ENERGYANDMINES

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Australia Summit Report

Every business has its own vision of success and its own challenges in achieving it. We are here for those who believe progress is always possible. For those on a mission who have the courage and perseverance to build for the future, even in uncertain times. We are here for you, applying our deep sector knowledge and financial expertise to help you look to the future.

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Energy and Mines Australia Virtual Summit 2021

MELODIE MICHEL
REPORTER
Energy and Mines

Australia is widely recognized as a leader in mine decarbonization, with a large number of ambitious projects announced in recent years. At the fifth edition of the Energy and Mines Australia Summit, held virtually in June 2021, more than 450 delegates from around the world tuned in to learn from the experiences of Australian miners and energy providers. Topics included the role of renewables in decarbonization, carbon-neutral gold and battery metals, green hydrogen and mine electrification, and throughout the conference it became clear that Australian miners are actively working to take decarbonization to the next level.

Picture Courtesy of Oz Minerals

Content pod 1:
Renewables and decarbonisation for mines

In the first part of the conference, miners from all over Australia shared their experiences in developing renewable electricity projects to power their operations. One of the most ambitious of these projects is Oz Minerals' wind, solar and battery solution at West Musgrave, in Western Australia (WA).

Luke Sandery, Package Manager, Power and Decarbonization at the mine, explained that, once completed, this is expected to be one of the largest offgrid hybrid projects on the planet, reaching 70-80% renewable penetration on an annual basis and cutting emissions from 250,000 to 50,000 tonnes a year.

The solution includes 75 MW of wind, 45 MW of solar, 30 MW/h of battery storage and 50 MW of diesel, but its success will depend on more than just renewables. "Beyond technology, the second enabler is culture: we empower our people to identify, investigate, de-risk and implement technologies that may add value for all of our stakeholders, and not just economic value," said Sandery.

The appetite for mine power decarbonization is clear in Australia, and because of the ever-more competitive price of solar, wind and batteries, even small, junior miners now have access to these solutions. Rod Saffy, Head of Global Mining at Aggreko, explained: "I don't think we've received a request for power recently that hasn't asked for a renewable solution. It comes down to the case study, the availability of the fuel, the financial model, but the appetite is definitely there."

The growth and maturity of energy storage is set to propel this appetite even further: economics keep improving, and developers are becoming more comfortable with a variety of storage solutions, including different types of lithium-ion batteries. David Manning, Global Head of Hybrid at juwi Renewable Energy, talked about the difference between NMC (lithium nickel manganese cobalt oxide) and LFP (lithium iron phosphate) batteries: "There are pros and cons for each, so we use seven criteria to determine the best solutions for each client. Pricing is very important but we consider product integration, fit and safety very seriously," he said.

Of course, miners need to consider system stability very carefully as they introduce new technologies to their grids. According to Darren Nankivell, Senior Solutions Engineer at Energy Power Systems Australia, the main risks are around system strength, fault contribution, control system operability and supply chain, parts, servicing and warranty. "You can easily undo any cost reduction introduced with renewable power. Conversely, mitigating these risks can significantly reduce total cost of ownership," he advised.

In a panel on zero-emissions mining, chaired by Jo Garland, Partner at HFW Australia, Tier 1 miners such as Fortescue Metals Group (FMG), Rio Tinto and BHP talked about the challenge of meeting their very ambitious carbon neutrality targets. They agreed that investment in grid stabilizing and transmission infrastructure is the current priority, in order to smoothly integrate the different elements of decarbonization such as renewables, processing and material movement.

With technology costs dropping, miners are becoming more and more ambitious about the renewable penetration they aim to achieve. But data shared by EDL from its proprietary hybrid energy modelling tool showed that the optimum renewable percentage changes quickly with input costs, typically between 40% and 70%. "Bridging this gap is the next challenge. We think we can get to 90-95% within the next year or two, but beyond that, it will take time," noted Todd Gordon, Business Development Manager, Renewables at EDL.

Miners and service providers agreed on the need to engage partners as early as possible in order to define the best combination of components for each site. "These are not vanilla components, they will be customized. A big lesson learned is around how to get the modelling done early in the project to understand the potential restrictions that could happen," warned Greg Koppens, Secondary Electrical Engineering at Entura.

Pod 1 Agenda and Videos

SUPPORTING RENEWABLES IN MINING

Hon Bill Johnston, Minister for Mines and Petroleum; Energy; Industrial Relations

Government of Western Australia

TOWARDS 100% RENEWABLE ENERGY MINING

Luke Sandery, Package Manager – Power and Decarbonisation, West Musgrave **OZ Minerals**

DISPLACING DIESEL FOR THE WORLD'S LARGEST ZIRCON MINE

Suresh Sakar, Engineering Manager - Australia, **Iluka Resources**

WHAT'S NEXT FOR HYBRIDS FOR MINES?

