



net zero emission mining wa conference 2022



Program

1-2 SEPTEMBER 2022

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MINISTER'S FOREWORD



Net zero greenhouse gas emissions targets by 2050 are accelerating change in global supply chains.

Demand for battery and critical minerals for clean energy technologies is increasing rapidly, such is the drive towards the use of low carbon products and processes.

A clean energy future will require a significant shift in the way we mine and a number of Western Australian companies have already responded to this challenge.

Our world-class skills, expertise and innovative thinking has led to major breakthroughs in utilising renewable energy to support remote and on-grid mining and mineral processing operations.

WA's reputation as a responsible mining jurisdiction has led to a number of mining companies choosing to conduct downstream processing activities and modern manufacturing facilities in our State.

Australian firsts in nickel sulphate and lithium hydroxide production have also been achieved here, while commitments to establish rare earths processing facilities and vanadium processing are progressing.

Over 50 mineral commodities are produced in WA and it is no surprise that global powerhouses such as Tesla, Ford and others are choosing to secure supply from us.

The McGowan Government continues to support local battery manufacturing and processing, with the recently launched Battery and Critical Minerals prospectus highlighting investment opportunities in WA to expand the value chain.

The Minerals Research Institute of Western Australia's (MRIWA) Green Steel Value Chain Assessment – an investigation into processing WA iron ore into 'green steel' – is also due for completion soon.

Steelmaking accounts for 7 per cent of global greenhouse gas emissions, so reducing emissions at varying stages of the iron ore production and steelmaking process can have a significant global impact.

Innovation and technology development is at the heart of this transition, and we are committed to developing our home-grown capability by investing in research for the benefit of WA.

Through organisations such as MRIWA, we actively seek opportunities to support new technologies that can accelerate emissions reductions in mining and enhance our standing as a global supplier of choice.

I encourage you throughout this conference to challenge what is possible, engage broadly and offer your thoughts to what I'm sure will be an insightful discussion.

Hon. Bill Johnston MLA

Minister for Mines and Petroleum; Energy;
Corrective Services; Industrial Relations

WELCOME FROM OUR CHAIR



I am delighted to welcome you for a second year to the Minerals Research Institute of Western Australia's Net Zero Emission Mining WA Conference.

Last year, our inaugural conference showcased examples of innovation in energy supply, new technology solutions and financing initiatives to achieve net zero emission mining. It also prompted discussions amongst delegates on tackling key challenges in this area, encouraging collaboration and knowledge transfer across sectors.

Since then we have seen our mining industry continue to innovate, whilst also responding to the challenges brought by the COVID-19 pandemic and a climate of increasing expectation and scrutiny with respect to ESG compliance.

Despite the challenges, this has brought new opportunities to reconnect with global partners and attract new talent to deliver solutions that will support our continued success.

Within MRIWA's portfolio, momentum has also been building in several related areas, including progression of the MRIWA Challenge on Green Steel and new focus areas such as Mineral Carbonation, Alternative Uses of Tailings and Waste, and Precision and Low Impact Mining.

In recognition of the enormous body of work underway, this year's conference program spans two days to capture the broad spectrum of opportunities from which Western Australia can demonstrate and deliver net zero emission mining to the world.

The conference sessions build on key themes initiated in 2021 and include discussion on new low carbon products and markets, opportunities for global supply of low emissions minerals and technology solutions, as well as new markets for carbon capture and sequestration within mine tailings.

The program also enhances its focus on the importance of collaboration, to maximise the benefits of the transition to a net zero emission industry and create lasting partnerships between industry and research organisations.

There is no shortage of innovation in Western Australia. We have the mineral and energy resources required for the global transition, as well as a fantastic body of talent within our industry, research and METS sectors.

How we harness these opportunities is critical to our success.

Once again, we look forward to hearing your views and insights to identify high impact research opportunities, build capability and prioritise effort.

Going forward, we seek to place Western Australia at the forefront of this transition and ensure that the state enjoys the benefits of our collective success.

Miriam Stanborough
Chair, MRIWA Board

ABOUT US

The Minerals Research Institute of Western Australia (MRIWA) seeks to stimulate high impact applied minerals research which will advance Western Australia.



We collaborate with over 100 industry and research stakeholders to focus efforts on those areas most likely to deliver tangible economic, environmental and social benefit for the State.

To do so, we invest in high value research by way of open grant funding processes, annual PhD scholarships, commissioning of research in areas of high importance, and championing knowledge transfer through our events program.

Priority focus areas

Our investments are guided by our Research Priority Plan, which describes the medium to long term knowledge and technology needs of the State's minerals industry.

We also champion priority initiatives under our 'MRIWA Challenges', which are campaigns targeting specific focus areas seeking to amplify activities of high value to the State.

Some of our current focus areas include:

Net Zero Emission Mining

Our Net Zero Emission Mining Challenge aims to reduce the carbon footprint, lower overall energy costs and improve the energy efficiency of the Western Australian mining sector through harnessing collective efforts, enabling decarbonisation to become an opportunity for the sector, not a cost. With the NZEM WA Conferences a key initiative under this Challenge, we are supporting knowledge transfer and concept generation to facilitate new research opportunities in this space.

Green Steel

Western Australia has significant under-utilised magnetite resources and a potential green hydrogen and renewable energy production capacity which would enable the state to participate in the emerging green steel industry. There are multiple scenarios through which Western Australia could do this, and this MRIWA Challenge aims to map the pathway to enable Western Australia to maximise use of its resources to support global green steel ambitions, creating new markets and industries for this state.

