



Technical and Innovation Update

11 May 2021

Welcome

Paul Galloway

Group Head of Investor Relations, Anglo American

Afternoon all, thanks very much for joining us. Today is an update on our technology journey. Technology is a key part of our core capabilities. It is integral to our holistic sustainability and it is making our world-class assets even more competitive. Tony and the team will take about 65 minutes to run through the slides. Then we'd be very happy to take questions - Stephen Pearce will join us for that. In many ways this presentation is building on the sustainability presentation which we hosted from a couple of weeks ago.

The next slide is from the lawyers and with that Tony, over to you please.

Technical & Innovation Update

Tony O'Neill

Group Technical Director, Anglo American

Welcome everybody. Before I start the presentation proper I will introduce the team of presenters that I have with me today. Firstly Matt Daley, Group Head of Mining; Dave Palmer, Group Head of Business Improvement; Rohan Davidson, Group Chief Information Officer; Arun Narayanan, Group Chief Data Officer; Donovan Waller, Group Head of Technology Development; and finally Pierre Herben, Group Head of Carbon Neutrality.

Re-imagine mining to improve people's lives

All our work is built around our fundamental company purpose. That is to re-imagine mining to improve people's lives. That is the context that we will place everything around. Technology and innovation are central to how we are creating a fundamentally more sustainable business. If we step back to around 2015 when we started FutureSmart Mining™ we talked about changing the footprint of mining, changing the inputs around water, around energy, the way it looked, the way that we interacted with the people around us and with our workforces.

We also talked precision. We talked innovation. We talked step-change - ambitious and transformational. We talked about reliability, performance, best-in-class and basically setting ourselves up for a future 15-20 years of leadership and success. It also needs to be noted that we are talking about end-to-end systems. Not pieces of a system - it goes across our entire business. It is clear that the boundaries between FutureSmart Mining™ and our sustainability programme actually don't exist. The two areas are inherently interconnected and part of the same purpose and ambition.

FutureSmart Mining™ today continues to develop, mature and morph at real pace. I would like to thank you and take the opportunity to update you and bring you along on our journey. We will take you through some broad headings. Firstly: operational excellence; digitalisation; innovation; carbon neutrality. They are the core of the broader programme that I talked about and ambition. There is a lot of other activity and a lot of other focus areas, but that is too much for today's programme, and perhaps the topic of a future event with you.

With that, I would like to hand over to the Group Head of Mining, Matt Daley, who will take you through delivering our full potential through P101.

Delivering our Full Potential Through P101

Matt Daley

Group Head of Mining, Anglo American

Today, we are really excited to share some of the significant progress we have made in our full potential P101 programme; a programme underpinned by the Anglo American Operating Model.

P101 takes a systems approach, looking at the value chain to ensure our improvement initiatives are targeted, leveraged and accelerated for maximum impact. When we commenced this programme in late 2017 we completed a self-assessment using available industry benchmark data to establish our baseline position against our industry peers. We had some strong areas, some not so strong but by and large we were sitting around the sixtieth percentile. Now fast forward to the start of 2021 and across the company we have moved up the curve significantly. A great result, but our work is not done. The foundation is strong and confidence levels are high that we will close the gap to benchmark and beyond over the next 18-24 months. So let us start with a couple of operational examples in Mining and Processing to explain how we are delivering these results.

Delivering our full potential through P101: Mining

P101 tactical mine design

Tactical mine design is foundational to equipment productivity and hence moving material safely at the lowest unit cost. Utilising 3D design tools to visualise equipment operating parts we are optimising equipment activities and interactions and providing ideal geometries to deliver benchmark productivity. Now, we have taken this approach into life-of-mine planning as well as short and medium-term design, ensuring across all timeframes planning decisions deliver the right material to the right place at the right time whilst locking in P101 equipment performance over the mine's life. This work has been a key contributor to seeing shovel productivity increase since the start of the programme. The before and after photo you see on the screen is an example of one of our operations in South Africa where best-in-class tactical mine design has produced a very different looking pit; we have different geometries, eliminating multiple vertical interactions, enabling step-changes in productivity.

Blasting design

Another key area of focus in the P101 programme has been drill and blast. With a focus on value, blasting has been key to improved equipment performance and concentrated milling rates. It also is delivering improved safety and social performance at our operations. There are two key areas of focus. The first is blast design, and Los Bronces is a great example where we have delivered a 14% improvement in fragmentation through design changes targeted to deliver optimal downstream milling benefits. Changes to blast design have also allowed us to eliminate trim, or buffer, blasts that are usually designed to sit against a pit wall. This improvement has reduced the frequency of our blasts, providing more productive hours in a week, and improved our shovel loading rates.

Blasting practices

The other key area of focus has been drill and blast execution. The best designs in the world are only useful if we can execute them with precision. To support this we have rolled out across the entire Group a standard real-time, in-field digital platform that tracks compliance to all aspects of drill and blast performance and enables designs to be modified using real-time accurate data as field conditions change. This platform is also integrated with our autonomous drilling fleets.

Haul road digital twins

The final example for mining – and I should mention that this is just a small subset of the P101 work programmes underway – is how we are using digital twins to optimise haul roads and improve operating

performance. Digital twins allow us to model theoretical truck and operator performance and measure it against actual in-field performance. We can then simulate modifications to roads before making changes in the field or we can address training and performance with operators to improve productivity. Such training is delivered through truck simulators that have been tailored specifically to our P101 objectives and we combine that with in-field coaching and mentoring. The example on this slide from Mogalakwena illustrates the power of these tools - we were able to deliver a 23% reduction in haul cycle times. That kind of improvement provides optionality to either use that additional capacity to move more material to increase revenues or if there is a higher value case we focus on efficiencies and parking up equipment, dropping unit costs and hence future capital requirements.

Delivering our full potential through P101: Processing

Maximising processing value drivers: throughput

I would now like to talk through some of the P101 examples for processing where the focus has been on the key value drivers of throughput, run time and recovery. Starting with throughput, Minas-Rio in Brazil is a great example where we have seen a 7% improvement in plant performance driven by systematic de-bottlenecking and circuit reconfiguration. This is basically changes to pumping and piping to modify the circuit, ensuring we eliminate bottlenecks and set the plant up to run as efficiently as possible utilising the existing infrastructure. This means we are banking the improvements for close to zero capital costs.

Run time

Run time is another key driver and we are seeing the application of our P101 asset maintenance strategies and tactics provide more operating hours per year. The Moranbah plant in Queensland is a great example where a 12% improvement in run time has been delivered through this targeted P101 focus.

Recovery

Recovery in processing plants is critical and the P101 programme is focused on delivering recovery in line with the full ore body potential. On the previous slide I talked about the system reconfiguration and de-bottlenecking at Minas Rio to improve throughput, what is really great about this programme of work is it also delivered a 2% improvement in mass recovery and when added to throughput this saw an overall 9% improvement in plant performance post the P101 work programme.

