help you understand a little bit about our proposition, it's worth, I think, just reflecting on the journey. I would say when I joined Iluka more than 10 years ago we were a very traditional mining company focussed on the mine to market. Now this has evolved over time to a market to mine philosophy; subtle language maybe but, actually, very impactful when you come to thinking about it from the customer's perspective.

Traditionally, we've brought products to market based on the resources. Obviously, the more progressive approach is to go and engage with your customers, find out what they need, determine their articulated needs, then develop your products, your market channels appropriately.

**[Slides 37 – 39]** Back in 2005 our marketing resources were very centred around Australia. We had a small office in Jacksonville, Florida, that was associated with the Green Cove Springs mine. In 2010, as a result of the Wave 1 initiatives, the concentration of resources changed. By that stage we had a fully staffed office in China that was complemented by warehouses in Northern Europe, warehouses in China and the United States.

Today our reach is truly global. We have 14 distribution nodes globally, supported by 10 offices. Our staffing has moved internationally, and this provides a degree of customer engagement capability that is unmatched in the mineral sands industry. Compared to, say, 2010 if you look at the numbers closely you will see a small increase in the numbers in Australia, and that reflects the increased number of people focussing on technical support so they can be close to both the mine and then, as need be, travel to our customers' sites and work with them at their plants.

**[Slides 40 – 41]** Just as our customer engagement model has evolved, so has our logistics and supply chain model. Prior to David commencing with the business we were, essentially, a FOB shipper. We relied heavily on agents to market our products into emerging and developing markets. We sold to a couple of big customers in Europe, North America and sometimes into the Middle East.

---

Fast forwarding to today, we serve more customers in more regions of the world with a just in time delivery option than any other feedstock producer. This de-risks supply to our customers by holding inventory closer to their consumption points.

We also achieve economies in bulk shipping and by bundling smaller parcel lots, sending these to our distribution hubs, where they are then packaged and sent off to customers in the right quantity that they can consume. Now, in China that might be a one tonne bag on the back of a truck. In Northern Europe it might be a 5000 tonne shipment of rutile on a barge. Both our customers and Iluka benefit from this model.

Now, as David alluded to before, there are questions: well, is this really cost effective? I believe - and the evidence shows - that it certainly benefits our cost to serve customers. I'll just take a moment to explain this graph. In 2004 the grey bars are the sales and marketing costs as you would find in the annual report - and defined in the annual report - but normalised to 2014.

**[Slide 42]** You will see the blue bars represent what our costs would be in 2010, and then today, if we were selling under the same model - that is some direct sales, but predominantly through agents - back in 2004. So, yes, sales and marketing costs have increased, but in 2010 - when we saw an increase in prices - had we been relying on a distributor model, there would have been a disproportionate share of the increase in price that would have leaked out of the organisation, and away from shareholders, to agents.

In 2014, last year, this leakage was smaller. Obviously, prices were a little bit - were less - but it was still \$3 million and not insignificant. So we believe this is - and clearly a tangible benefit of the direct marketing approach.

The other benefits - that are, perhaps, less obvious, but equally important to us - are the insights that we gain from talking to more than 220 customers on a regular basis. I've been asked in the past how do we form our view of the market today and the market going forward. Well, of course, we do all our analysis. We look at the macroeconomic impacts. We look regionally. We look by segments and products.

But I can assure you the conversations that the marketing team has with these 220 customers spread around the world - the insights that they afford us goes a long way to forming our view of what's going to happen - or what is happening and what may happen - going forward. And it's an advantage that we hold over our competitors. **[Slide 43]** To this end, a more recent development has been the alignment of our resources to our customers' segments: zircon, titanium and the section that we don't talk about as often, our trading arm, or IMTI.

We have also been very deliberate in our attempts to recruit knowledge and expertise from our customers' business. Robert comes from the pigment side. He's a case in point. And Simon will touch on some of the recruiting successes that he has had in the zircon market in recent times.

The depth of the team is evident also in its diversity. Now, we employ some 40 people of 10 nationalities, speaking 17 languages. That gives us the ability to afford to have the conversation with our customers in the language that is their native tongue and they understand. Again, that's a competitive advantage that we hold over some of our competitors.

---

**[Slide 44]** Not only are we diverse in our sales force and our distribution, but we are also diverse in our product offering, and therefore, our customer base. Robert and Simon will cover in a little more detail the product suite and what we're seeing in each of these markets, which I know is a question on people's minds. But needless to say, because of our breadth of sales across the multiple sectors and multiple geographies, this diversity of sales means that we are not a one product or one country play.

If you take, for instance, our titanium sales, we are well overweight in the rutile market, of selling rutile into the welding market. Now, this is a market that makes up a small percentage of overall TiO<sub>2</sub> consumption, but demands a premium. And, as the numbers show, we sell 11% of our high grade ore to this market.

**[Slide 45]** Now, as David mentioned in his AGM address, we now sell more than 50 discrete products. Last year we shipped all of those products within specification, which is truly a testament to the professionalism and commitment of Steve Wickham's operational team, particularly in light of the changes that we've been going through.

We also recognise that we can't rest on our laurels and that to stay ahead of the competition we need to continue to innovate. We have launched eight new products in the last 18 months, and we'll be launching new products in the coming months. Simon and Robert will touch a little bit on this as well, along with new products - a clear imperative and is top line growth. Top line growth is a function, obviously, of revenue - or the revenue is a function of volume of price, so I'll talk first about volume, as we have the view that volume leads price in this market.