David Manning, Global Head of Hybrid, **juwi Renewable Energies**

POWERING COBURN WITH HYBRID SOLAR AND BATTERY STORAGE

Luke Graham, Managing Director & Chief Executive Officer, **Strandline Resources**

LESSONS LEARNED AND NEXT STEPS FOR MINING HYBRIDS

Chair: **Ray Massie**, Specialist Hybrid Energy Solutions, **Entura**

James Koerting, Manager, Energy, Australasia, **Gold Fields**

Patrick Mutz, Managing Director and CEO, **Image Resources**

Suresh Sakar, Engineering Manager - Australia, **Iluka Resources**

Greg Koppens, Team Leader - Secondary Electrical Engineering, **Entura**

KEY TAKEAWAYS FROM GLOBAL HYBRIDS FOR MINES

Rod Saffy, Global Head of Mining, **Aggreko**

PROVEN SUCCESS: DELIVERING HIGH PENETRATION RENEWABLE POWER FOR MINES

Geoff Hobley, General Manager – Remote Energy, **EDL**

Michael Buzzard, Senior Business Development Manager, **EDL**

Todd Gordon, Business Development Manager – Renewables, **EDL**

LOWERING RISK AND ENHANCING RETURNS FROM RENEWABLE PROJECTS FOR MINE SITES

Andrew Gilhooly, Assistant Director APAC - TrinaPro Business, **Trina Solar**

MITIGATING RISKS FOR MINING HYBRIDS

Darren Nankivell, Strategic Initiative Manager -Hybrid Power Systems and Digital Solutions

Energy Power Systems Australia

BUILDING A PATHWAY TO ZERO-EMISSIONS MINING

Bruce Anderson, CEO, **247Solar**

HOW TO ACHIEVE ZERO-EMISSIONS MINING

Chair: **Jo Garland**, Partner, **HFW Australia**

Louis Kent, Principal Carbon Management, **BHP**

Michael Scotton, Senior Manager - Energy and Climate Change, **Rio Tinto**

Bethwyn Cowcher, Manager, Energy and Power (Strategy and Legal), **Fortescue Metals Group**

Juergen Zimmermann, Head of Business Development and Technology, Grid Edge and Microgrid Solutions, **Hitachi ABB Power Grids**

Content pod 2:

Gold mining and renewables

The second content pod of the conference focused specifically on gold mining and its role in the global energy transition. Opening the segment, John Mulligan, Director and Climate Change Lead at the World Gold Council, presented the organization's granular analysis of gold's overall carbon footprint.

Very unusually in the mining sector, gold has minimal scope 3 emissions. In fact, 99% of GHG emissions come from mining processes, with 80% associated with power consumption. "As decarbonization of electricity is increasingly accessible, this concentrates the opportunity for gold to move towards carbon neutrality. Net-zero gold is a realistic prospect," said Mulligan.

In order to meet the Paris Agreement commitment, gold miners will have to cut emissions by 27% (for the 2°C target) to 46% (for 1.5°C) by 2030. And while the pathway is clear, progress is uneven around the world. In Australia, 2019 data was not as promising as expected, but things are changing rapidly. "The major cause for uncertainty was that when looking at reserve depletion and mine life in Australia, analysts didn't see as clear a picture in terms of reduced production from higher-emission mines and increased production in lower-emissions mines. That might have been because of emissions intensity being defined by grid power on site, which I think has changed a lot. If we were to look again at more recent data, we could be a lot more confident that there would be a clearer set of indications of emissions reductions," Mulligan added.

One of the gold companies at the forefront of global decarbonization is Gold Fields. The company's Energy Manager, James Koerting, presented case studies of its latest Australian hybrid projects at the Granny Smith, Agnew and Gruyere sites. According to him, net-zero mining means eliminating as much of emissions as possible, and neutralizing the rest. "As mines mature, the greater depth and increased scarcity of higher grade ores make mining more energy-intensive. Decarbonization needs to be more aggressive to offset the impact of mine maturity. How do we do this: an electric mine powered by high-penetration renewable energy and storage with a minor contribution from fossil fuels offset by carbon sequestration initiatives," he explained.