Mineral Carbonation

The widespread, industrial-scale utilisation of mineral carbonation has enormous potential to sequester Western Australia's CO₂ emissions, but is inhibited by technological and economic challenges. Curtin University has been engaged to develop a roadmap for adopting mineral carbonation as a large-scale CO₂ capture and sequestration process. This initial roadmap will investigate technology mapping, scientific goal setting, an economic business case and policy considerations, to inform the progression of research opportunities going forward.

To enquire about funding, our other focus areas, or new research opportunities, contact our Research Portfolio Managers at rpm@mriwa.wa.gov.au.

KEY NOTE SPEAKERS



Hon. Bill Johnston MLA
Minister for Mines and Petroleum; Energy; Corrective Services;
Industrial Relations

The Hon. Bill Johnston is Western Australia's Minister for Mines and Petroleum, Energy, Corrective Services and Industrial Relations.

He has been a Minister for the McGowan Labor Government since March 2017, and has previously been Minister for Commerce, Electoral Affairs, and Asian Engagement.

So far, his achievements include cutting red-tape for the mining industry, introducing the Work Health and Safety Bill (industrial manslaughter provisions) and assisting in revolutionising Western Australia's energy system.

In Opposition he served as Shadow Minister for State Development and Energy from 2012, and Shadow Minister for Mines and Petroleum from 2013. He was a Member of the Economics and Industry Standing Committee and Deputy Chair of the Inquiry into Domestic Gas Prices from 2010 to 2011. Prior to entering Parliament, he was the State Secretary of WA Labor from 2001 until 2008, with responsibility for all State and Federal election campaigns.



Samantha Tough
Pro Vice-Chancellor Industry Engagement
University of Western Australia

Samantha Tough has a broad and varied career in many industries including energy, resources, engineering, agriculture, health and education. She has combined an executive career with over 25 years as a non-executive director in the public and private sectors.

Samantha is the Pro Vice-Chancellor Industry Engagement at the University of Western Australia and currently serves as Chair of Horizon Power, Director of the Clean Energy Finance Corporation, Chair National Energy Selection Panel, Director Fluence Ltd and Director Mineral Carbonation Ltd.

Samantha's previous board roles include Saracen Mineral Holdings Ltd, Synergy, CBH, Cape plc, Murchison Metals Ltd, Strike Resources Ltd, Chair Retail Energy Market Company Ltd, Chair Structerre Pty Ltd, Chair Molopo Energy Ltd, Chair Aerison Pty Ltd, Chair Southern Cross Goldfields Ltd and Deputy Chair of the WA Academy of Performing Arts. Samantha's executive roles include General Manager North West Shelf with Woodside Energy Ltd, Director Strategy of Hardman Resources Ltd, Senior Vice President Natural Resources Commonwealth Bank, Director of the Pilbara Power Project and CEO Asthma Foundation WA.

Samantha completed a Bachelor of Laws and Bachelor of Jurisprudence at UWA and worked as a barrister and solicitor before progressing to the commercial sector. She is a Fellow of the Australian Institute of Company Directors.



Professor Ross Garnaut AC

Director
ZEN Energy

Ross Garnaut is an Emeritus Professor in Economics at The Australian National University and an Emeritus Professor in Business and Economics at the University of Melbourne.

Over the past fifty years, he has had many senior roles in business and as a policy advisor and diplomat. Ross was the senior economic policy official in Papua New Guinea's Department of Finance in the years straddling Independence in 1975, principal economic adviser to Australian Prime Minister Bob Hawke from 1983 to 1985, and Australian Ambassador to China from 1985 to 1988.

Ross was awarded a Companion of the Order of Australia (AC) in 2017 for work on climate change and energy, and an Officer of the Order of Australia (AO) in 1993 for services to education and international relations.

He is the author of numerous publications in scholarly journals on international economics, public finance and economic development, particularly in relation to East Asia and the Southwest Pacific. His recent books include *Superpower: Australia's low carbon opportunity*, *Black Inc.* (2019) and *RESET: Restoring Australia after the Pandemic Recession* (2021).

He is now Director of ZEN Energy and Director of Renergi.



Bill Hare

CEO and Senior Scientist
Climate Analytics

Bill Hare is a climate scientist with 30+ years' experience in climate change science, impacts and policy. He is the CEO of Climate Analytics, Adjunct Professor at Murdoch University and visiting scientist at Potsdam Institute for Climate Impact Research. He was a Lead Author for the the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report, for which the IPCC was awarded the Nobel Peace Prize in 2007. He also led the influential World Bank Turn Down the Heat reports series in 2013–2014, and is one of the leaders of the Climate Action Tracker. In addition, he holds a role within the UN Secretary General's high level expert group on non-state actors net zero commitments.

In Western Australia, Bill has a history of work relevant to the gas sector and state level emissions target setting. Using a whole of economy approach, his team has produced a detailed 5 degree Paris Agreement compliant pathway for Australia with detailed sub sectoral and sectoral constraints that are technically and economically feasible. He has also led studies that have unpacked emissions from exploiting the Canning Basin, the emissions from Woodside's entire Scarborough Pluto Project, and estimated a Paris Agreement 1.5°C compatible carbon budget for all sectors of the Western Australian economy.