Revenue

Finally I'm going to touch on revenue. Kumba is a great example of where multiple disciplines have come together to deliver an outcome. In this example we had Geology, Geotech and Mining involved with new blast designs and then processing and maintenance engineers implementing modifications to the plant, crushers and screens. When all combined together this delivered a 5% improvement in the lump/fine ratio across the two mines at Kumba. With lump iron ore attracting a higher premium than fines, we saw an increase in revenue for the site post this work.

Delivering our full potential through P101

P101 best practice principles

We all know that improvement programmes can deliver short-term benefits due to the added management attention and focus and then sometimes we see performance drop away when attention is diverted to the next issue. The P101 programme is different. It was designed from day one to change the way we work. It is fully integrated into the Operating Model. We have ensured best practice principles are embedded into management routines and they have been documented and supported by flexible, modern training programmes that are part of our governance practice and standards. P101 is becoming our normal. To that end, we believe this programme uniquely positions us to take the same P101 approach as technology is deployed and we redefine the industry benchmarks. We are planning for new ways of mining and

processing as part of the FutureSmart Mining™ programme, and we are going to be positioned at the top of the curve as the industry changes.

P101 operational improvements

The final slide here highlights some further P101 examples. We have seen improvements in truck performance that deliver increases in material movement or further reduce our haulage costs. We have seen loading performance improve across the Group and an example of that is in our PGM business which saw a 25% increase in annual volumes at Mogalakwena with their rope shovel, allowing us to park up other high cost loading equipment. A very similar story across our processing plants. We have seen improvements across the board in key focus areas of run time, throughput and recovery. Now, the operational improvements are important and they are worth celebrating but what really matters is how this translates into value. And at that point I am going to hand back to Tony O'Neill.

Tony O'Neill: As an aside, Matt and a couple of cohorts, Andrew Marxsen and Andrew McClelland, have taken P101 as an idea and a catchy slogan from concept in 2017 to part of the everyday language across the business today. It has been a fascinating exercise of when you can click at the right idea with an organisation.

Today, the operations look at and learn from each other and that is not without a little bit of competition between them - all helping the equation. The benefits of P101 at \$2 billion, and that is rounded and gross, clearly are significant. Capital intensity has improved roughly 30%. The planning and analysis, as Matt said, of each aspect of the operations are at levels that we haven't seen before. And that is giving us a really different insight and understanding of the business, particularly around value flows, pluses and minuses. There is further opportunity particularly around another layer of stability and that drives further value unlock. It is all built around the Operating Model and with that I would like Dave Palmer, the Group Head of Business Improvement, to talk about the Operating Model and value release.

Tangible Value Delivered

Dave Palmer

Group Head of Business Improvement, Anglo American

As you just heard from Matt, we have made significant progress in the implementation of the P101 programme, which is underpinned by the deployment of the Anglo American Operating Model right across the business. These operational improvements across safety, productivity and cost performance have delivered material value. As we presented in the annual results earlier this year, we have now delivered over \$2 billion in gross annual improvement as at the end of 2020 through a variety of initiatives that span right across our commodities. Now, Covid has certainly had an impact, and it continues to do so. However, we have taken a range of actions to ensure we can stay the course.

On our current projections, we still see significant further value from the P101 programme over the next few years, with significant contribution coming from a number of key initiatives across throughput at Los Bronces, further optimisation of Minas-Rio, as well as significant improvement from the longwalls in Australia as we return to normal operations. With all this in mind we foresee the gross potential actually delivering up to \$3 billion by the end of 2022.

Stability is the key to sustaining our full potential

As we continue to ramp up the improvements that we are delivering, we also need to look at the challenges that we face in converting this to the bottom line. And we need to understand how do we sustainably unlock that full potential and deliver that full value? Turning our minds to that, while by 2020 we delivered over \$2 billion in gross improvement across P101, Operating Model and technology and innovation, about half of

that has hit the bottom line in terms of net EBITDA improvement for the same period. As highlighted at annual results, we still encounter operational instability and timing issues that currently prevent us from fully realising this potential in terms of net EBITDA benefit, particularly in the same period. That is not entirely unexpected considering the rapid rate of improvement that we are delivering.

To unlock this value requires us to stabilise and optimise these complex industrial value chains which are made up of the individual processes and sub-processes. And this is where the Operating Model and P101 really come to the fore. It is the stability of these sub-components that is key to long-term sustainable value. It is worth noting that every mining company on the planet encounters this challenge - as a matter of fact every linear industrial system for that matter. Whilst the problem is common, the point of difference is how we are responding to it.

Our Operating Model enables us to identify, quantify and address this in a really systematic way. To reduce that instability and variability at every level through the business. That is what allows us to increase performance right the way through the value chain. In order to further accelerate this across the organisation we are also engaging in sprint-based interventions at our operations to address this instability and reduce this variation where it matters most. It is this systems approach that enables us to bring forward greater value from our improvement initiatives and also allows us to be far more selective in terms of where we build capability and invest in capacity, driving maximum value.

We are also leveraging the superior capabilities that we have within our technical and sustainability team to not only deliver the physical improvements, some of which Matt has just taken you through, but to further enhance our capability through the digitalisation of our Operating Model right through the business. And you are going to hear a lot more about that today. Ultimately, we are now better leveraging our people across the Group to realise the full potential of the business and harnessing the power of process and technology. The impact of this is that we will see an increasingly greater proportion of our improvement flowing through to net EBITDA.

I appreciate all of that can sound a bit theoretical so here's what it looks like in practice. Here is an example of a recent sprint in our Los Bronces operation targeting truck payload increases for one of our fleets. You can see on the left-hand side how we stabilised that process by controlling the outliers, steadily increasing that average payload performance as the sprint programme progressed as we moved to the right-hand side. How did we achieve this? It is a really systematic approach to the process. It includes some quite detailed quantitative analysis of key value drivers and understanding reference distributions. And that is what enables us to pursue the high leverage opportunities. We targeted operator proficiency and we reduced variation through some operator-assist technology and we optimised the equipment configuration to give us maximum capability. What is the impact of that? Ultimately, increased truck payloads means increased production volumes and reduced haulage costs.

Stability delivers EBITDA

Let's have a look at how this all comes together, and ultimately how we deliver our part of the \$3-4 billion in EBITDA improvement commitment we have made. We initially identified that the Operating Model and P101 would contribute about \$1.5 billion to this target. As I said earlier, our gross improvement, we see that now delivering up to \$3 billion over the next couple of years. And most importantly, an increasing majority of this gross improvement is now hitting the bottom line as the Operating Model becomes more systemic and our targeted stability sprints become embedded across the business. As such we are confident in meeting the net \$1.5 billion commitment for our contribution with further potential upside. Essentially, we have delivered a lot of improvement through the Operating Model and P101 to the business, and there's plenty more to come.