To achieve this, Koerting advises starting with the electricity supply. In the example of Agnew, this would mean increasing renewable capacity to three to five times the mine load, and adding 35 to 90 hours of energy storage. To go from the current 54% renewable penetration to 100%, the initial investment would have to be multiplied five-fold, which is not realistic at present. Still, Koerting is carefully monitoring the cost curve of large-scale energy storage as the key to Gold Fields' ambitions.

In a panel of gold miners chaired by Dominic DaCruz, Sustainable Energy Project Lead at Zenith Energy, participants listed the challenges they face in moving to renewables at their sites. These include managing integration into existing infrastructure and obtaining permits. "There's no one-stop shop, you have to do all the investigation, go through permitting, etc. We like to get things done quickly, but it takes years and you have to keep the momentum going," lamented Tony Makuch, President and CEO of Kirkland Lake Gold.

Managing the moving parts of fuel cost fluctuations, commodity price fluctuations, rapid technology advances, government funding initiatives, price of carbon and diesel subsidies is no easy task, but partnerships with IPPs or consultants can make all the difference. And the benefits of acting to decarbonize far outweigh the capital and time investment: attracting talent, empowering communities and indigenous partners, and securing future access to capital. "Sustainability is the best long-term indicator of long-term profitability. If you decide not to do this, you're going to be left behind," concluded Paul Huet, Chairman and CEO of Karora Resources.

Pod 2 Agenda and Videos

WORLD GOLD COUNCIL

THE ROLE OF RENEWABLES IN VALUE CREATION FOR GOLD MINES

John Mulligan, Director and Climate Change Lead, World Gold Council

AZELIO

CLEAN POWER: WHEN AND WHERE YOU NEED IT

Felipe Gallardo, Business Development Manager, **Azelio**

TOP 5 LEGAL CHALLENGES WITH NET-ZERO MINING

Jo Garland, Partner, **HFW Australia**

THE CHALLENGES OF ACHIEVING ZERO-EMISSIONS MINING

James Koerting, Manager, Energy, Australasia, **Gold Fields**

MINE HYBRIDISATION: HOW TO REACH 100% RENEWABLE ENERGY WITHOUT THE SPIN

Stephen Sproul, Head of Technical Sales, APAC – Microgrids & Energy Storage, **Hitachi ABB Power Grids**

THE ENERGY TRANSITION: MAPPING THE WIND AND SOLAR RESOURCE OF YOUR PROJECT

Paul Copestake, Head of International Markets, **Fulcrum3D**

GOLD MINING LEADERS: HOW DO RENEWABLES FIT FOR OUR MINES?

Chair: **Dominic DaCruz**, Sustainable Energy Projects Lead, **Zenith Energy**

Duncan Gibbs, Managing Director, **Gold Road Resources**

Cameron Sharp, Mining & Utilities Segment Manager – Large Electric Power, **Caterpillar Australia**

Tony Makuch, President & CEO, **Kirkland Lake Gold**

Paul Huet, Chairman & CEO, **Karora Resources**


CARB

Content pod 3:

Transitioning to carbon neutral for battery metals miners

Battery metal miners are arguably the first that should decarbonize their operations, since global decarbonization creates more demand for their products. At the conference, Allan Restauro, Analyst, Metals and Mining at Bloomberg NEF presented an updated outlook of supply and demand in this space: first, annual passenger electric vehicle (EV) sales are expected to reach a more than 50% share

by 2035, supported by policy, improvements in battery density and cost, additional charging infrastructure and a general commitment by manufacturers and consumers. This greater adoption of EV will translate into increased battery demand: by 2030, annual lithium-ion battery demand is forecast to reach 2,700 GW/h annually, and by 2035, it could reach 4,500 GW/h. Unsurprisingly, this will result in great demand for lithium carbonate and hydroxide, but also cobalt sulphate and nickel sulphate. In fact, many battery metals could encounter supply challenges in the next decade.

But what does this mean for emissions? Restauro explained: "Metrics for battery metals and sustainability are not as fully established. While these metals pale in comparison to the behemoths of steel and aluminium in terms of energy use, they are some of the most carbon-intensive to produce, nickel being the highest, even higher than aluminium." The market is asking for responsibly sourced metals for batteries, including carbon-neutral criteria. Unfortunately, Restauro doesn't believe mining customers will be willing to pay a premium for net-zero battery metals in the near future.

Still, miners have started the process of decarbonizing their operations, with a heavy focus on emissions-intensive processing activities. For Dale Henderson, Chief Operating Officer at lithium producer Pilbara Minerals, this means doing everything differently. "Our strategy is based on four pillars: raw materials production with more sustainable and ethical extraction, decarbonization, innovation with new means to execute processes and operating, and building resilience," he said. Specifically, Pilbara Minerals is focusing on ore sorting to reduce energy intensity, moving from carbon-based fuel sources to solar, life cycle assessment and integrating the climate-related financial disclosure (TCFD) framework.