SESSION SPEAKERS



Nicole Roocke

Chief Executive Officer

Minerals Research Institute of Western Australia (MRIWA)

Appointed CEO of MRIWA in November 2018, Nicole spent the previous 15 years at the Chamber of Minerals and Energy of Western Australia coordinating industry input on a variety of government regulatory and policy issues and facilitating collaboration within the resources sector.

Nicole holds a Master of Science in Industrial and Organisational Psychology from UWA and a Master of Risk Management from UNSW.



Vincent Algar

Managing Director

Australian Vanadium Limited

Vincent Algar is a geologist by profession with over 27 years of experience in the mining industry, spanning underground and open cut mining operations, greenfields exploration, project development and mining services in both Western Australia and Southern Africa.

Since 2015 Vincent has been Managing Director of Australian Vanadium Ltd (ASX: AVL) and is responsible for advancing the company's high-grade Australian Vanadium Project in Western Australia, which will comprise a mine site south of Meekatharra and processing plant located close to the port city of Geraldton. Mr Algar was instrumental in the launch of AVL's subsidiary VSUN Energy, with its focus on developing the vanadium redox flow battery market for energy storage.

Vincent represents both AVL and VSUN Energy to the mining, financial and energy markets within Australia and overseas. He has strong technical, ESG and financial knowledge.



Matthew Bowen

Partner

Jackson McDonald

Matthew Bowen heads Jackson McDonald's energy and regulation practice. The growth of hybrid, distributed and renewable energy is transforming the energy sector, forcing energy players to rethink their business models and challenging the applicable regulatory regimes. Matthew and his team identified and embraced this transformation early and invested heavily in developing their understanding of the technology and the associated policy issues.

More recently, he has done the same with the emerging renewable hydrogen industry, preparing regulatory landscape maps for the State government and presently assisting a private entity with a commercial-scale renewable hydrogen project.



Marcus Dawe
Chief Executive Officer
MCI Carbon

Marcus Dawe is a climate thought leader, serial tech entrepreneur, board member and chair based in Canberra, Australia.

Marcus is CEO and co-founder of MCI Carbon (formerly Mineral Carbonation International), an Australian-based global technology platform that transforms CO₂ into building materials and other valuable industrial products. Marcus has been leading the MCI team since 2013, when it was first founded by the consortia of GreenMag Group and Orica.

MCI Carbon is now building its next demonstration plant in Newcastle to further the development of its carbon platform, with over 40 staff in Australia funded by the Australian Government and private investment.



Gary Frampton
Head of Business Development and Technical Projects
BHP

Gary has played a significant role in the transformation and reorientation of BHP's Nickel West business – from a commodity supplier (stainless steel sector), to becoming the world's leading supplier to the battery metals market.

Gary is also responsible for driving Nickel West's Pathway to Net Zero emissions. The business is well advanced with Scope 2 emission reductions through wind and solar power purchase agreements, and the construction of large solar installations in the northern goldfields. Fleet decarbonisation and mineral carbonation are being pursued in tandem.

Other senior roles across Gary's 22 year tenure with BHP include General Manager of Kalgoorlie Nickel Smelter and Kambalda Concentrator, and General Manager of Kwinana Nickel Refinery.

Gary holds a degree in Chemical Engineering.



Jan Haak
Vice President of Partnerships and Business Development
First Mode

Jan Haak is the Vice President of Partnerships and Business Development of First Mode Australia; a creative engineering company designing and delivering resilient, reliable solutions for technology's most demanding frontiers, including clean energy, planetary exploration, and sustainable transportation systems.

Prior to founding the Australian First Mode team, Jan worked with customers in Agriculture, Mining, Finance and Energy at Amazon Web Services and has had a career building complex software platforms. Jan's background in Data, Artificial Intelligence and software development compliments First Mode's applied engineering skillset.



Mary Hackett

Chair

Future Energy Exports CRC

Mary Hackett has an extensive career in the resource sector, spanning more than 30 years, with senior executive roles in Brown & Root, Woodside, and General Electric. Her most recent executive role being CEO of General Electric Oil & Gas for Australasia.

Mary is Chair of the Future Energy Exports Cooperative Research Centre and was formerly a Non-Executive Director and Chair of the ESS (Environment, Social and Safety) Committee for Northern Star Resources. She also serves as a Non-Executive Director for Strike Energy, Sapient Cyber and Blue Ocean Marine Monitoring.

A Graduate of AICD and a Fellow of Engineers Australia, Mary holds an honours degree in Mechanical Engineering from University College Galway, Ireland.



Darren Hill

General Manager for Commercial and Business Development

Horizon Power

Darren Hill is the General Manager for Commercial and Business Development with Horizon Power. He is tasked with delivering clean, innovative energy solutions that meet customer needs and ensure business sustainability through growth in our regional communities. These goals are delivered through a strong framework for planning, asset investment and project delivery.

With qualifications in Information Technology and Electronic Engineering he has extensive experience in strategic leadership across telecommunications, gas and electricity utilities.

Darren is also a Director on the Board for the International Microgrids Association and Boundary Power, a company that delivers renewable energy solutions and asset management services.



Laura Hillis

Director, Corporate Engagement
Investor Group on Climate Change

Laura is the Director of Corporate Engagement at IGCC and leads the regional implementation of Climate Action 100+ in Australia and New Zealand.