**[Slide 46]** As we innovate and we bring new products to market, and our existing products, we will make these offerings in a responsible and disciplined fashion. We will not bring to market material - we will only bring to market material as it is needed, and we will continue to target markets where we think we can add value to both our customers and, ultimately, to our shareholders.

We were very successful in having a first mover advantage in China, and we have plans afoot to emulate this success in other emerging markets. Now, it's a challenge and something that occupies a lot of our time, is to identify who the winners will be, not today, but tomorrow and in five years' time.

Picking those winners is not just about understanding what they need today and their articulated needs, but what they might need tomorrow; and you heard from Doug and Rob about Metalysis and how complementary our SR offering is to that new emerging and exciting technology. We're obviously taking - and as is talked about often - we're taking steps to broaden our offering in the sulphate ilmenite market.

**[Slide 47]** Now, as I mentioned before, volume leads price, but this pricing picture is probably not one that if you're a purchasing manager you would feel very warm and fuzzy about. In the last 12 months we've spent a considerable amount of time thinking about the dynamics that led to this volatility, particularly during the period of 2009 to 2013.

**[Slide 48]** To assist us, we've retained the services of one of the world's preeminent pricing consultants, people who consult to a range of industries and I think were able to give us good insights across a number of

---

market dynamics and regions. Together, we have analysed not only our actions and others' actions in developing a new pricing strategy for our zircon. As the leader in zircon we believe that the responsibility falls to us to reduce the volatility that has been challenging both our customers and our shareholders.

Now, an outcome of this is that we remain committed to quarterly pricing in zircon. We feel this is the right timeframe for the industry. We also believe in maintaining a spot business as important as a price discovery mechanism and as a mechanism to take opportunity of changes in demand. Now, as part of our strategy we will distinguish between those who contract with us and those buy on spot. The prices we charge for our products will be guided by a roadmap. It's a roadmap that we have developed where we think prices can go and as importantly, where prices cannot go. We give consideration to the impact that prices will have on modernisation, substitution and thrifting, the inducement of supply, and we balance those considerations with the need to provide a return for our shareholders and to reinvest in supply for the future.

Now of course, the markets themselves will determine the pace and the momentum at which we go down this path, but I can assure we have a very clear way forward. I think that's probably an appropriate juncture to hand over to Simon who will talk a little bit about our product development and in a little bit more detail about our pricing and payments framework.

**[Slide 49] Simon Hay:** Thanks, Matt and because although Afrikaans may be the second language of resource development, Mandarin is the second language, increasingly so, of marketing. In my presentation I'll provide an overview of our zircon marketing approach and our team setup, our products and logistics arrangements. We'll give you some detail on the major industry sectors, including some of the sectors which you don't hear about so often. We'll talk about some of our development initiatives we have underway and conclude with how this all adds up to a differentiated marketing approach for Iluka zircon.

**[Slide 50]** Matt explained that we are organised to understand our customers, and how have we made that happen within the zircon marketing team? Over the last two years we've expanded the number of our sales team to enable greater face-to-face contact with customers. We engage directly wherever possible. In some areas we have to use agents; Japan is one particular case in point where Japanese buyers still prefer to use intermediaries. We've increased our analysis of downstream industries. We now routinely talk to tile producers. In the past there was minimal contact. In our regional marketing model we've placed our offices close to customer clusters and our warehouses in similar locations.

On the recruiting front we've employed in our regional offices we employ locals who have industry experience and at a senior level over the last few years we've recruited people with more than 10 years' experience in downstream sectors, including zircon milling, glaze production and frit production and also zircon procurement and development initiatives in ceramics. So this has gone to greatly improve our frontline sales force.

**[Slide 51]** As we've implemented the regional marketing model we've grown our customer base very significantly as these charts show. Our customer numbers have more than doubled over the last five years and this long tail approach helps us to identify the winners that Matt talked about. If you go back five years ago - currently our top two customers five years ago were only number five and 10 in terms of volume, so those customers have grown very strongly. Their purchases from Iluka have grown by over 300% in those five years.



---

Also the long-tail approach is particularly suited to the zircon industry when you consider that many zircon enterprises, enterprises that consume zircon, buy small amounts of zircon, less than 100 tonnes per year. So it's imperative for us to tap into this part of the tail that we have a large sales force, a sales force that's deployed into these areas where the customers are based.

**[Slide 52]** Matt also spoke of the hub-and-spoke distribution network that we have for zircon. This is particularly important in two key regions. Buying often occurs in surges and having products available at the time and at the place where the surges occur enables us to win orders, merely by the fact of being present with product in those regions. Secondly, the hub-and spoke model helps our customers control their working capital requirements. Effectively we hold stock for some of our customers who order from us on a just-in-time basis.

A new sales channel we developed in 2014 was customs-cleared service from our China WFOE. WFOE is a wholly foreign-owned enterprise. This sales channel is very popular with smaller customers, those that don't have access to foreign exchange. Another advantage of this channel is that it offers next-day delivery compared to sales from bonded warehouses which often take seven to 10 days to be processed before delivery. This channel via the WFOE has provided solid sales growth over the last year and we're seeing that continue in 2015.

**[Slide 53]** Next I'll talk about our product portfolio. Iluka zircon products span the full range of zircon feedstocks all the way from ultra-premium grade through to concentrate and tailings. Our premium grade supplied to high-end applications in ceramics, fused zirconia, refractory and casting industries. Our standard grade is the preferred feedstock of zirconium chemical producers but it's also quite a versatile feedstock, finds its way into ceramics and foundry end applications. In between those two grades we have a relatively new grade called universal which was developed specifically to meet the new and emerging demand from the ceramics industry that came about because of technical developments, principally around digital printing.