In a panel on the transition to carbon-neutral battery minerals, miners pointed out that decarbonizing their operations is also a matter of capturing the economic opportunities arising from battery demand. However, they added that the battery minerals supply chain is still new, and that car manufacturers' commitments to carbon neutrality are not always reflected further down the chain.

This lack of maturity can also create issues when it comes to financing. "The challenge in funding resource projects is the lack of transparency on pricing, some of the markets are very small as well so it's hard for non-specialist financiers to get their heads around that" said Rob Wilson, Head of Western Australia and Resources at the Clean Energy Finance Corporation. Including a shadow carbon price in calculations was mentioned as a good way to tap into carbon funding mechanisms.

Electrification is the key to mining decarbonization, and collaboration is needed for it to reach its full potential, according to Jess Maddren, Mining Segment Director at Schneider Electric. "Sustainability through optimization extends into our functions as a business; we're moving towards a circular economy focusing on positive impacts. The electrical product industry is the perfect example for this, and the demand is driving change," she noted.

Pod 3 Agenda and Videos

CUSTOMER DEMAND FOR CARBON-NEUTRAL BATTERY METALS

Allan Restauro, Analyst - Metals and Mining, **BloombergNEF**

TOWARDS NET-ZERO EMISSIONS LITHIUM

Dale Henderson, Chief Operations Officer, **Pilbara Minerals**

TRANSITIONING TO CARBON NEUTRAL FOR BATTERY METALS MINERS

Chair: **Stedman Ellis**, CEO, **Future Battery Industries CRC**

Vincent Algar, Managing Director, **Australian Vanadium**

Rob Wilson, Head of Western Australia and Resources, **Clean Energy Finance Corporation**

Matt Dusci, COO, **IGO Limited**

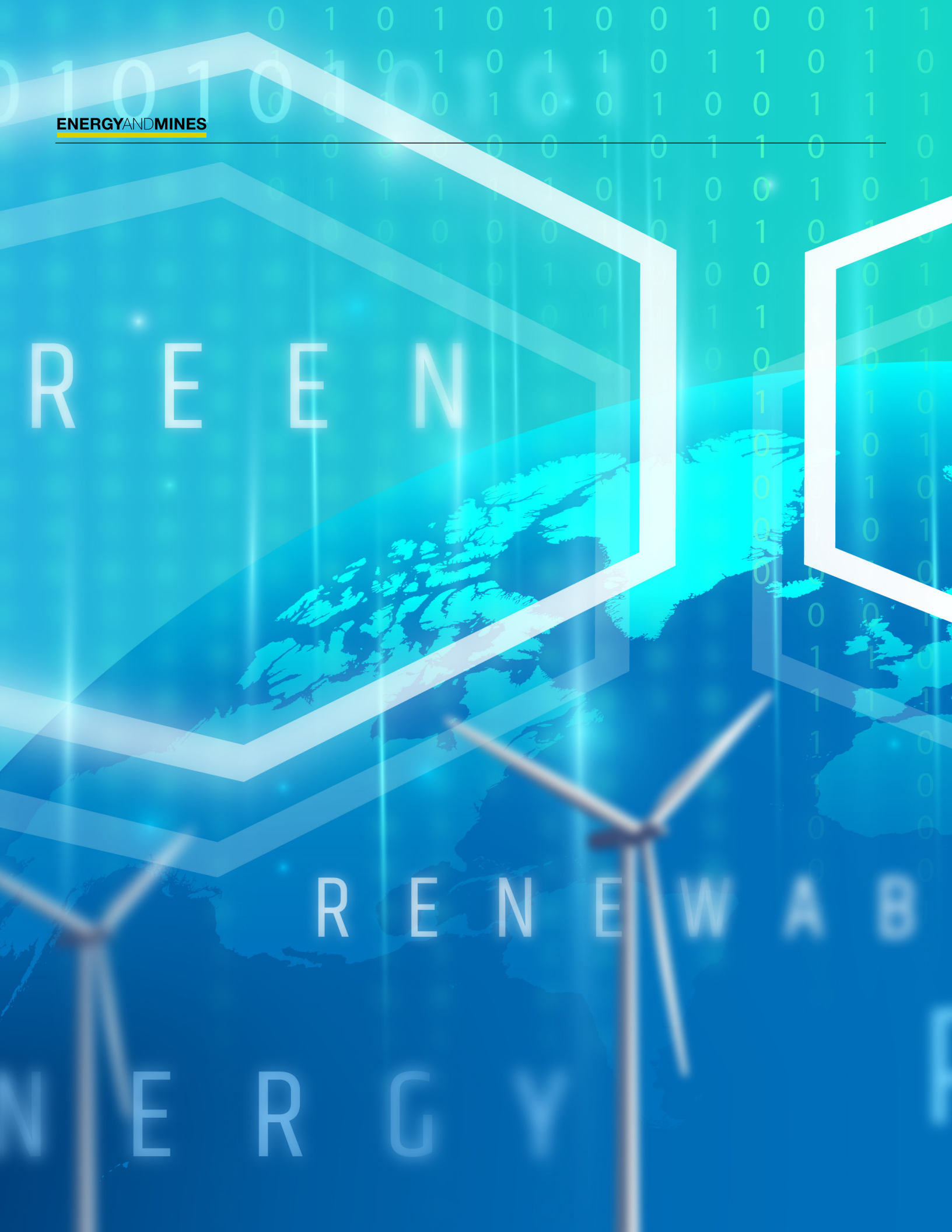
Dale Henderson, Chief Operations Officer, **Pilbara Minerals**