She manages IGCC's corporate engagement program of work and thematic research on corporate climate change issues relevant to investors. She was a key contributor to the development of the Climate Action 100+ Net Zero Company Benchmark in 2020 and led the development of the initiative's 2019 and 2020 progress reports.

Prior to joining IGCC in 2019, Laura worked in the banking and insurance sector at both Bank Australia and the Suncorp Group in sustainability and corporate communications. At Bank Australia she led projects including sustainability reporting, modern slavery, reconciliation, and climate change policy. She also has extensive experience engaging with companies on supply chain issues related to biodiversity, deforestation and human rights from her time at Zoos Victoria leading corporate engagement. Laura holds degrees in social psychology and communications from the University of Melbourne and QUT, and has also studied economics, corporate governance and climate policy.



Professor Michael Hitch

Head of School, Western Australian School of Mines: Minerals,
Energy and Chemical Engineering
Curtin University

Professor Michael Hitch is the newly appointed Head of School of WA School of Mines: Minerals, Energy and Chemical Engineering. Michael came to Curtin from Tallinn University of Technology, Estonia where he was Director and Head of the Institute of Geology and Michael has previously held senior academic roles at UNSW Sydney and the University of British Columbia in Canada.

Prior to embarking on his academic pathway, Professor Hitch spent 23 years in the resources industry in roles ranging from operations, corporate finance and senior executive roles with leading organisations including AngloGold Ashanti, Ivanhoe Mines and Echo Bay Mines.

Professor Hitch's research areas include sustainable resource management, CO₂ mineral carbonation from mine waste by-products, circular economy and the emergence of social licence in post command and conflict societies.



Felicity Lloyd

Chief Executive Officer

Heavy Industry Low-carbon Transition Cooperative Research Centre (HILT CRC)

Felicity Lloyd has a Bachelor of Chemical Engineering from the University of Adelaide (SA). Felicity is a technical, operational and sustainability leader with more than 17 years' of heavy industry experience at Adbri most recently as National Business Improvement and Sustainability Manager fostering sustainable outcomes across the national operations including the delivery of a leading low carbon fuel strategy and implementation project.

Felicity has been a member of the Centre for Energy Technology (CET) Advisory Board, the Faculty of Engineering, Maths and Computer Science Advisory Board and is a Member of the Australian Institute of Company Directors (AICD).



Oliver Mackay

Head of Enterprise Solutions

Everledger

Oliver Mackay is on a mission to help organisations solve complex supply chain issues and better manage their impact on people and planet. Educated as an Anthropologist, he has a 15 year background in global manufacturing, trade and supply chain development.

Fabricating equipment for the mining and oil and gas sectors while based in Asia, Oliver led cross-cultural and cross-disciplinary teams to deliver multi-million dollar projects. His decade of experience living and working in China grew an awareness of the reality of global supply chains and the challenges faced by organisations in materially improving social and environmental factors.

Today, Oliver works across Everledger's Enterprise clients and supports the product team with subject matter expertise in supply chains and chain of custody methodologies.



Brigette McDowell
Chief Executive Officer
Cheeditha Energy

How can you achieve your net-zero target without impeding efficiency and profitability? This is the question Brigette McDowell, co-founder and CEO of Cheeditha Energy, seeks to answer.

Brigette completed a Bachelor of Commerce at Curtin University and entered the construction industry in Perth. During the first 10 years of her career, she continued to study a Master of Project Management and a Graduate Certificate in Energy and Carbon Studies. In 2017 she relocated to the Pilbara, making Karratha home. Having established a strong connection with the Yindjibarndi people and with her passion for the environment and sustainable futures, in 2018, she co-founded Cheeditha Energy in partnership with Cheeditha Aboriginal Community.

Cheeditha Energy has cemented itself as the Pilbara's foremost Aboriginal Renewable Energy and Energy Efficiency company. Its purpose is to be Your Partner to Net-Zero, continuing to seek out innovative solutions ensuring partners have a clear path to a net-zero future.



Bernard Norton
Country Managing Director
Hitachi Energy, Australia

Bernard Norton is the Managing Director of Hitachi Energy in Australia and leads the Sales and Marketing team within the organisation.

Hitachi Energy is a global technology leader that is advancing a sustainable energy future for all. We serve customers in the utility, industry and infrastructure sectors with innovative solutions and services across the value chain. Together with customers and partners, we pioneer technologies and enable the digital transformation required to accelerate the energy transition towards a carbon-neutral future.

Hitachi Energy are advancing the world's energy system to become more sustainable, flexible and secure whilst balancing social, environmental and economic value. Hitachi Energy has a proven track record and unparalleled installed base in more than 140 countries. Headquartered in Switzerland, we employ around 38,000 people in 90 countries and generate business volumes of approximately \$10 billion USD.

Bernard has been with Hitachi Energy since 2015 and has over 30 years of utility and related industry experience.

Bernard holds an Associate Diploma in Electrical Power, a Masters of Management and is a member of the Australian Institute of Company Directors.



Shannon O'Rourke

Chief Executive Officer

Future Battery Industries CRC

Shannon O'Rourke commenced as Chief Executive Officer of the Future Battery Industries Cooperative Research Centre on 1 December 2021.

He is a seasoned executive with 25 years' experience in the energy sector including senior management roles with Woodside, Chevron and industrial research with Rio Tinto.