Finally, concentrate and tailings. These products enable us to access a more price-sensitive area of the market and simultaneously provides an outlet, a very profitable outlet for some of our by-product streams. Matt talked about eight new products over the last 18 months. We continue to develop new products and we have a few in the pipeline in the zircon team right at the moment.

**[Slide 54]** Next I'll talk about some of the key market sectors, starting with ceramics. It's probably well known to most of you. It's the largest zircon sector. Approximately half of global zircon consumption is into the ceramics market and Iluka sales approximately equally weighted to that with 51% of our sales going to these end uses.

Zircon into ceramics is typically milled first to micron level and it's used in the production of opacifier flour, which is then used in the production of end products being opacifier, glaze, frit and engobes. The market is very fragmented. The average Iluka ceramics customer would consume about 5000 tonnes of zircon per year but the average tile producer would consume well less than 1000 tonnes per year. So for this reason very few tile producers actually engage in zircon milling, they all generally prefer to buy milled zircon on the market.

---

**[Slide 55]** New technology in the form of double-pressing, double-charging, digital printing is changing the way that zircon is being used and that's been playing out over the last few years. Over those last few years we've observed less zircon being used in the ceramic body and more zircon being used in frits, glazes and ceramic colour pigments, again associated mostly with digital printing changes. Iluka responded to these changes with the creation of new products, universal grade being one of those in particular, and this grade has been a good, solid seller for us into the European market in particular, particularly European frit producers.

**[Slide 56]** Next market I'll talk about is the zirconium chemicals market. This market segment comprises many different zirconium chemicals but ZOC or zirconium oxychloride is the precursor compound to the production of all those chemicals. ZOC production is heavily concentrated in China with about 95% of the world's production there. Most of it, or more than half of that is in Shandong, and that was one of the reasons why we created our sales office in Qingdao, which was to supply this market and these customers.

Large players are emerging in this market in China. The top three have certainly expanded over the last few years and now account for about 45% of market share. Last year we saw an attempt at some consolidation in this industry with two of the top five attempting to merge. The merger failed for other reasons but I think increasingly we'll see more activity in this space in China because the smaller producers are under a lot of pressure, cost pressures due to economy of scale but also environmental regulations. I'm certainly aware of many of these plants being closed for longer periods of time, shorter periods of time, because of environmental regulations and increasingly tightening environmental regulations.

The end uses for zirconium chemicals are very diverse, as you can see from the little box with industrial end uses all the way through to personal care and health. The nuclear industry also is a consumer of zirconium metal which is mostly produced - again ZOC is a precursor for zirconium metal production. Just on the nuclear industry - using some stats from the World Nuclear Association there are 29 new nuclear plants under construction in China and India. There are currently only 47 in use and there is another 67 at the planning stage. Each one of these plants would use a few hundred tonnes of zirconium metal as a first fill and then they need to be replenished over the years. So with Japan also potentially restarting their 50-odd nuclear reactors this can be a growth phase for zirconium metal. Many of our ZOC customers in China have active plans of construction or new plans under way for the production of zirconium metal.

**[Slide 57]** A related sector to ZOC is the fused zirconia industry which accounts for around 20% of our zircon sales. Major end uses are industrial mostly, around abrasives, brake pads for cars and also ceramic colour pigments. So zirconium chemicals can also impart colour to tiles. These customers and industries prefer premium grade products and some of our major customers with specific requirements we have actually tailored some new products specifically for their uses.

**[Slide 58]** The final sector that I'll talk about is the refractory and foundry industry which is a much smaller sector for Iluka. We're only around about 5% of our sales report. The steel industry - zircon is used in specialty refractory applications like ladle tap holes and darts, high temperature resistant areas in particular in glass furnaces. Zircon is used much more widely throughout the furnace particularly in high wear areas.

---

The foundries - typically we sell to intermediaries because the intermediaries supply the smaller foundry users. Some foundries will only use five to 10 tonnes of zircon per year so it's not actually effective for us to tap into that really small end of the long tail. So we do use intermediaries in those cases.

**[Slide 59]** Matt again talked about our new pricing structure. Just to give it a little bit more detail, with this structure we aim to provide some price predictability in order to reduce price and volume volatility and allow for better volume planning for our customers and also within the Iluka business as well. The starting point for this new pricing structure is a reference price which we are establishing as a global starting point for our whole pricing structure. This reference price is based on the most commonly sold tonnage combination that we sell globally and that is premium grade zircon, two tonne bags sold ex warehouse in Asia. That reference price sounds very similar to other reference prices that you would hear quoted for other minerals industries. That is no co-incidence.

The reference price will assist our customers passing on zircon price changes downstream to their customers. This increased transparency is certainly an objective of this structure. We will also offer payment terms choices for our customers with any associated costs again being transparent. Our zircon sales pricing structure has been very complex when you consider we have well over 100 customers. We sell to six continents and 18 products, so infinite variability in product offerings that we could offer. So this structure also aims to simplify our pricing offer across regions and product ranges. We'll also incentivise customers to adopt our preferred buyer behaviours. This is not just about price discounts. This is about mutual benefits for both Iluka and for the customer. We aim to reduce volume volatility as I said for Iluka and also secure our position with some of our key customers. It's not about aggressive market share growth or chasing market share and it's not about discounting as I said. We'll structure these incentives for mutual benefits. The benefits to the customers are listed there on the slide.

**[Slide 60]** I think a key area which separates Iluka marketing from our competitors is our product development approach. This is where we work with industry leading customers. We work with research institutions and industry bodies to solve problems, to develop new products and new applications. We have 10 projects currently underway across different sectors and with a range of partner types. These projects are at various stages of development. We have one entering commercialisation right now. The pace of development of these projects is often driven by the pace that we can protect the IP. So that's fundamental throughout these projects that we ensure we protect and capture that IP.