Tony O'Neill: It was fair to say that there was some resistance to the Operating Model in the organisation in the early days. This has certainly turned around under Dave's leadership. There is a real pull from the business and Dave's challenge now is to get it rolled out even quicker. And he's certainly got an aggressive programme this year.

If we step back though, in 2015 our technical industrial IT infrastructure was really behind where we considered appropriate to layer our FutureSmart Mining™ programme onto and how we used data to analyse and optimise our work was really constrained by this. Using the Operating Model as the base principle, Rohan Davidson, our Group Chief Information Officer, has done wonders transforming our technical infrastructure, enabling our programme to proceed at pace.

Advanced Process Control

Rohan Davidson

Group Chief Information Officer, Anglo American

Today I'm going to talk about the wonders of Advanced Process Control - what it is, how it improves our business performance and the contribution it makes to our sustainability journey. As part of our digitalisation approach, one key component is to take the best technologies across all industries and adapt them to our operations. And we have leant heavily on the tools and techniques forged in the petrochemical industry and we have developed our own industry-leading capability and Advanced Process Control (APC). APC automates the implementation of the Operating Model across our plant control systems, unlocking optimisation that has previously been beyond our reach.

At its heart, APC employs virtual operators or algorithms in closed loop control that are responsible for optimising a single process step to achieve a target output. This might be a mill rotation or maybe a sump level or a valve setting. The technology is particularly useful where the process steps involve time lags, like long conveyor runs or surge pins or float tanks. Operators and their conventional control systems struggled to accommodate these time lags but they lend themselves very well to advanced mathematical modelling. In particular, with artificial intelligence and machine learning we can usually produce models that outperform the best operators running these complex systems.

At our large plants, there are many APCs. Take, for example, our copper operations at Los Bronces. Our end-state for Los Bronces has over 100 of these virtual operators, we are three years into the programme, we have completed about half, and last year the half that we have completed contributed over \$60 million to the underlying operational performance of Los Bronces through improved recoveries, energy savings and throughput improvements.

The graphs on the slide here are indicative of the sort of performance that we can achieve through APC. To read these graphs the conventional control portion is shown on the left-hand side in red and where the APC has its hands on the wheel that is shown in green. At our Minas-Rio operation, APC streamlines our crushing and our metal separation processes. At our copper operations, at Los Bronces we have had some of the best results - our giant SAG mills have APC models that help us with the grinding process where there is a 10-15 minute residency time for all of the raw inputs that go into our SAG mills. Keeping throughput constant is important to match downstream metals recovery capacity and you can see there the APC control after a period of adjustment is able to keep throughput at a much more constant range than we had under manual control. In this particular case, we have improved the stability by 32%.

APC is also looking to optimise energy efficiency and reduce water use. In this particular case, for every tonne we mill we have managed to reduce the energy consumption by 17%. As Tony has mentioned, at the start of our transformation journey we had no underlying standardisation across our plant and control

velocities, our infrastructures, and no way to integrate support services across them. With APC we have integrated the system across plants which gives us whole-of-business visibility performance monitoring, support and for our incident response.

APC improves energy and water efficiency

Our goal is to have all available processes under APC by 2024. Last year, we reached the half-way mark and the systems that we have put in place contributed over \$170 million to underlying earnings. We are on track to double that record next year. As well as the throughput benefits to drive the financial contribution, APC lets us optimise our energy inputs and our water consumption. Last year, we saved 173,000GJ of energy, dropping over \$5 million from our power bill. Most of this came from our Chilean copper operations where APC controls the grinding mills but a 7% energy reduction across the entire system. Each time we build one of these controls we look for opportunities to solve the same problem that exists elsewhere in the Group. The copper mill logic is being retrofitted to our PGM operations and the early stages of this project have already reduced our power and consumption there by 4% across the system. In Brazil, a 12-month project to stabilise the temperature and moisture of the feed stock for our nickel smelter has contributed directly an 8-kilotonne annual reduction in our CO₂ footprint.

APC improves energy and water efficiency

We hear a lot about digital twins. We are in the process of building digital twins for all of our key operations. We take laser scans which let us build detailed CAD models. We combine these with drawings and plant master data and that gives us a digital twin, which let us model different scenarios. They are used for instance by a processing team to explore expansion options and improve flow sheets. What sets our approach apart though is the tight integration between the digital twins that we are building and the APC environment. Having real plant data gives us a full virtual asset, including simulated instrument data, lets us run a training environment not unlike a flight simulator but for plant operators, letting them practice recovery of stable operations from scenarios they are never likely to experience in the real world. Our rich plant data passes through the APC environment which gives us context for our data lake and for our analytic solutions, which my colleague Arun will talk to shortly. All of these technologies are baked into the commission and the design of Quellaveco, our first fully digital mine.

Tony O'Neill: As Rohan said, his work has enabled connectivity and digital twins for a large part of our business. It has enabled us to move on a vision we had around artificial intelligence - to be among the best to effectively simulate and optimise our business in real time – and bring it to life. We also want to be in control of our destiny in this area. Arun Narayanan, our Chief Data Officer, has recruited an outstanding team in the data analytics space and our ambition is to lead the industry in this area.

VOXEL™

Arun Narayanan

Group Chief Data Officer, Anglo American

I'm going to be unveiling VOXEL™ which is the mining industry's first digital transformation platform for data-driven decisions. It brings together some of the points that were already discussed today. It is the implementation of the Operating Model with machine learning and artificial intelligence. It encompasses the entire value chain for us and it helps us really move forward into the future.

What is VOXEL™ and how does it work? What are the aspects of it? The first point though is about the Operating Model. The Operating Model tells us to do the right work, in the right way, at the right time. In that context, VOXEL™ is all about figuring out what that right is.

VOXEL™ Cloud-based platform

So VOXEL™ brings a lot of things together. First of all, it is a platform built in the cloud. It is a very modern platform looking at all of the data that exists in our operations and trying to bring that all together is the first step. Rohan referred to a variety of digital twins. That data plus data coming in from our historians as well as geoscience data as well as external data is all pulled in into a modern, scalable infrastructure that we call the data lake. This data lake contains the data of our operations and presents the first opportunity for us to start to integrate things. As we begin to build these integrated models we are cleaning up the data. We are performing data management tasks at the lowest levels from data quality to the highest levels like data management. This cleaned-up information allows us to create data-rich applications that are listed on the screen over here. And what are these applications and how they work form the rest of this presentation. It gives us a great opportunity to leverage the advancements happening in the computer science industry to bring machine learning, artificial intelligence, burst capacity for our applications through cloud computing and much, much more.