SUSTAINABILITY THROUGH OPTIMIZATION

Jess Maddren, Segment Director- Pacific Region, Mining, **Schneider Electric**

WHAT CANADA IS DOING TO SUPPORT THE ENERGY TRANSITION TO A LOW CARBON ECONOMY

Andre Francois Giroux, Consul General of Canada in Sydney, **Government of Canada**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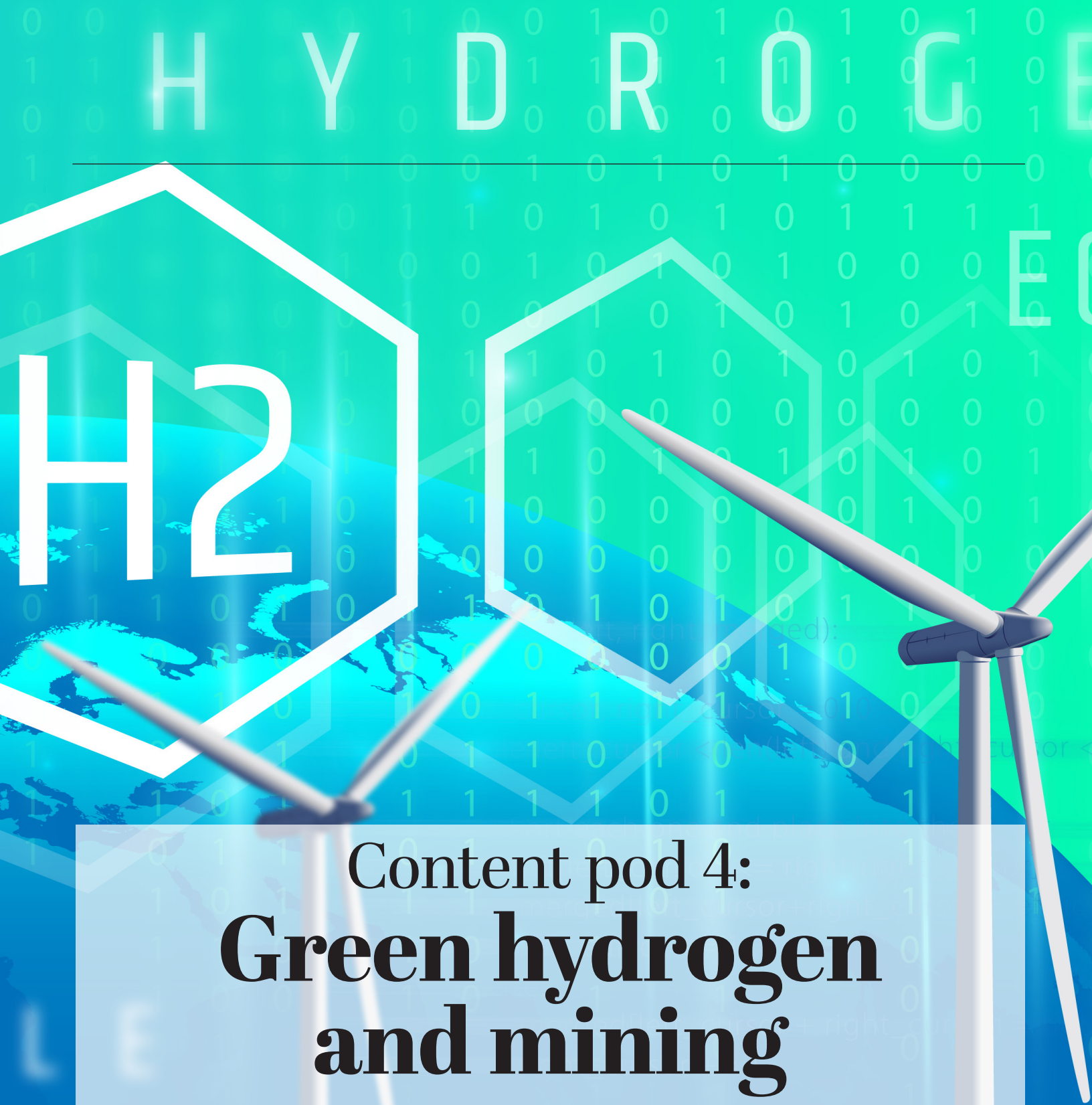