On our technical support for customers this enables us to engage with other levels of the customer organisation. So we create not just the commercial relationship with the customers but a deeper relationship with them and also helps us enhance our understanding of their business.

**[Slides 61 - 62]** The product development team also undertakes analytical studies. One of the studies that they do routinely is a ceramic industry tile study. This is the third year - 2014 was the third year that we undertook the study. This study involves an assessment of the tile production industry all the way through to sampling of tiles from showrooms and producers and crushing those tiles to determine their zircon content. We continue to expand the scope of the study. In 2014 we bought tiles; we sampled tiles in more regions and a greater number of tiles. Again in 2015 we will expand the scope of the study. The results of the study last

---

year were generally positive for zircon demand, confirmed that the focus of the industry on substitution and thrifting has played out. This matches feedback that we were receiving from our customers and also from the tile plants when we were visiting the customers.

Chinese tile production is the greatest volume producer in the world so we spend a fair bit of time in China talking to tile producers. We found the famous brands, the well-known brands, had higher zircon loadings than less famous brands. Also in general, the famous brands had more zircon loading in 2014 compared to 2013. In India we saw zircon loadings were comparable to what we saw in China and higher in some cases. In Europe the zircon loadings were stable, again still higher than what we've seen in China and India.

In regard to product mix in the tile industry we saw the increase in popularity of glazed porcelain and glazed rustic tiles, again led by the continuing penetration of digital printing. These tile types had a year on year increase in zircon loadings. We saw polished porcelain tiles decline in popularity and fortunately for Iluka these tiles are the ones that are also declining in zircon loadings. So the tiles that are growing in popularity had more zircon which is very positive for the zircon industry.

**[Slide 63]** Finally to conclude I'll highlight from the key attributes of our marketing that we believe to differentiate us and our marketing efforts from our competitors. We're a highly reliable, large scale supplier. Our products span a full range of zircon feedstocks. We develop new applications on an ongoing basis successfully. This one is not exactly a marketing attribute but I like to claim it anyway. We have over 100,000 tonnes of latent zircon capacity that we can bring online at short notice. Particularly in the emerging markets we are positioned to capitalise on growth into the future.

Now I'll hand over to Bob Gibney who will take you through the TiO<sub>2</sub> marketing approach.

**[Slide 64]**

**Robert Gibney:** Thank you Simon. Good afternoon, now that it's a little bit after 12 o'clock noon. I'm glad to be here. I'm the newest member of the Iluka team having joined in February 2014. I came over from the pigment side of the business, over the mineral sands side having known David and the team for a number of years as one of my responsibilities was actually procuring the feedstocks for Tronox. Before that, a company by the name Kerr-McGee so I got to know Iluka exceptionally well and with 25 years of experience hopefully I can bring to the table a better perspective for the company on the products and services that are really required to meet the needs of this important market segment for us.

**[Slide 65]** So with that let me get into some of the information on the industry. Many of you are aware of the TiO<sub>2</sub> pigment market but also we service, as Matt mentioned, two other market segments - both Ti metal as well as welding. Both are important for us. We have a disproportionate share of the welding market. Ti metal is growing at a high rate. I'll get into that later. But for the first number of slides I really want to focus your attention on the pigment sector itself as it is the bulk of our sales on an annual basis and makes a big contribution to the company. So it's split roughly 50 50 right now between chloride and sulphate. In fact back when I started in the industry back in the 1980s everyone thought that by today chloride would be the dominant force on a global basis and sulphate would be in its latter days of survival. But in fact China, through the growth of sulphate technology, has kept sulphate as part of the day to day feedstock market. It continues

---

to grow although at a slower pace. We believe that chloride will continue to grow and have a larger position in China. I'll get to that in a few moments.

**[Slide 66]** Matt mentioned our product portfolio and it is targeted at the high grade feedstock market primarily but we do have a wide variety of lower grade feedstocks including chloride and sulphate ilmenite. It's becoming a larger focus for the company. So in terms of our marketing approach today I'd like to go through three main areas of focus for you. Number 1, as Matt mentioned we are really looking to try and reverse the trend from a push into the market to more of a pull mentality.

Next I'll go through the value and use application of our pricing methodology and then expanded technical collaboration with our customers which is really one of the key differentiators for us. We have in my opinion some of the best technical people in the industry. We need to leverage that as best we can.

**[Slide 67]** So focusing in on customer needs, you know, having come over from the pigment side, and I saw it firsthand sitting on the other side of the table, primarily feedstock companies will focus on the business side. When I say business side, it's the procurement, supply chain and logistics. They're essentially coming in trying to negotiate a deal based off of price, and somewhat on performance. What we really want to do within Iluka is focus much more on the technical and operational side, because at the end of the day when I was procuring feedstocks, I was tied in at the hip with our operators and R&D and technical labs on a day-to-day basis. As you'll see in a moment the impact to a pigment producer, as well as titanium metal sponge or a welding producer, of the feedstocks that they're utilising can have a big impact on the bottom line because it's such a big component on their cash cost. So we're going to do that increasingly through a variety of different methods.

**[Slide 68]** So when I talk about the percentage of cash costs, this 33% is a long-term average. Back a few years ago when we are the peak, it was around 50% of the cash cost for an average chloride producer. Today back down around I think the historical average or maybe slightly above, but that therefore creates a lot of pressure internally within a pigment producer to keep the costs down, or more importantly get the most value out of the feedstocks that you're putting in your chlorinator or even your sulphate process facility.