His career spans traditional and renewable energy markets with a track record of success in the commercialisation of research outcomes including managing CRC collaborations through the Future Fuels CRC and the CO₂ CRC.



Santi Pal

Managing Director – Group Technical

Rio Tinto

In his role as MD Group Technical, Santi Pal is accountable for setting and supporting the direction for Rio Tinto's surface mines today and in the future, focusing on value and material risk.

Santi began his career as a graduate mining engineer in Broken Hill in the early nineties. Since then, he has worked in various engineering, technical and operational leadership roles across Australia in multiple commodities in both surface and underground mining.

Santi is married, proud parent of twins and a pet Maltese Poodle.



Cory Smith

Director Automation and Electrification Technical Services

Newmont

Cory Smith is a mining engineer from the University of Missouri with a demonstrated history of working with large scale autonomous haulage operations. He's drawn from experience in operations, implementation, change management, and dynamic systems to support the deployment of 7 Command for Hauling fleets.

Cory is a licensed Professional Engineer in Minnesota, and a registered member of SME. Currently, Cory is the Director of Surface Automation for Newmont Mining Corporation, based in Perth.



Associate Professor Wen Soong

School of Electrical Engineering

University of Adelaide

Wen Soong is the former Head of the School of Electrical Engineering at the University of Adelaide where he has been working for nearly 25 years. He completed his B.Eng degree in Electrical Engineering at the University of Adelaide and a PhD in electric machines at the University of Glasgow, UK.

Wen then worked for four years in the electric machines and drives group at General Electric Corporate Research and Development in New York, USA. He has about 150 publications and 10 patents and has worked on industry projects relating to heavy vehicle electrification, high-speed compressors, magnetic bearings and standalone generators.

Wen's research interests include: electric transportation, renewable energy and energy storage systems. He is involved with the Future Battery Industries CRC project on Mine Operational Vehicle Electrification (MOVE) which is led by the University of Adelaide and has a number of industry partners including BHP and IGO.



Vivek Srinivasan

Associate Director CSIRO Futures

CSIRO

Vivek Srinivasan is an Associate Director in CSIRO Futures, the strategic advisory arm of CSIRO. He leads the energy and resources portfolio within CSIRO Futures and specialises in complex national and industry challenges and the role that science and technology can play in addressing them.

Vivek's recent work is focused on supporting industry growth and emissions reduction projects for government and industry customers. He is currently leading the development of CSIRO's Low Emission Energy Storage Roadmap – which includes analysis on energy storage implications in mining and mineral processing. He previously led CSIRO's Mining Equipment, Technology and Services (METS) Industry Roadmap, CSIRO's CO₂ Utilisation Roadmap which explored opportunities to make products out of carbon dioxide and waste streams such as tailings, and CSIRO's Hydrogen Research, Development and Demonstration (RD&D) report.



Miriam Stanborough

Chair

Minerals Research Institute of Western Australia (MRIWA) Board

Miriam Stanborough is a chemical engineer with more than 20 years' experience in the minerals processing industry, across commodities including copper, uranium, gold, silver, alumina, lithium and mineral sands.

Miriam has held roles in technical development, production management, project management, business improvement, HR & diversity strategy, and sales and marketing.

She holds additional degrees in Arts and Mineral Economics, is a member of the Australasian Institute of Mining and Metallurgy and is a graduate of the Australian Institute of Company Directors.

Miriam's other current board roles include Non-Executive Director of Pilbara Minerals and BCI Minerals, Director of ChemCentre, and Deputy Chair of the Northern Agricultural Catchments Council and Scouts WA.

With her husband, she runs a beef cattle operation in the south-west of WA.



Amy Steel

WA Leader

Engie Impact

Amy is the WA Leader in ENGIE Impact's Sustainability Solutions team, leading the Western Australian team with a primary focus on decarbonising the mining sector. With over 10 years' experience, Amy has developed a core expertise around climate scenario analysis, with this expertise cutting across physical risk and decarbonisation. The types of projects have ranged from assessing and modelling the physical risks resulting from global warming under different emission scenarios, through to establishing decarbonisation targets and trajectories, and evaluating the techno-economics of technology types required to meet these.

Amy was a co-author of the MRIWA and CEFC report series *Mining in a low-emissions economy*. This report brought together Amy's experience in decarbonisation, climate science, policy and finance.



Darren Stralow

Chief Executive Officer

Bellevue Gold Limited

Darren Stralow is an experienced mining executive and qualified mining engineer with over 20 years' industry experience. He was a member of the senior management team at Northern Star Resources for over 10 years, with roles including head of operations and head of business development during a period of exceptional growth. Darren has extensive experience in strategy development and execution, building and operating modern underground mining operations, business integration and transformation, and building high performing teams.

Mr Stralow now proudly leads Bellevue Gold and their pathway to net zero emissions by 2026, which will be underpinned by the world class off-grid power station capable of an annual renewable energy penetration of ~80 per cent, which will provide secure, reliable and low-emission power to the Bellevue Gold mine.



Professor Matthew Tonts

Chair

Environmental Protection Authority

Professor Tonts commenced the role of EPA Chair in January 2021.

He has extensive professional experience spanning Western Australia's environmental, regional, higher education and research sectors.

Between 2017 and 2020 he was Pro Vice Chancellor and Executive Dean of the University of Western Australia's Faculty of Arts, Business, Law and Education. Prior to this he was Head of UWA's School of Earth and Environment and Director of the Institute for Regional Development.