Content pod 4:

Green hydrogen and mining

Australia is at the forefront of green hydrogen development, and the country's miners have taken a key role in identifying and pursuing the decarbonization opportunities presented by this technology. For instance, Rio Tinto believes green hydrogen has a special role to play where electrification cannot occur: as a replacement for fossil fuel in process heat applications, as a carbon reductant substitute in refining, and as diesel or natural gas replacement in processing.

At the conference, Sreeraj Balanchandran, Principal Advisor Decarbonization, Rio Tinto Aluminium, presented the company's pilot project at the Yarwun aluminium refinery, in Gladstone, Queensland. The project swaps natural gas for hydrogen in calcination, the last step in alumina refining, requiring 900°C heat. "By substituting this natural gas with green hydrogen, we have proven that it is possible to achieve the desired solution. We can achieve up to 50% decarbonization of the overall refining process," he noted.

Rio Tinto has a patent pending for this decarbonized process, which can be applied to many industries. According to Balanchandran and Tomas Mach, Manager Technology, Energy and Carbon Abatement at Rio Tinto, who co-presented at the Summit, the development of a viable end use is the first step to developing a commercial supply chain for green hydrogen. "Partnerships and coordinated action are needed to deliver a hydrogen supply chain and a technology-ready industry that overcomes the cost barriers to deployment," said Mach.

Australian miners looking to participate in the development of hydrogen technology can look for financial support from government agencies such as ARENA and the Clean Energy Finance Corporation (CEFC). ARENA has already provided $55mn of funding to close to 30 hydrogen projects over the last four years, from early stage research and development to demonstration projects and on the ground deployment. And while miners including BHP narrowly missed out on the agency's first Renewable Hydrogen Deployment Funding Round, ARENA CEO Darren Miller encouraged them to continue to seek its support.

The key issue around green hydrogen commercialization is cost: currently estimated around A$6-9/kg, it needs to go down to A$2/kg to be competitive with other fuels. "For most applications, green hydrogen is not yet commercially competitive. All the elements of producing, transporting, storing and using it add up. That cost stack is really challenging, so it's important to collaborate with others to promote cost development," noted Kathryn Horlin, programme manager at BHP.

Experts at the conference agreed that two things are needed to bring costs down: electrolyzer and balancing plants' capital costs need to decrease dramatically, and the cost of renewable solar and wind generation has to be cut by half. Lorenzo Ducci, Hydrogen Senior Commercial Officer, Enel Green Power, explained that between these two, Capex is the most relevant. "Even though all projects are different, energy costs and Capex cover 90% of hydrogen costs. The reduction of LCOE on the energy side is forecast to happen soon, but the impact of this reduction is not so relevant because for every A$20/MW, you have a decrease of A$1 in the hydrogen price. What's really needed is a reduction in Capex. To target A$2/kg, we would need a sixfold decrease in Capex," he said. This may seem out of reach, but most speakers believe that hydrogen is set to follow the cost curve of solar and wind energy generation, dramatically dropping in price in the next few years.

As for business models, Ducci believes the collocation of the renewable plant and the electrolyzer at the mine site would be best to cut transportation and storage costs, provided that enough land, water and renewable resources are available.

Pod 4 Agenda and Videos

SUPPORTING GREEN HYDROGEN OPPORTUNITIES FOR MINES

Darren Miller, CEO, **Australian Renewable Energy Agency**

GREEN HYDROGEN AND MINING AND REFINING

Tomas Mach, Manager Technology – Energy and Carbon Abatement, **Rio Tinto**

Sreeraj Balachandran, Principal Advisor Decarbonisation, **Rio Tinto Aluminum**

WHY GREEN HYDROGEN FOR AUSTRALIAN MINES?