VOXEL™ is different

Now, VOXEL™ is very different. It is different because the entire system, the entire value chain modelling, has been built specifically by us for mining as opposed to looking at other alternatives which are specifically targeted just to equipment or to other solutions. It looks at the full value chain, it takes in the deep expertise that sits in the T&S (Technical & Sustainability) organisation and the business units and it encapsulates that knowledge in the way these applications and these solutions are designed. It takes all of the digital twins that were built at individual steps of the value chain and pulls together almost a systematic digital twin of the full value chain - and that is really what sits at the heart of VOXEL™.

VOXEL™ drives intellectual property and data ownership

We are taking a stand on data ownership. The data that we generate as part of our operations is an asset. It is our asset and we have to treat it as you would treat any other asset. We need to protect it, we need to make sure we are using it where it needs to be used and we need to make sure that we are getting the best return that we can get from that asset. And that is what the VOXEL™ data programme sets out to do. It gives us a pathway to begin to claim ownership of that data and begin to use that data to drive the best decisions that we can – that we can get.

The other aspect of this is intellectual property. Intellectual property in this system is owned almost entirely by Anglo American. We do work with industry-leading partners like Microsoft for the cloud solution and we buy other components where they are necessary but they are encapsulated away and the intelligence in the system is owned entirely by us. What that means for us from the scalability standpoint is that we can productise these solutions and deploy them at pace without incurring additional costs to all of our operations. We have evaluated a variety of other options. Clearly, you can build a bunch of point solutions, you can look at commercial off-the-shelf software and pull those all together to form digital solutions. But as we compare and contrast those options to VOXEL™ it is very clear that VOXEL™ always comes out ahead of all of these because it gives us the quickest pathway to owning our data. It gives us intellectual property and scalability of deployment. It also gives us an ownership in our own future in terms of how fast and how hard we can drive this programme.

VOXEL™ system view

If we were to think about this as a system view, there are many things that are happening here. But as we introduce the applications it is important to understand that these applications are integrated at the data level and they give you opportunities to optimise the full system. One way to think about it is the first thing that you can get out of it is that you can just fundamentally eliminate waste that exists in the system. Both Matt and Dave referred to this in their presentation but maybe an analogy is a better way to go here. If you

look at a system like Uber, what it is doing is it is reducing the number of wasted minutes that passengers are waiting for drivers and drivers are waiting for passengers. That elimination of waste is what happens when you build such a holistic system. Similarly we want to understand what ore bodies exist, what ore bodies should be mined and what ore bodies go through processing plants correctly so that we can just fundamentally eliminate waste from the system.

Applications

There are specific applications inside the VOXEL™ ecosystem and these perform specific tasks.

Starting off with S3, the sustainability application, these applications have capabilities to do power analytics, methane gas analytics, the ability for us to track our environmental and biodiversity impact, as well as greenhouse gas modelling.

Moving on to G3, the geoscience application, which allows us to do rapid resource modelling. As we acquire core samples we are able to use the power of artificial intelligence to quickly analyse and perform analysis of the core which usually takes us a long time to do. As we rapidly reduce the time it takes us to do these core analyses we can build ore body models very quickly. The same application G3 also has capability to burst into the cloud to do model execution and further refine the ore body definition. Here we are not buying computers but we are really just using the computer power available to us on demand to be able to solve these problems.

In the M3 product, for mining, we are able to optimise mine planning and also, in the context of P101, review our operational performance. In addition to that, we can track materials spatially which plays a role in the full value chain integrated play but also we can understand what is in our stockpiles and model our stockpiles in detail.

One of our flagship products is P3, which sets out to change the game in the way we run our processing plants. We can optimise the recipe for our processing plants given the ore body feed.

A3, for asset utilisation and maintenance, gives us a way to make sure that we are using our physical assets to their best possible potential, perform maintenance tactics optimisation and predictive maintenance.

The health and safety of our employees is very important. There is actually an entire application dedicated to that and H3 application sets out to deliver that outcome. In addition to being responsible for tracking some of our COVID-related responses, the H3 application digitises critical controls, makes sure that we can do an automated TARP – trigger/action/response plan – as well as perform video safety analytics.

There is a variety of applications and these are being built over time and it is a journey for us to get these deployed everywhere. But some of these applications are actually live and they are available for our use at our sites.

I now want to share with you some specific examples of these applications being used at some of these sites in P3, A3 and H3, and I am also going to share with you some upcoming features in S3 and X3.

Processing Optimisation

Process Health – Mogalakwena North (PGM concentrator)

Starting off with P3 - what is P3 and what is trying to do? The best way to think about it is – it is like Google Maps for a processing plant. It helps you understand as you will have done before on paper what your control chart looks like and it helps you see these electronically. It helps you understand in this particular case performance process review, which is a digital rendering of different controls and understanding when those controls are outside the bounds of your KPI. The metallurgist can quickly review those actions and make remedies, and make sure they are back on track to achieve the KPIs that they set out to have.

What is maybe very special over here is that we are able to detect the state of the processing plant. We call it context and as physical properties change, such as input or mineralogy or someone changes the set points, the system automatically detects a context. And it is able to give you the KPIs in the sort of setting of that context. It is like understanding what your revs should be for a specific gear but as your gear changes your revs change in a car - the same analogy applies here. And just like Google Maps, it gives you the context of where you are, what is coming and what is very exciting is recipe optimisation. It is going to tell you what to do as well and give you the best recipe for the specific ore body field that you are getting. And this is done with a context of what your ESG performance looks like.

Asset Management

Predictive maintenance – ACP (PGM processing)

The A3 application is at the Anglo Converter Plant in Rustenburg and this is talking about maintenance. Typically, if you perform maintenance on a schedule, you can either over-maintain or under-maintain the asset. Under-maintenance means unexpected shutdowns and over-maintenance can result to wasted operational efficiencies. What predictive maintenance does is allows us to monitor the health of the asset digitally and trigger alarms much in advance allowing us to plan and execute the maintenance work as part of the Operating Model principles. This also makes it safer. In this particular example, over last two months we have had five catches in the Anglo Converter Plant which has saved us more than 121 hours of downtime. It has detected everything from water levels that are unfavourable, to nozzle and leaks, and to furnace points that were not set to the right level. And allowing us to make remedies to them much, much more proactively than we would have done otherwise. All of this ensures that we are able to counter the headwinds that we are facing.

Safety and Health

COVID-19 response

H3 is the health and safety product and this example is specifically the Covid response part of the health and safety product. There is a global dashboard on understanding the impact of coronavirus within our employees and our operations that we have built. In addition to that, we have also built a comprehensive track and trace programme to understand how the virus is spreading because we have deployed wearable devices for our employees. This allows us to proactively not only manage the health of our employees, but it has also made operational differences to us, specifically in one case where we were able to understand that one member of a crew had exposure before the ship went out. These are casual examples of operational benefits in addition to the health and safety benefits from the same application.