The ore itself has also a dramatic impact on the amount of chlorine you consume and the petroleum coke you ultimately have to procure. The other process chemicals and maintenance is also a key issue, and that's wrapped up in the other category. But maintenance of the chlorinator itself can be impacted by the types of ores that are going in. So what we are doing now, in conjunction with work that Rob Hattingh is doing with his group, is trying to develop a much better understanding of exactly what is going on inside the chlorinator with our feedstocks in combination with others.

As you'll see on this next slide, the typical pigment producer will try to achieve a certain head grade going into their chlorinator. This head grade has a direct impact on the amount of waste that's produced, ultimately the throughput and the uptime of the chlorinator itself, and each plant has unique characteristics that we have to take into account when we're looking at trying to supply a suite of feedstocks. **[Slide 69]** In this example the synthetic rutile could easily be natural rutile. It could be chloride ilmenite in this formulation. I just simplified it for you, just looking at a chloride slag and a synthetic rutile. But primarily virtually every customer will use a blend of feedstocks, and that blend will take into account these variable, but they're trying to get the best

---

value going through the chlorinator that they can possibly get. So our job at Iluka now on the marketing side is to try and determine what our feedstocks can do to maximise that value on a day-to-day basis.

**[Slide 70]** So coming from the pigment side of the business, I can tell you firsthand there are a number of value considerations that pigment customers as well as titanium, metal and welding go through on a day-to-day basis when they evaluate a feedstock supplier. First and foremost is your availability, your sustainability, and your reliability of supply. I can tell you that back in 2010 we were very concerned at Tronox we were going to be short on feedstock, because we could see six to nine months out that there wasn't enough rutile, there wasn't enough high grade ore to go around and meet the needs of our plants.

That is not a good scenario because if you ever shut down a pigment plant, not only is there the cost of the shutdown itself and the idling, but those tonnes of production are lost forever. You'll never recoup. So the rule number one, never run out. You're aligning yourselves with suppliers that are reliable, sustainable, and that can have product for you, not only this quarter but years down the road.

Product quality is the next consideration, not only titanium dioxide content but then all the analytes and other impurities that go along with it. A tremendous amount of testing and work goes on to verify that these feedstocks can operate efficiently in a chlorinator. Consistency is also important of course, and this all leads then into product performance within the chlorinator or the sulphate process itself, through throughput, uptime, lower maintenance costs, et cetera. Really in the product performance category there's really two that pigment customers look at: there are enablers and there are detractors.

We of course want to have enablers in our product portfolio, but a detractor can pull down some of these attributes, but it may come at a lower cost. Hence one of the reasons when you see an upturn in the cycle for the chloride producers, they'll start tending to put more high grade feedstocks into their blend to get better throughput, better uptime, better capacity utilisation, and it truly is an enabler. So you can look at the synthetic rutiles and the natural rutiles that then are favoured as capacity utilisation starts to move higher, especially greater than 90%. Then this all leads into our value in use. Matt mentioned it. It is a critical aspect of our day-to-day interactions with customers to make sure that we're maximising the value on a day-to-day basis for our products.

**[Slide 71]** So how does Iluka stack up? Well I'm in a sales role, so of course I'm going to say we do a great job of this, but I wouldn't have joined up with the company if I truly didn't believe that we did. We are the second largest feedstock producer and supplier in the world behind Rio Tinto. So customers want to make sure they're aligned with people that are going to be there long-term, so that obviously helps. Our product quality and our product performance is some of the best in the industry. I saw it firsthand. Most of our customers, if not all, they're buying from us for a reason, and it's not that we have the lowest price; it's that we provide a package of products and services that maximise the value. We are dedicated, as it says, to doing that every single day.

**[Slide 72]** So let me just now go through this technical marketing approach that I talked about a bit earlier. We have augmented recently our technical sales team to bring in additional expertise on both chloride as well as the sulphate process. They're interacting every quarter with all of our key accounts, especially in some of the growing regions of the world. You can imagine that we have regular interactions in Europe, North America of

---

course, but increasingly in China. Part of what we're trying to do is educate customers on how our products perform in their applications, and also how they can better formulate using our products to maximise the performance of their various pieces of equipment.

**[Slide 73]** Just stepping back and looking at the China market that I mentioned earlier, it still is growing at a tremendous rate, although here in the last year we've seen some restructuring that I'll go through in a minute. But if you look at that graph, the sulphate technology or capacity grew at a tremendous rate all the way up until 2013, and finally we saw a bit of an uptick in chloride capacity coming in. There are currently some plants going through various stages of commissioning, and we believe that will continue. I'll show you here in a few minutes some more information on that.

**[Slide 74]** It is a changing landscape, as I mentioned. The number of sulphate plants that are in the market total about 57. Now that's down from its peak. TZMI estimates - and we have verification - that roughly 10 plants are currently shut down, and that's pulling back 280,000 tonnes a year of capacity. There's about four plants currently in commissioning phase in the chloride sector of the market. We're certainly involved on a day-to-day basis in discussions with these four operators of the chloride process, and we have people that have been interacting on a technical basis to make sure that we're getting our feedstocks in front of them so that as they do ramp up, we're part of the blend going into their chlorinators.

The majority of the shutdowns to date have been caused by both sub-economic conditions but also environmental restrictions that the Chinese government has imposed on polluters in streams, estuaries and rivers. This is going to continue to have an impact. The other interesting restructuring that's going on in China currently, there are rumours that Henan Billions and Sichuan Lomon are in final discussions on a merger. Henan Billions, their stock was suspended from trading as a result of these discussions. If they are put together, combined they would be the third to fourth largest producer globally, and become a powerhouse on a global basis. So interesting times, never a dull moment in that sector of the industry.