Chair: **Giles Parkinson**, Editor, **RenewEconomy**

Kathryn Horlin, Program Manager, **BHP**

Lorenzo Ducci, Hydrogen Senior Commercial Officer, **Enel Green Power**

Rupert Maloney, Head of Hydrogen Investment, **Clean Energy Finance Corporation (CEFC)**

Tomas Mach, Manager Technology – Energy and Carbon Abatement, **Rio Tinto**

CONCENTRATED SOLAR POWER FOR OFF-GRID MINES

Philippe Wilmotte, Sales Representative, Australia, **John Cockerill**

Content pod 5:

Renewables for grid-tied mines - Key drivers and next steps

While many Australian mines are remote, some do enjoy the benefit of being grid-tied. This gives them access to a broad number of power decarbonization options, from PPAs to new renewable developments — and they are under pressure to adopt these solutions.

David Wickstrom, Associate Director at Macquarie, pointed out investor pressure to decarbonize is finding its way into financial results. "We conducted an analysis comparing a large set of carbon-exposed companies to transitioning energy companies and oil and gas majors, and we found the cost of capital for those transitioning companies was about 100 basis points lower than for carbon-exposed companies, and 100 basis points lower than oil and gas. That translates into share prices as well," he said.

Presenting at the summit, BHP's Michael Smythe, Energy Manager, and Aidon Thomas, Energy Specialist, laid out the pros and cons of the various options available to grid-tied miners. "The fundamental principle of renewable PPAs is that they offer low risk, resource-optimized green electricity without directing capital away from core business," noted Thomas.

BHP recently began a five-year PPA with GreenCo for two assets in Queensland. The agreement links BHP to two new greenfield projects (a 100 MW wind farm and a 320 MW solar farm). Over the five-year term, the agreement will deliver a carbon reduction of approximately 1.7 million tonnes of CO2. Additionally, the miner also signed a 10-year PPA with Risen Energy in WA, purchasing 20% of the Merredin Solar Farm's output to use at the Kwinana nickel refinery, cutting energy cost by up to 20% and reducing electricity emissions by 50% by 2024 (based on 2020 levels).

These two examples follow different contracting structures: in Queensland, it's a firmed supply PPA, whereas in WA, it's an output-based PPA. Both have their pros and cons, so Thomas and Smythe advised the audience to start by considering how much emphasis they want to place on affordability, reliability and sustainability. "Not discounting other considerations, there are three key elements to guide the right renewable PPA: energy beyond intermittent renewable profile (or firming), contracting structure, and term and associated price risk," said Smythe.

Discussing contracting structures, Sieuwert de Zwaan, Head of Energy Australia at ING, explained that grid-tied miners can choose to contract renewable electricity either through utilities, virtual power PPAs or dedicated projects built locally. According to miners, contracting a retailer is the simplest solution, since most retailers have a portfolio of renewable assets, and can simplify the structure of the contract. However, the link between the mine and the renewable project may not be very visible. Sleeved PPAs (via a retailer, but with a renewable project developer) can add flexibility in terms of renewable projects attached, but also add complexity in contracting. Finally, contracting a project developer directly creates a strong link with the renewable project, but adds substantial risk.

The renewable energy retail market is going through a dramatic transformation, opening up access to a broad range of end users. Chris Halliwell, APAC Manager, Energy and Environmental Markets, Renewable Energy Hub, explained that beyond wholesale PPAs, there are now a lot more retail-integrated options to provide price risk management

and retailer services. “Even one step further, we’re moving into a market where there’s such accessibility to renewable energy options that there’s the potential for progressive procurement to capture the price of the day.

Digital tools will soon allow miners to purchase green blocks as opposed to having to purchase green energy at a fixed price for 10 years,” he added.

Pod 5 Agenda and Videos

BHP

THE ROLE OF RENEWABLES PPAS IN MEETING EMISSIONS GOALS

Michael Smythe, Manager Energy, **BHP**

Aidon Thomas, Energy Specialist, **BHP**

Renewable Energy Hub.

UNLOCKING RENEWABLES FOR GRID-TIED MINES

Chair: **Anna Freeman**, Policy Director - Energy Generation & Hydrogen, **Clean Energy Council**

Chris Halliwell, APAC Manager - Energy and Environmental Markets, **Renewable Energy Hub**

Michael Smythe, Manager Energy, **BHP**

Sieuwert de Zwaan, Head of Energy Australia, **ING**

David Wickstrom, Associate Director, **Macquarie Capital**

Content pod 6:
Mine electrification

After the integration of renewable power, electrification of equipment and processes is widely seen as the next stage in mine decarbonization. The Energy and Mines Australia Summit featured two industry initiatives to accelerate the development of these technologies: the Electric Mine Consortium and the Charge On Innovation Challenge.