Prof. Tonts is internationally known for his expertise in environmental geography, regional environments, rural communities and spatial planning. He has worked closely with Commonwealth, State and local government, as well as not for profits and the private sector on issues related to regional development, land use assessment, urban development and environmental management. He has also worked on a range of projects in collaboration with partners in Africa, North America, Europe and South East Asia.



Michael Voros

Counsel

Ashurst

Michael Voros is a Counsel with global law firm Ashurst. He is a leading lawyer for climate and carbon related issues and for environment and approval issues in Western Australia.

Michael has been at the forefront of carbon issues since 2006, one of the few with that outlook across successive waves of carbon policy. He has worked with numerous leading Australian and global clients, including for the development of a carbon offset industry in WA.

OUR PROGRAM

1 September

8:00 – 8:45 Registrations and Coffee

8:45 Conference Opening

Welcome and Housekeeping
by MC

Nicole Roocke
Chief Executive Officer
MRIWA

Welcome to Country

Neville Collard

Ministerial Address

Hon. Bill Johnston, MLA
Minister for Mines and Petroleum; Energy; Corrective
Services; Industrial Relations

Opening Keynote

Opening Keynote

Samantha Tough
Pro Vice-Chancellor Industry Engagement
University of Western Australia

9:45 – 11:10 Session One – The Net Zero Mine: Planning and Design

Session Hosted by Hitachi Energy

Top 5 Energy Essentials for
Achieving Net Zero

Bernard Norton
Country Managing Director
Hitachi Energy

Developing Net Zero Gold

Darren Stralow
Chief Executive Officer
Bellevue Gold

WA Greenhouse Gas Emissions
Policy: Planning Considerations

Professor Matthew Tonts
Chair
Environmental Protection Authority

Mine Operational Vehicle
Electrification (MOVE) Project

Associate Professor Wen Soong
FBI CRC Project Co-Lead
University of Adelaide

Interactive delegate session

Panel Q&A discussion

11:10 – 11:35 Morning Tea

Report Launch: *Mining in a low-
emissions economy*

MRIWA

**Clean Energy Finance
Corporation**



minerals research
advancing WA

11:45 – 13:10 Session Two – Energy Optimisation

Session Hosted by Horizon Power

Providing Pathways to Decarbonise Energy Systems	Darren Hill General Manager for Commercial and Business Development Horizon Power
The Carbon Question - The Easy or Hard Way	Mary Hackett Chair Future Energy Exports CRC
Energy Storage Considerations in Mining	Vivek Srinivasan Associate Director CSIRO Futures
A Shift in Approach	Brigitte McDowell Chief Executive Officer Cheeditha Energy

Interactive delegate session

Panel Q&A discussion

13:10 – 14:00 Networking Lunch

14:00 – 15:00 Session Three – Concurrent Masterclasses

Climate Transition Action Plans: Investor Expectations for the Mining Industry	Laura Hillis Director, Corporate Engagement Investor Group on Climate Change
Introduction to Carbon Markets	Michael Voros Counsel Ashurst
Renewable Power Purchase Agreements for the Mining Industry	Matthew Bowen Partner Jackson McDonald

15:00 – 15:25 Afternoon Tea

15:25 – 16:55 Session Four – New and Emerging Technology: Material Movement

Session Hosted by Rio Tinto

Net Zero Hauling Technology	Santi Pal , Managing Director - Group Technical Rio Tinto
	Cory Smith , Director Automation and Electrification Technical Services Newmont
	Michelle Keegan , Manager Electric Mine Consortium
Building the World's Largest Zero-Emission Truck	Jan Haak , Vice President of Partnerships and Business Development First Mode

Interactive delegate session

Panel Q&A discussion

16:55 – 17:05 Conference Close

Closing Comments	Miriam Stanborough , Chair MRIWA
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17:05 – 19:00 Conference Sundowner

2 September

8:00 – 8:45 Registrations and Coffee

8:45 Conference Opening

Welcome back by MC

Nicole Roocke
Chief Executive Officer
MRIWA

Opening Keynote

There's no Superpower without power: Managing the Energy Transition in Western Australia

Professor Ross Garnaut AC
Director
ZEN Energy

9:20 – 10:40 Session Five – Low Carbon Products and Markets

Integrated Onshore Supply Chain for Steel and Battery Markets

Vincent Algar
Managing Director
Australian Vanadium Limited

HILT CRC - De-risking Decarbonisation for Heavy Industry

Felicity Lloyd
Chief Executive Officer
HILT CRC

Mineral Carbonation: Collaborative Opportunities

Professor Michael Hitch
Head of School
Western Australian School of Mines: Minerals, Energy and Chemical Engineering, Curtin University

Transforming emissions profitably into low carbon materials for the circular economy

Marcus Dawe
Chief Executive Officer
MCI Carbon

Gary Frampton
Head of Business Development and Technical Projects
BHP

Panel Q&A discussion

10:40 – 11:05 Morning Tea

11:05 – 12:05 Session Six – Concurrent Masterclasses

Climate Transition Action Plans: Investor Expectations for the Mining Industry

Laura Hillis
Director, Corporate Engagement
Investor Group on Climate Change

Introduction to Carbon Markets

Michael Voros
Counsel
Ashurst

Renewable Power Purchase Agreements for the Mining Industry

Matthew Bowen
Partner
Jackson McDonald

12:10 – 12:55 Networking Lunch

12:55 – 13:50 Session Seven – Creating Impact through Collaboration

Session Host: Engie Impact

Amy Steel
WA Leader
Engie Impact

Panel discussion featuring:

- **Amy Steel**, WA Leader, **Engie Impact**
- **Shannon O’Rourke**, Chief Executive Officer, **Future Battery Industries CRC**
- **Oliver Mackay**, Head of Enterprise Solutions, **Everledger**

13:50 – 14:05 Closing Keynote

Closing Keynote

Bill Hare
CEO/Senior Scientist
Climate Analytics

14:10 Conference Close

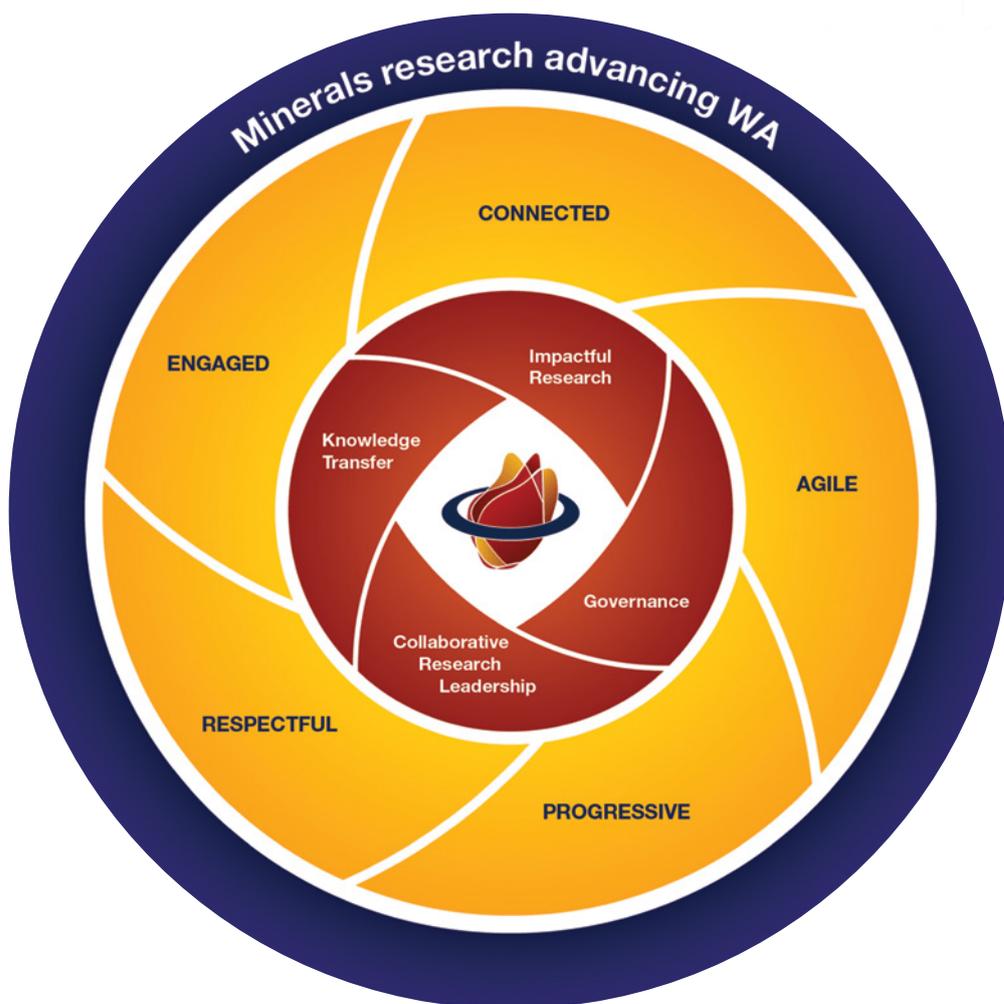




Image supplied by Hitachi Energy.

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HITACHI



Hitachi Energy has a long history of providing energy solutions to mining operations, utilities, and remote communities. We play a key role in advancing and accelerating a sustainable energy future for all. Leading mining companies are demonstrating their support for that sustainable energy future through their commitments to ambitious net-zero emissions targets. Technology from the likes of Hitachi Energy is a foundation stone that will help them achieve emission reduction goals, while continuing to deliver strong operational and financial performance.

Mining is energy-intensive with up to 40 per cent of a mine's total operating budget going towards fuel and energy (including diesel, gas and electricity). Reducing emissions and future-proofing operations against rising fuel costs by adding renewable energy sources and storage technologies into the energy mix is becoming a greater focus for mining companies.

Battery Energy Storage Systems utilizing Hitachi Energy's Virtual Synchronous Machine (VSM) technology are a proven way to reduce emissions from mining operations. And, there is a compelling business case for installing BESS as so called spinning reserve paybacks are typically under 5 years. VSM ensures supply stability and reliability whilst enabling operators to completely switch off gas or diesel generation which is normally idling in the background to cover a generation failure event. This reduces emissions, whilst reducing fuel and maintenance costs of electricity generation plant.

Hitachi Energy is also seeing increased enquiries from the mining industry for e-mobility solutions which can be applied to digging and hauling operations. With around 50 per cent of a mine's operational CO₂ emissions coming from the excavators and dump trucks, this is an area which must be addressed in order to achieve net-zero emissions targets. Hitachi Energy's Grid-eMotion™ Flash is a pioneering solution for sustainable e-mobility; this solution is evolving and being adapted to meet the requirements of the mining industry to enable rapid and safe charging of battery electric dump trucks (for example) without impacting the efficiency of mining operations.