Sustainable Operations

Greenhouse Gas modelling

I'm now going to talk about an upcoming feature for the sustainability product, S3. Sustainability sits at the core of what we are doing within the whole platform and what we are trying to fundamentally drive out of the platform. One method of doing that is to model greenhouse gases in relation to incremental production steps - this much production caused this much greenhouse gas versus that much caused that much. This gives us an opportunity to understand what decisions we need to take to balance our throughput and our financial outcomes in the context of greenhouse gases and our commitments that we have made there. You can see that Google is also going down the same path - there is a green routing option that will soon be available in Google which will let you say, 'I want to take a trip that is two minutes longer but it is 10% more greener.' That is exactly the same concept that we are bringing in through S3 where we say, 'This last 2% in production is costing me 20% of my greenhouse gases and do I pursue that, or do I pursue something else?' It gives us that visibility in a very clear and understandable manner.

Digital Operational Planning

X3 is one of the most critical products in our portfolio. The X stands for integration and it is central enough to our strategy that the X3 product actually makes its way into the name of the platform VOX3L™ itself. And X3's fundamental goal is to deliver the operational planning component of the Anglo American Operating Model. The digital operational planning tool, or DOP, delivers the promise of giving you a way to use the power of computers to get a much better plan out of the system. DOP builds value driver trees and using these value driver trees we are able to assess different scenarios and rank these scenarios for the best outcomes that we want based on whatever objective function or balance of them that we are looking for. So, you can either optimise for throughput or greenhouse gases or balance them out.

This operational planning tool has many advantages in the way the picture is drawn. First of all, it uses the data from the data lake so everybody is working on the same holistic dataset and we are all together in the same picture. Secondly, it gives you the ability to model different things in the computer system and find out the best answer for you for the given scenario. And thirdly, it ties very closely with the feedback portion of the Operating Model which are all the applications that I spoke about. G3, M3, P3 - they are all providing feedback as to how well the previous round of the operational planning went. So together, you can see that this is really laying the foundation for us to step into a version of the Operating Model that is fundamentally powered by digital technologies. And for us to be able to do scenario planning in a way that was never possible before. The pulling of all the information together from the full value chain is driving this.

Looking at the technology, the way we have built the VOXEL™ platform and the set of applications that sit in it, we have been quite successful financially. In the three years that we have existed as a team we have spent less than \$100 million and returned \$150 million in value in the period ending in the last year. And this year we are accelerating quite a lot and we are almost planning to spend the same amount of money to return that same \$150 million impact just this year alone. That shows you the speed at which we are accelerating with the programme.

This programme is going to be successful as it depends on people if we take them along on this journey.

Digital literacy is a key enabler

Building a digitally literate organisation

The digital literacy programme is a key enabler for that part. As we begin to build a data-rich organisation we are expecting people to understand these technologies and to be comfortable with it. To that end, we have rolled out what we call a digital literacy programme. It is a lot of training that people can access online at their own pace in bitesize chunks. And there has been a tremendously enthusiastic response in the take-up of that programme. In addition to the basics, there is also an advanced nano-degree programme for those who are far more committed. Think of it like a single course in a Masters programme that allows people to commit to one area of study, like Citizen Data Scientist, and deliver that in a period of time and be much more confident about these technologies.

VOXEL™ enables remote work

Integrated Remote Operating Centre (IROC)

VOXEL™ allows us to enable remote work. In one example, we have built the Integrated Remote Operating Centre in Santiago in Chile, which gives us an opportunity to enable a way of working that was not really possible before. It reduces the need to make needless trips to the site. The people at the operating centre have the same data that is available to people at the site. And it brings about a step-change in efficiency and productivity. This also is laying the foundation for us to bring in experts who might be located elsewhere to look at the same problem and give you advice as well. Essentially, the digital transformation work also transforms the way in which work itself is done.

VOXEL™ Digital Transformation

So pulling it all together - there is a digital transformation that is underway within Anglo American. This digital transformation is promising to deliver both sustainability efficiencies as well as value growth. And the pillars on which it stands are a holistic transformation of people, process and technology. The people transformation is led by the digital literacy programme. Process transformation partly through the VOXEL™ data programme, partly through the way remote work is enabled. And the technology is a game-changing, differentiated productised set of applications that sit on a modern cloud-based deployment of technologies that are available to us.

Tony O'Neill: The starting premise in putting together the data analytics team was that mining was not cool and we would struggle to get serious talent to join us. We have found the complete opposite. What we have found is that we were able to attract people from organisations that we thought were cool and the reason has been really around our purpose. The people have joined us because they wanted to change the world and they see our purpose as a vehicle to do that. That they can leave their impact on the future for humanity. We have got an amazing organisation - it's been really, really one of the joys to watch.

If we move on though, FutureSmart Mining™, where our programme effectively began in 2014 has not been left behind while we talk about all these other things. Donovan Waller, our Group Head of Technology Development, will take you through our traditional innovation programme and bring you up to date as to progress in that area.

FutureSmart Mining™ Integrates Technology & Sustainability

Donovan Waller

Group Head of Technical Development, Anglo American

For those of you who are new to our course since our 2019 update, let me give you a short history of where we've come on our technology journey. Our early assessment on our FutureSmart Mining™ journey was that we wanted a more precise and sustainable pathway for ourselves and the industry. One that would simultaneously achieve profitability and sustainability. As such we looked outside our industry for help and we embraced open innovation and collaboration. In 2019, we shared with you a number of technologies that showed a lot of promise and today what we will show you is the delivery outcomes and the progress of those technologies as well as some new and some more promising technologies.

Over time we have also become better at discovering new technologies and taking them through the development cycle, as well as embedding them into our operations. In addition, as Tony mentioned earlier, FutureSmart Mining™ has grown to embody the Sustainable Mining Plan as well as delivery of the Anglo American Operating Model, P101 and digital.

Concentrating the Mine: Bulk ore sorting

In ore bodies, grades occur naturally in uneven distributions, and what we do is we take advantage of this by sensing the grade and the material as soon after the blast as possible and we reject the obvious waste instead of processing it through the plants. This means we have a higher grade that goes through the plant and then we speed up the mining rate in order to make sure that the plant is kept full. In an ideal situation you are able to reject up to 40% of the mass for a 20% upgrade. We have completed demonstration units at El Soldado, Mogalakwena and Barro Alto. In fact, we have gone one step further in that we have a full production unit in Mogalakwena. Barra Alto has turned their demonstration unit into a production unit, are in the process of securing another, and we are well under way in getting Los Bronces up and running in a full-scale rollout as well.