Members of the Electric Mine Consortium, including South32, 3ME Technology, IGO and Gold Fields, reflected upon the challenges ahead of them in commercializing an electric solution for underground mining equipment. "We're trying to understand the economics of the equipment, there's a productivity issue to be resolved, it's not as easy as diesel gear. We need to be able to communicate to our clients what it's going to cost them and what they need to do on their mines," noted Peter Campain, General Manager, Plant at Barminco.

In terms of drivers, Jayde Webb, Practice Lead, Mining Technology at South32, explained that electrification is not just about derisking future operations, but also creating a more attractive work environment for younger generations and improving mining's image. "The other thing is around the automation of electric equipment: how can we use this to reduce the cost of automation to add more productive time in a 24-hour period," she said.

Electrification, automation and digitization were identified as the three pillars for the future of mining, with each one enabling the other. "Electrification is the easiest first step to take and will enable more automation," said Gavin Mann, Manager, Mining Studies at Gold

Fields Australia.

One of the obstacles to overcome is around the price of battery technology. Campain pointed out that miners could spend the same on a battery for long-haul equipment as they spend for the equipment itself today. This creates a lot of risk that needs to be distributed between OEM and offtaker. “Battery as a service is one of the things we really want to see. OEMs need to take the technical risk on those batteries,” he added.

Some of the miners within the consortium are set to begin trialling underground equipment later this year.

The other industry initiative, the Charge On Innovation Challenge, relates more to open-pit equipment: founding patrons BHP, Rio Tinto and Vale teamed up to ask vendors from all types of industries to come up with solutions to charge mining truck fleets without losing productivity. “So far we’ve had around 250 vendor registrations from around the world. In August, shortlisted vendors will make a pitch and receive feedback from the patrons, who will then go through their own evaluation process and rank the different processes. In October, we’ll hold collaboration workshops to identify a suitable consortium to accelerate commercialization, with the goal of seeing those solutions on mine sites in the next few years,” explained Scott Davis, Lead Innovation, Zero Emissions Material Movement at BHP.

But mobile movement is not the only element miners are looking to electrify. Ray Chatfield, Global Technical Manager, Refining Energy at Alcoa presented the company’s Wagerup alumina refining demonstration project, which aims to replace the emissions-intensive Bayer process with mechanical vapour recompression. The solution has a zero carbon potential on a mine with 100% renewable grid power.

Pod 6 Agenda and videos

ENABLING SUSTAINABLE AND ZERO-CARBON MINES

Doug Walker, Executive Chairman, **Zenith Energy**

Dominic DaCruz, Sustainable Energy Projects Lead, **Zenith Energy**

COLLABORATING ON ELECTRIFICATION TO ACCELERATE DECARBONISATION

Chair: **Graeme Stanway**, Founder, **State of Play**
Gavin Mann, Manager: Mining Studies, **Gold Fields Australia**
Jayde Webb, Practice Lead Mining Technology, **South32**
Michael Hegarty, Technical Projects Lead, **IGO**
Peter Campain, General Manager, Plant, **Barminco**
Steve Lawn, Chief Growth Officer, **3ME Technology**

THE NEW STANDARD IN MINING MOBILITY

Paul Smetsers, Marketing Manager, **Tembo e-LV**

RENEWABLES AND ELECTRIFICATION IN ALUMINA REFINING

Ray Chatfield, Global Technical Manager Refining Energy, **Alcoa**

DEVELOPING NEW CONCEPTS FOR LARGE-SCALE HAUL TRUCK ELECTRIFICATION

Scott Davis, Lead Innovation - Zero Emissions Material Movement, **BHP**

Moving forward through collaboration

Many technical and commercial challenges are yet to be overcome for Australian miners to meet their ambitious carbon neutrality targets. But judging from the unprecedented number of collaborations mentioned at this year's Energy and Mines Australia Virtual Summit, they have all realized that they cannot do it alone. With this level of industry cooperation, it won't be long before Australia boasts its first 100% renewable, 100% electric mine.

HYDROGENANDMINES
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HYDROGEN'S ROLE IN DECARBONISING MINING

A timely, informative networking opportunity for mining, hydrogen, finance and renewable energy experts to connect on hydrogen developments and challenges for mines.

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- ✓ Hydrogen storage in mining microgrids
- ✓ Hydrogen for mines: economics and business case
- ✓ Hydrogen opportunities for mid-tier mines

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