**[Slide 75]** A lot of this is driven, as I mentioned, by the keen focus of the Chinese government on environmental restrictions. The 12<sup>th</sup> Five Year Plan that came out a few years ago clearly outlined the desire of the Chinese government to make that environmentally friendly technologies were employed to produce a whole host of different products, including titanium dioxide. The interesting thing to note on the translation is that they want the industry to use no less than 90% titanium dioxide containing feedstocks. Now if you look at chloride and sulphate slags, they tend to be lower in Ti percentage. Our products are all well in excess of 90% when you look at the high-grade feedstock. So it suits us quite well, and we're excited about the potential as this emerging industry continues to take hold.

**[Slides 76 - 77]** So how are we approaching the market? We're obviously going to take the technical collaboration to the next level. We want to be viewed as a trusted adviser to our Chinese customers, and we'll do that through - as we've previously announced - a China Technical Centre that we're going to bring online later on this year. We're very excited about it, and I'll tell you a bit more here in a second about that. Also in conjunction with Rob Hattingh's group we continue to work on the Acid Soluble Synthetic Rutile, or ASSR, our sulphate ilmenite, our chloride ilmenite, chloride SR and natural rutile product suite for this market segment.

---

We'll leverage our extensive logistics capabilities in China. As Simon and Matt both mentioned, it does differentiate ourselves versus our competitors. As I'll mention in a few moments, occasionally you'll see spot shortages of certain products by certain of our competitors, because they don't have local warehousing. We can take advantage of that quickly and step in when others are waiting for a ship to come in.

So our China Technical Centre is in the final stages of site selection. It will be in the outskirts of Shanghai, and Matt and Simon and I actually leave tomorrow to head up to China, and we'll be looking at final sites on Monday of next week. We're very excited about this potential. If you look at it, the Western producers of pigment, they've been doing this for a long, long time, decades. They know more than we'll ever know about their own processes.

But the Chinese producers, they're very much in their infancy. They're desperate for help from anyone that they can get it from, and certainly we want to be there at the forefront to help them understand how our feedstocks and their equipment can be maximised to get the best value. So we're going to utilise this facility to not only do that but to demonstrate, educate and help our customers both for the zircon side of the business as well as TiO<sub>2</sub>. More to come on that as we get closer to opening.

**[Slide 78]** Just a few final slides on the other end use market segments that I had mentioned earlier. Titanium metal is growing at about 5.2% CAGR per year, and that's driven primarily by the aircraft build, the new generation, or next generation, aircraft. I flew down here yesterday morning on an A380. If you look at the 787s that are now in the air, they contain about three times the amount of titanium as the older generation, whether it be a 777 or a 767.

Yes, they're primarily composite material, but the engine itself - the fasteners, the wheel gear - all of that contains a high amount of titanium. And they're doing that for weight and fuel efficiency requirements. Our natural rutile and synthetic rutile are perfectly suited for this market, and so we're seeing a nice uptick in growth from this market segment.

**[Slide 79]** And, finally, the welding market: it's the long tail for the titanium feedstock industry. There are a lot of customers dominated by the China market. China's two thirds of the global stick electrode market and one third of the flux cored wire market. And that's driven by infrastructure spend. It's driven by the fact that China is now the largest builder of ships in the world, with about 40% of the market share on new ship builds. So it'll continue to be a dominant player in that market. Once again, with our product suite, we're well positioned in that market.

And, just as one final snippet, talking about our logistics capabilities and when others have shortages, we can take advantage of it. Recently there have been spot shortages in that market on rutile 92.

With that, I'll turn it back over to David. Thank you very much.

**David Robb:** Thanks, Rob. You'll be pleased to know that that's the end of the slides. I don't know if we have a finishing one. Q&A. In theory, we're meant to finish in about 10 minutes or so, but I'm sure we can run over a little bit. Feel free to address your questions to a specific member of my team or, if you're not quite sure where it would go, then ask me. You know that, normally, I try and give my answer first anyway, so see how you go.



---

**Owen Birrell: (Goldman Sachs, Analyst)** Hi. It's Owen Birrell from Goldman Sachs here. This is a question probably more for Robert, regarding China. You spent a lot of time talking about China and the market dynamic there. Just wanting to get a sense as to how much TiO2 feedstock you're actually selling in to China at the moment. What do you see as the biggest driver of your potential growth into that market? Is it the chloride technology? Or is it you producing a sulphate based product?

**Robert Gibney:** So it all depends on - ASSR would be a great add to our product portfolio. As Rob mentioned. Having a competitive product to sulphate slag would be a fantastic win for us, and I'd love to see that come to fruition.

We are currently selling chloride ilmenite into that market. They don't have their own chloride ilmenite source, so they do import material, and that's our dominant sales into China, is lower grade feedstock at the current levels because we don't have a high grade sulphate product.

Now, we do have synthetic rutile and natural rutile in virtually all of the chloride plants that are up and being commissioned on a test basis, so we're active in that side of the market. And as they grow you would anticipate that our natural rutile and synthetic rutile sales would follow.

**Mark Busuttill: (J. P. Morgan, Analyst)** Hi. This is Mark Busuttill from J. P. Morgan. My questions relate to zircon marketing. Firstly, can he tell us what the zircon reference price is today? Also I was just wondering how much of your sales are actually to end customers and how much are to opacifiers and millers as intermediaries? Then, finally, what part of the changing pricing dynamics meant that you went a month without selling anything? What caused that dynamic in the industry back in March?