Concentrating the Mine: Coarse particle recovery

Coarse particle recovery, CPR, uses a hydro-float recovery in order to recover metal at larger particle sizes. This means that the particles spend less time in the mill and we are able to increase our throughputs by up to 20%. Since particles are large, and when used in conjunction with our hydraulic dry stack, we are able to then recover more than 85% of the water. The images that you see there on the slide are the El Soldado unit we are currently commissioning as we speak. The Mogalakwena unit will be up and running towards the end of the year. We have also managed to bring forward the rollouts at Los Bronces and at Minas-Rio.

Concentrating the Mine: Hydraulic dry stacking

Looking then at a process that follows on from coarse particle recovery - hydraulic dry stack. We use the sand created from the coarse particle recovery and we create a sandwich-like structure with layers of sand and conventional tails. The water from the fine tails drains through the sand layers and, as mentioned earlier, we are able to recover more than 85% of the water. What gets left is a stable dry stack that can be repurposed for other uses. At the moment we are constructing a full-scale demonstration unit at El Soldado that you can see in the image at the top of the slide. As we go along this process we are sharing the experience with regulators in order to bring them along with the journey. Hydraulic dry stack is applicable to anywhere in the business where we have the sand available, which typically comes from coarse particle recovery, although it doesn't necessarily have to.

Hydrogen truck and plant

In order for us to achieve our 2030 de-carbonisation targets we need to displace 1.5 billion litres of diesel that we consume each year. Using green energy to power our operations we use the excess to generate hydrogen on site. We are currently building the world's largest fuel cell powered vehicle. The fuel cell battery combination has been constructed and is currently under test. It will soon be delivered to South Africa and installed on a truck, which is ready, in order to run before the end of the year. Our aim is to roll out at seven sites before 2030 and so we have those in planning. We aim to kick off the first production site, Mogalakwena, in 2024.

Concentrating the Mine: Microwave

Microwave is a really interesting new technology that I do not think you would have heard too much of before. Some minerals respond well to microwaves which pass seamlessly through the waste. This differential heating causes stresses and microfractures in the rock, causing the rocks to soften and hence they melt quicker, resulting in an increased throughput. In addition, they tend to break along the ore grain boundaries meaning that liberation becomes easier. We are currently looking at rolling out a unit on the Los Bronces pebble circuit. The technology is applicable across PGMs as well as copper.

Speed of innovation to value

Whilst it is wonderful that we have this great portfolio of technologies, what it really says to us is that if you want to take advantage of them you need to be able to get them rolled out quickly. We have learnt to ideate and develop the technologies quicker and we have also found new ways to be able to implement them quicker at operations. What is really pleasing to me is that every technology that we have developed so far has been rolled out before the one before it. I am not sure how long we can keep that up, but it is a really good trend. Microwave is our flagship example in this instance. From the first laboratory results of having the results on what happened to the ores in the microwaves, to us coming to a final design will take us only one year and we anticipate that the rollout would only take six-months.

Part of what allows us to do this is some of the work that we have been looking at in terms of modular replicable plants. Traditional mining technologies are developed over around a 15-20 year cycle and so far we have been able to reduce this down to a 2-5 year cycle, and we are still reducing it. As a result we are

turning our speed of implementations into a competitive advantage and we have got a whole lot more exciting technologies to come.

Tony O'Neill: I think it is worth noting that what Donovan talked to you about today is a subset, or our second wave technology. We can see another wave banking up behind this but that is for a future presentation.

We are committed to a third of our sites being physically carbon neutral by 2030, and carbon neutral by 2040. Mark has certainly been talking extensively about that. I think we all agree the world needs it but it seems like a really natural fit with our technical and sustainability ambitions. It was clear from an early stage that we need to develop a detailed granular pathway which we can execute to achieve the targets because they are really quite onerous. We are very pleased with work to-date. Pierre Herben, our Group Head of Carbon Neutrality, who has recently joined us, will take you through a high level look at some of this work.

The Carbon Neutrality Challenge Offers a New Mining Landscape

Pierre Herben

Group Head of Carbon Neutrality, Anglo American

Last year, Anglo American announced its ambition to reach carbon neutrality by 2040. Before we go further it would be good to look at the size of the problem. Please look at the chart on the slide which represents the sources of greenhouse gas emissions we have across the group.

The first source, you see it in orange, is basically the electricity, so it is the emissions generated by fossil fuels used by the power plants that produce the electricity we are acquiring to power our sites and mine operations and it is a good third of the total emissions of our group.

Then if we look at the second category, those are the fossil fuels we use directly to power our trucks and for the mobility, like diesel, but also the coal that we use for some heating of some processes like smelters.

And a third main source of emissions, you see it on the left in blue, is fugitive methane, which is very specific to met coal mines like in Australia where we are for safety reasons ventilating heavily the different mine shafts and the exiting air contains very diluted sources of methane, but quantities of methane which nevertheless have a very strong impact on greenhouse changes and climate. These are the three main categories. Since last year, we started to develop a pathway, to control our destiny and make sure we get there in time.

A multifaceted pathway to carbon neutrality

Renewable energy generation

If we look at the pathway, it is really multifaceted. It is a set of six building blocks, or levers, that connected together will provide us the path towards carbon neutrality. The first one is about generation of renewable energy, so it is really about developing the capabilities for all the sites across the globe to get access to carbon-free electricity.

Hydrogen generation

When we are deploying that, we are integrating the second lever, which is production. You have seen a great project already in development in Mogalakwena with Donovan, and actually here it is really integrating renewable energy with hydrogen production to replace diesel by hydrogen and start operating our fleet.

Energy storage

But when we speak about renewable energy we always speak about intermittent sources, we speak about solar, we speak about wind, and our mines need to operate 24/7, 365 days a year. So, we have been

contemplating a series of options, to provide the necessary storage capabilities that will enable us to generate and store, and dispatch, energy, you know, 24/7 to our operations.

Methane capture

The fourth lever – we spoke about methane emission – is how we will capture that methane and neutralise it to avoid emissions or impact on greenhouse gas due to methane emissions.

Energy efficiency

The fifth lever is an important one, it is energy efficiency, and I am really connecting you back to what you have seen in technical innovation from Donovan, but also all the digital progress made with Arun on that field, where it is about producing more with less, so avoiding energy consumption, avoiding emissions from the beginning, and also planning things better in a way that we are emitting less. It is an integral, connected part of the journey we are going through.

Emissions compensation

And last, but not least, we know that there will always be minor but difficult to abate emissions. So here, we have embarked on a set of ideation processes to identify nature-based, technology-based options to capture and sequester CO₂. We check the system and the architecture of the building blocks we have identified, and we believe we are in a very good path towards carbon neutrality.