**Matthew Blackwell:** Yes, Mark, I can answer some of that. The first thing is what's the price - of course, that's what I was waiting for someone to ask that. We publish the reference price on our portal for customers to see. That's it. They can log in through their unique identifier. It's a price that's competitive. That's all I'll say.

On the percentage that we sell to millers versus the end markets, we don't sell any end markets in zircon. Everything - all the zircon we sell is processed in some way, whether it's fused to make fused zirconia, whether it's milled into opacifier or flour to then go into fritzing glazes. It goes to those markets. So it's one of those markets that we don't do that value adding stage, and we don't - we've looked at it, obviously, but we think it's best done by others.

**Mark Busuttill: (J. P. Morgan, Analyst)** Sorry. Just on that basis - and I guess it's a third question - does that mean that you have less visibility in terms of what's going on in those end markets, because you sell, effectively, through intermediaries? Then just the last question was just on that month of March, just why you didn't sell anything.

**Matthew Blackwell:** March. We did sell in March, and we've sold in April and we're continuing - as we reported at the AGM - that market conditions haven't changed since the quarterly. They're variable across regions, but our - demand remains steady.

**Simon Hay:** And just on the millers, the millers mostly keep low stock so that when they order from us we get a fairly good indication of the market right at the time. The processing time for the millers is relatively short.

---

They can convert sand to milled product in a matter of days. So that gives us a good line of sight. And, as I talked about in my presentation, we do meet with tile producers on a regular basis to get - triangulate the information from the market.

**Clarke Wilkins:(Citigroup, Analyst)** Clark Wilkins from Citi. Just in regards to the change of model from using agents to distribution, what has that meant in terms of what is the normal level of inventory you have to carry? So you've obviously seen finished product inventory build-up quite significantly over the last four or five years. How much of that is in response to this change in model or how much of that has just been due to the weak markets?

**Matthew Blackwell:** Look Clark it actually hasn't changed that much because if you think about an FOB model you've still got to hold the inventory - large inventory perhaps in Australia ready for those shipments. We tend to ship more as we produce it now to those points of distribution and so that the overall industry hold has not changed significantly.

**David Robb:** Remember too that of the \$800 million approximately on our balance sheet that represents finished goods inventory and also concentrate, has not been through our MSPs [mineral separation plants] yet. We have indicated that roughly half of that we would see as being excess to what we might typically hold and that typical hold obviously is based on the marketing and distribution model that we have now. So that \$400 million will be monetised over time.

**Question:** Sorry just a question on - over here - volatility on marketing with the zircon market with the changes. My understanding and correct me if I'm wrong but the bulk of that volatility comes from the expansion and contraction of the pipeline as people restock and destock as prices rise and fall. The closer you get to your customers obviously the less the pipeline can fatten and thin. If you're only X per cent of the market and the others are not doing this, how do you really reduce volatility given that you're the swing producer in the market at the moment. So have you really in fact reduced the volatility you see in terms of apparent demand?

**David Robb:** I'll make a couple of comments and then perhaps Matt you can also. Influence on the market is not just a mathematical outcome of your market share. Certainly most people watch what we are doing. We're going to have a reference price well the reality is Iluka has been the reference price forever. People tend often to price off us. I might just make a comment too about why that reference price is for customers. There are obviously legal issues associated with price signalling that we have to manage as well.

In terms of the volatility piece Mike, I think the volatility that we saw was exacerbated by the size of the moves. Right there was clearly a speculative element. There are people that we supply who see their business model as being a stock appreciation or a stock value decline model. They get really excited when the value of the stock they hold goes up even if their margins are not going up. We did see in 2010 and 2011 in hindsight we would accept that there was clearly some speculative buying that went on that added to the volatility in demand because then it was sitting there when prices came down. I think our just in time model gives us a better read now.

---

The pricing framework as Matt mentioned is designed to encourage the behaviours that we seek and that too I think will assist with a lower volatility. The other aspect in volatility of course is what other big players do. To date anyway it's been very clear from both their words and their actions that the number two zircon supplier is adopting a demand following model as well. That was not the case last time. They had a different approach last time. I think the other thing that's happened is the number three is fully sold if not short currently and that was not the case before either.

Finally, if you think about where  $TiO_2$  prices are particularly in ilmenite compared with where they were, the by-product mentality, i.e. I don't care what I get for my zircon it's just a reduction in cost of producing ilmenite - the temptation to think that way is reduced dramatically also because everybody's margins are under pressure and the revenue stream from zircon is more critical today than ever. Matt do you want to just talk about the volatility piece.

**Matthew Blackwell:** Yes look Mike I think the other part of the volatility piece is as our customers they didn't know where pricing was - had no idea where it was going, there were lots of people talking in the market about what it could do. I think that providing a reference price for them first of all as David said and people talk about the Iluka price all the time, it will be less easy for people to perhaps boast about what price they got when it's actually published.

So that will help the transparency and as we are the leader in zircon it's our duty to try and provide a price logic that makes sense to our customers and is more transparent and helps them pass that information on to their customers who may have been concerned about where the trajectory would go and then should they be thinking about substitution of other products.

**David Robb:** Can I just emphasise again a point that was made I can't remember whether it was by Simon or by Matt but there is a body of our customers on both sides, zircon and  $TiO_2$  that prefer us to do the work for them. They prefer us to put our prices up in a very visible way and that then gives them the rationale to go to their customers and say look I have to put my price up because my feedstock guys are putting their prices up. That sentiment exists today. I still hear that, that my business would be better Iluka if you put your prices up because that would give me the ability to get my prices up.

So it's still in some aspects a reasonably unsophisticated market. For example it uses first in/first out accounting on stock as I mentioned. What the oil industry discovered the error of that 20 years ago but it's still very common in our industry that people think they're making a good margin because they don't think about what the replacement tonne is going to cost them for their feedstock.

**Question:** With respect to your ceramic tile study, is there much of a lag in the data we're getting out of that? Was that carried out say through to December last year or is that recurrent? Leading on from that, can you make any comment on how's in demand in China currently?

**Simon Hay:** Yes the tile study does take a fair period of time. From the start of collection of tiles, well first of all there's an assessment phase, a desk top study at the start all the way through to the results would be six months. So it does take a fair period of time. I wouldn't say the industry moves are substantially within that six month period. We see trade shows over years that you see subtle changes across the year. So I'd still

---

say that the results are relevant for the moment. Chinese property - well there's reports coming out every day saying that it's bottomed in some areas, that prices have started to turn in the tier 1 cities. There are month-on-month increases in Shanghai, Beijing, Shenzhen just recently. Tier 2, tier 3 cities still falling and still flat in other cases. So it's still very difficult the property market in China that's for sure. One thing that's very interesting to me on the zircon sales front is that it doesn't seem to be affecting our sales to the millers.

**David Robb:** Remember that a lot of the distress you hear about property in China is property developers. Remember that zircon and TiO<sub>2</sub> typically go into Chinese property when the owner goes in for the first time. So fit out is just in time typically. So yes there are vast concrete canyons in China. Maybe that's representative of pull forward of concrete and rebar demand it has not representing anything to do with zircon or TiO<sub>2</sub> being pulled forward and then a latency problem.

The other thing just very interestingly in my view - no one's an expert on China least of all me but some of the social policy changes some of where China is now trying to go in relation to the quality of its growth and the enfranchisement of a bigger group of people is the liberalisation of a Hukou system. Under the Hukou system unless you held a Hukou you were not able to own property, period. So the first wave of urbanisation in China the three hundred million odd people who have moved from rural to city, no Hukou could not buy property. So what we've seen to date really didn't represent in my view the force of urbanisation but it will now because they are liberalising that system.

The other thing there was an interesting study that Simon you shared with me now if I remember the date alright, it's something like this, of household income in Hong Kong, extreme example I admit, roughly 30% of a person's income goes on their housing - the physical house not the living costs whereas in China it's only 10%. Now you might think well okay that's Hong Kong and China will never be there that's true but Taiwan is 20%. There is another wave to come in China which is all about upgrading because most of what Chinese people have today is pretty rudimentary. As GDP per capita continues to grow and as consumerism takes over, we don't worry about Chinese property. We really don't. It's a positive. Particularly when the tiles that Chinese people seem to prefer we know have high zircon loadings.

**Question:** Sorry just one final one. How do we think about the zircon reference price without saying what the price is, is that to the standard product or is that like a weighted - like in terms of weighted average across the portfolio? Also, what sort of variance is there from a standard grade to a premium grade in terms of zircon pricing? Again, not in dollars per tonne, but maybe percentages or something like that.

**David Robb:** Not dollars per tonne but percentages - good one Clarke, yes.

**Matthew Blackwell:** So the reference price is set for premium grade. Premium grade 2 tonne bags sold ex-warehouse in Asia. The discounts and the premiums for other products within the range confidential but we share with our customers. They are as again as Matt has said, competitive. We have to still be competitive in this market to sell.

**David Robb:** Maybe we'll adjourn and we will certainly be available for questions. Could I just sum up perhaps in this way - a year ago at least so in May last year I spoke about how our industry is changing. One thing that's not changing we believe is that demand is robust medium to long term. This is a GDP-driven

---

industry, but urbanisation, consumerism in China, application diversity that you heard of today, they're all big forces that are unchanged. Yes, there's short-term volatility. It can be economics, it can be inventory effects as Mike mentioned but certainly all the evidence is that the down cycle as it were is ending, or ended, who knows? We'll only know in absolute rear-vision mirror terms.

Pigment is changing. Its ownership is changing. You heard of a major merger in China. Its geography is changing in terms of where the critical mass is and there are technology shifts and China has all of those forces at work. In terms of feedstock for TiO<sub>2</sub>, quality is diminishing, the pipeline is emptying. We don't have any more Richards Bays or Eneabba's on the horizon. Risk is increasing, both geographic and technical. So there's a supply problem. We all know it when it hits us, but we're certainly thinking about it. One of our responses I'll come to in a sec.

Zircon, you saw assemblage decline. It is an industry that's leaning out in terms of rutile and zircon. Tile manufacturing transformations have been a headwind for decades. The recent modernisation, thrifting and substitution push as prices went to unprecedented levels was really just a continuation of a headwind we faced for 20 or 30 years as global intensity of use has declined as the manufacturing centre of the universe for tiles shifted to regions that tended to produce tiles with lower zircon loadings. There is now a bit of an evidence, certainly our tiles surveys support it, that that intensity of use is no longer a headwind, at least is neutral and may even be becoming a tailwind and increasing. You'll get your GDP effect but you'll also get an intensity of use effect as well.

Finally, technology has a much bigger role to play. We have been active in technological endeavours. I am very excited about their potential. Increasingly that excitement is driven by a view about what some of what we are doing, the impact it can have on the whole industry not just on Iluka. For so long as I'm in charge anyway we will continue to make the investments that we are making in our marketing and in our technology. So with that, let's go and please feel free to ask questions of any of us outside. Thank you for your time. I know it was a wet day to get here but I do appreciate it. Those of you who are on the webcast still, if there are any, thank you also.