Initial progress is on track for critical emissions areas

I would just like to briefly show you some of the progress we have made since last year. If we start and focus on southern Africa, we have developed a comprehensive plan to convert all our sites, and we operate in four countries, to 24/7 renewable electricity access. We are now initiating the next phase, starting engaging very soon with stakeholders, with partners, with governments etc to start the deployment phase. Integrated in that plan is the hydrogen truck, with the demonstration and the first implementation happening by the end of this year in Mogalakwena.

If we move west to Latin America, I am also very happy to announce that now the team has secured renewable electricity access to all our sites, in Peru, Chile and Brazil. It is very nice to have Quellaveco as a new mine site to start operating directly with renewable electricity.

Australia - we are planning the same approach for renewable energy, to convert our operations. Specific to our met coal mines we have already developed a concept study and identified potential solutions. We are now starting a pre-feasibility study on a solution to capture and neutralise the methane coming from our ventilation process, with safety as a first priority and greenhouse gas abatement as a second priority, obviously. When you look at the plan with what we have already delivered, we are very confident that we are going to beat our target in time and we are, so far, on track.

Tony O'Neill: We have always felt that strategic mine planning is an absolute key to understanding optionality of any mining business and the value of any mining asset; just how you set it up, the infrastructure, getting the scale and the options right. And at personal level, I had not seen many examples of this work being done at the right level over my career, and I suspect Mark would have the same view. So, we set about developing this as a core competency and capability within the organisation, and Matt Daley and Carmen Letton, with their teams they have developed a suite of strategic plans that, certainly in my view, have been top-class, it has been really pleasing.

Strategic Mine Planning

Matt Daley

Group Head of Mining, Anglo American

Technical innovation unlocks optionality

Today we have talked about P101, our data-driven digital transformation with VOXEL™, APC, new technologies and our carbon strategy. These individual programmes are all critical to reimagine mining to improve people's lives, but when you combine and leverage these programmes you really start to see the full value and optionality this work can deliver across Anglo American's portfolio of assets.

An integrated view of value for the group

NPV of 10 assets

To that end, during 2019 we completed, as Tony mentioned, a series of resource-development plans for 10 of our assets or districts. These resource-development plans are unconstrained, full-potential plans that incorporate many of the programmes of work and technology we talked about today, but, of course, in their 2019 state of maturity. Now, this work illustrated that in conjunction with our large and high-quality resource base, there is a potential for a 30-50% uplift in NPV from the group of assets that we reviewed. As you can see from the pie chart on the right of the slide, the NPV uplift is driven by a combination of P101 technology development and conventional expansion.

Resource development planning has continued through this year using the latest work that was presented today, and compared to 2019 we are seeing innovation and technology overtake conventional expansion as the preferred pathway to value. This new pathway is adding even more value, earlier, at lower capital cost and, importantly, with an improved footprint from a sustainability standpoint; less water, less energy, less carbon. The new preferred pathway is also providing significant new optionality to our portfolio; it has allowed us to look differently at timing and scale of growth opportunities. Asset life extensions change the thinking on how we should deploy capital and what regional or greenfield projects will be the most value-accretive. We strongly believe, and the results are reinforcing that belief, that today's work programmes will deliver a different and better future for mining.

Q&A

Sergey Donskoy (Société Générale): Firstly, is it possible to quantify, what sort of amount of PGM you will need to convert your own truck fleet to hydrogen across all operations, and what electrolyser capacity will be required to achieve that as well? And, second, do you think about investing or expanding the production in your iron ore divisions at Minas-Rio and at Kumba to capture more of the value that some others may reap if you do not do that?

Donovan Waller: The first thing to say is that the fuel cells that are currently in use use quite a bit of platinum, but if we have a look at the US Department of Energy's suggested amount of platinum that they are aiming for into the future, it talks to around about 48 ounces of platinum per truck. And when we have a look at the electrolyser portion, which also uses platinum, we are looking at round about 31 ounces per truck, so it really just depends on the number of trucks that we're rolling out. So, for instance, at Mogalakwena we'll be rolling out 40 trucks.

Tony O'Neill: We continue to look at the options, but, the rail constraint at Kumba and the pipeline at Minas-Rio are not short-term fixes; they would require a multiyear programme. We continue to look at them. I know that the crew at Kumba certainly talk to Transnet regularly about rail capacity, but there are no short-term fixes in train at this point.

Ian Rossouw (Barclays): I had a couple of questions on the expansion options, particularly at Collahuasi. You are obviously looking to approve plans over the coming year. Does some of this technology make you want to pause some of these expansion options, and maybe not just related to Collahuasi but others as well, and then, try to integrate as much as possible into these before you make the decision? And then, just related to that on Quellaveco, you have added some of this technology there as well recently and just wanted to get a sense of what you think the ultimate savings on power, water, and maybe just an idea of the longer term production profile, how that changes versus the original approval guidance?

Matt Daley: The technologies you saw today have a really high level of applicability for Collahuasi, bulk ore sorting, coarse particle flotation, hydraulic dry stacking; we're studying these technologies at the moment. Near-term for us, Collahuasi opportunities sit in the debottlenecking of the existing plant. We have the mine ability to feed expanded capacity in the plant. So first prize, debottlenecking, second prize, certainly moving towards implementation of technology. Currently working very closely with the other joint-venture holders at the moment to position this technology as being the pathway for expansion for the asset.

Ian Rossouw: But could this potentially delay some of those expansion decisions, do you think?

Matt Daley: The pathway is really going to be around permitting. So, at the moment, there's nothing committed beyond the near term, which is the addition of a fifth ball mill, so that project will go ahead. Anything beyond that at the moment we have full flexibility in terms of what we implement. So near term, debottleneck, fifth ball mill, beyond that time horizon complete flexibility on how we take the asset forward.

Richard Hatch (Berenberg): I just wondered whether you might be able to talk a bit about electrification of drills and suchlike, and whether you see an opportunity there. And then, on South Africa, would you be able to give us any steer or guidance over the timeframe for sorting out your own power solutions there? And then finally, would you be able to give us any numbers around capex, and what kind of investment is required to progress these net zero targets? Obviously, the Group's generating a lot of free cash - is now the time to start putting a bit more into these technologies when you have got the money and it is flush?

Matt Daley: On the electrification front, 100%. If you look at our large rope shovels, they are already electrified. If you look at a lot of our large production drill rigs, take Mogalakwena for example, about 80-90% of their fleet is already electrified. It is always a trade-off between the value proposition of being electrified and the less mobility you have by having cables through your pit. As we transition into our large modern undergrounds, example being at Venetia, we are very much moving to an electrified future for that asset. If you go forward with our plans, in terms of acquiring the next fleet, as we move into production the intent is to have everything that we can electrify electrified over the next three to five years.

In terms of hydrogen, also looking at options away from the trucks into smaller fleet. I think there is very much a future with electrification, either through having pure feed by cables or hydrogen on drills and on support equipment like dozers.

Paul Galloway: I think we missed out part of Ian's last question. So, Tony, I think there's two with you, Quellaveco and the second part of this one, please.

Tony O'Neill: So, Ian, the commercial terms that we already had in place for Quellaveco on power were quite competitive, and in moving to the renewables I do not think there was a big financial benefit at all, but it enabled us to, if you like, have a green mine from get-go and that was something that we were very keen on.

In terms of coarse particle recovery, at Quellaveco it is at the back end of the process, whereas you get the real benefit from coarse particle recovery in a water sense at the front end, so there isn't a particular saving in water at Quellaveco. The permit was always limited by water. The current mine is permitted to 127,000 tonnes a day. I think the permit, as it stands, limits us to 150,000 tonnes a day at some point in the future.

Our aim though, given where we are is to get the thing up and running and stable as quick as we can, particularly with Covid, and then look beyond, pretty quickly from there towards going towards 150kt. But, at this point, 127.5kt is the go.

On power in South Africa – we are at a point where we are about to start discussions with the government and our local communities. I think for us to put a timeline around that at this point is a bit presumptuous; they may or may not like what we put to them. We think the plan is solid; it certainly looks very workable to us. It is basically wind power at East and West Coasts, renewables and then storage of energy in water – it is a well thought through concept that hangs together. Hopefully, we get some sense of people's reaction to this over the next two months, and I think after that, if we've got a direction from the government in particular, I think at that point Mark or somebody could talk to the topic.

Myles Ailsop (UBS): Thinking about the capex and opex implications of all the technology and decarbonisation of the business. How much capex are you going to be spending each year, do you rely on subsidies and does it increase opex, like we hear from a lot of companies, or are there options to use this to reduce opex? And then, on your net EBITDA improvement of \$800 million - what are you net of?

Stephen Pearce (Anglo American): On the capex, in terms of, say, a programme like power in South Africa, we will come back to you once we work out the details and have the discussions with the government. The main things that will influence that is who may we partner with, how much would be on our balance sheet over what time versus others, etc.? And so we will guide you as those plans firm up.

In terms of things like Donovan's area, where we are doing the R&D work and some of the early-stage rapid turnover of trials, etc., that is all included in our capital guidance that we give across those forward years. And our best estimates of the programmes that the team have put together, that would be executed over the timeline that we give the capital guidance is also included in those numbers.

As I have often said, depending on the initiative and the site, I would encourage people to think about the benefits that come with a lot of this technology, not just the cost of implementing. So, it is about recovery at Quellaveco as we put that plant in, it may be about grey water or energy savings at El Soldado, those sort of things. These programmes do have a very rapid payback in the majority of cases as we look to implement and so they are really quite positive from an NPV perspective, and it is those numbers you will see that drop into the EBITDA. We need to deliver these numbers to help offset the impact of inflation, for example. So when we put out the original \$3-4 billion target to 2022 we always said we needed to hit that sort of number because we are likely to give about half of it back in inflation over time, and so that is the way that we have constructed the numbers.

Sylvain Brunet (Exane BNP Paribas): On the \$3-4 billion EBITDA improvement target, could you just remind us, was this based on 2017 prices at the time and are we right to think that the delivery in the coming year and next year will be, essentially, accelerated, because if we look at slide 14 you delivered \$2 billion over three years and, effectively, the target would be \$2 billion over two years. Also, automation was not mentioned much. I know it used to be a bit more fashionable in Australia a couple of years back. Is it the case that this is not applicable to your operations or do you think the cost of implementation is not compelling enough?

Stephen Pearce: You are right, the delivery of the benefits does accelerate through the balance of 2021 and 2022. We have always said that, particularly in relation to some of the technology and innovation the team have been progressively implementing and rolling out the initiatives and with that forward programme 2021 and 2022 are very important for the technology and innovation benefits and for the volume benefits, particularly as we deliver Quellaveco in 2022.

I think the message that would like you to take away from the team's presentation today is, yes, we are confident we will deliver those targets, but there is lots more to come, both in the years beyond 2022 as we

continue to roll out, and next generations and modules, etc., but also as we get that stability that Dave spoke about as well. It is a combination of those two things that gives us a lot of confidence in the future, as we go forward.

Tony O'Neill: With respect to automation, the Quellaveco mine is autonomous – it is something that we are very interested in. Clearly, as a company in the jurisdictions that we work in, employment and our relationship with our host communities is really more important than automation. So it is an area that we will be ready to move into; certainly, the equipment we buy is autonomous-capable and will be going forward. If we get the right relationships, and particularly employment numbers and outside the gate will be the key to that, then we will push in harder. But I think, you know, we have circumstances that are not like Australia, for example. So, we will be capable and if we have the right approvals and blessings, then we will go forward with it.

In saying that, we have also looked really hard at the performance of a lot of people who put automation in. There have been some really outstanding success stories, that is why we are interested in it. But, we have also seen quite a number of players who have not put it in very well at all. So, it is part of our armoury going forward if we choose to deploy it.

Sergey Donskoy: When we speak about gross improvement and net improvement, this \$3-4 billion target with ~\$1.5 billion coming from Operating Model & P101 and \$1 billion coming from technology and innovation, are these gross improvements or net improvements?

Stephen Pearce: There are massive headwinds and bigger timing implications as things are caught up in working capital and haven't been released to EBITDA because we are seeing instability in the plants. So, it is a net result that drops to the EBITDA line but before inflation.

Also, can I just add to that value driver point in terms of automation? Obviously, given the scale in Australia, particularly in places like Pilbara with the limited processing they do get benefits from automation, in fleet automation in particular, which are probably more important than material for them. In our case, we are mining different things. Besides iron ore, a lot of the benefit we get from automation is in processing and control and stability through the other parts of the process. And hopefully you have got that sense that that is the value driver that really drives the bottom-line for us.

Richard Hatch: There are quite a few greenfield growth opportunities in the portfolio – PGMs (Twickenham, De Brocken), Sakatti in Finland, Chiliak over in Canada, Woodsmith in the UK. How are you, thinking about all of these different technologies on the greenfield projects? And are there any ones in which you can see a great opportunity by implementing some of these technologies?

Tony O'Neill: Mainly, the applicability of the technologies we are talking about have pretty much got universal application. In PGMs, in the Northern Limb, there is a lot of interest in how we transform that business. In Copper, at the major assets there is also clear application of these new technologies and thinking. I think around all the assets we actually see opportunity, but probably the major ones at this point would be around the Northern Limb and Collahuasi, at the right time.

Paul Galloway: Thank you very much indeed for your time this afternoon. As ever, if you have got any follow-up questions then please contact myself, Rob Greenberg, or Emma Waterworth.

With that, thank you very much indeed and have a very good afternoon. Go safely.