These are just two examples of how Hitachi Energy's OT & IT solutions can support the drive to Net-Zero in the mining industry. With our pioneering technologies and digital solutions, Hitachi Energy are looking forward to working with our customers and partners to co-create the carbon-neutral mines of the future.



Image supplied by Hitachi Energy



Image Supplied by Rio Tinto. The 'Charge On Innovation Challenge' sought to look beyond the mining sector to develop concepts for large-scale haul truck charging systems.

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The Rio Tinto logo consists of the words "RioTinto" in a white, serif font, centered within a solid red rectangular background.

Cutting haul truck emissions: We can't do it alone

Removing Rio Tinto's dependence on diesel to fuel mining fleets will be crucial in Western Australia (WA) as we move towards net zero emissions by 2050.

Just under a year ago, our target was to reduce our scope 1 and 2 carbon emissions by 15 per cent by 2030. We are now targeting a 50 per cent reduction in that same timeframe, and have earmarked significant capital to deliver to the revised targets.

Our actions in the next few years are critical to succeed and deliver on our commitments.

As diesel-fuelled vehicles are one of our largest sources of emissions, we are working collaboratively with industry partners to develop electric mining vehicles or vehicles fuelled by hydrogen.

Large haul trucks are our number one priority for electrification, as they account for one third of these emissions. Full battery electric haul trucks will require in-cycle charging for maximum productivity.

Working with our partners, BHP and Vale, we have sought to accelerate commercialisation of interoperable solutions for charging large electric haul trucks through the global 'Charge On Innovation Challenge' launched last year.

Eight technology innovators' submissions were selected to progress initiatives beyond the challenge.

The winners are currently collaborating with interested mining companies, Original Equipment Manufacturers (OEMs), and investors to accelerate technology development to support the future roll-out of zero-emissions fleets.

As part of Rio Tinto's 'Green Surface Mine' project, which aims to develop an 'all renewable-energy' mine, significant work is also underway with our key partners to design and co-create zero-emissions haul trucks for our WA operations.

Efficiency will be critical in reducing haul truck emissions and coordinating demand with supply will be an important element of the solution as well – as carbon-free electricity will be required to power our mines.

Essentially, a whole portfolio of electrification technologies are required to deliver our first 'Green Surface Mine'.

What is abundantly clear to us at Rio Tinto, though, is we have a significant and collective challenge that requires genuine and collaborative partnerships to solve.

Whether it is partnerships with OEMs to manufacture battery operated haul trucks, or working with industry on charging solutions from renewable sources, we know we can't do it alone.

By putting people at the heart of our business, and working closely with our partners, customers, community stakeholders and government, we're determined to meet the climate challenge head-on.



Photo supplied by Horizon Power of green hydrogen demonstration plant under construction in Denham.

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Since our inception in 2006, we have been a trusted partner to Western Australian communities and industries in providing safe and reliable energy, delivering new infrastructure and accelerating emerging technology.

The decarbonisation agenda has quickly transitioned from discussions around aspirational goals into actions where quantifiable targets have been set and businesses are holding themselves accountable to deliver on clear, evidenced transformation plans.

Today's accelerating pace of change in climate action has seen us speed up our transition toward this greener future and ensure we deliver real change by 2030.

We are playing a pivotal role in Western Australia's net zero carbon future exploring new and innovative ways to deliver renewable energy solutions tailored to overcome the unique challenges faced by each of our customers, business, and industry.

We are applying the knowledge gained through our ground-breaking trials, to work in partnership with our customers to provide truly tailored sustainable solutions for a clean energy future that works towards achieving decarbonisation targets.

We are decarbonising energy systems across regional and remote WA, with the construction of Australia's first green hydrogen demonstration plant in a remote microgrid, powering towns with 100 per cent renewable energy, deploying renewable stand-alone power systems, exploring renewable diesel, creating Australia's longest electric vehicle fast-charging network, and deploying emergent energy management technology to maximise the use of customer solar.

As a vertically integrated business, we operate across the full energy supply chain: generation, transmission, distribution, and retail services. This, combined with our industry leading experience and expertise, puts us in a unique position to design energy solutions that consider the full supply chain.

Operating across an area covering more than one quarter of the Australian continent, the diversity of environments and climates in our service area cannot be matched. But no matter where we are in regional WA, we find ways to overcome the challenges the unique and unforgiving landscape throws at us to deliver cleaner, greener energy solutions for our customers.

We are ready to work together to explore new and innovative ways of safely and reliably integrating renewables and decarbonising the energy system to meet your net zero emissions targets.



Photo supplied by VSUN Energy.

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Collaboration Critical to Accelerating a Decarbonised Mining Sector

By Amy Steel, WA leader, ENGIE Impact ANZ

Australia is among the top producers of the world's key mineral commodities, many of which are crucial to the low-emissions economy of the future. Thus, it has a critical role to play in the transition to net zero emissions by 2050. Decarbonising mining is a compelling opportunity to align financial and sustainability goals for competitive advantage, both now and in the longer term.

In an emission-heavy industry such as mining, net zero may appear to be a lofty long-term ambition. But along the entire value chain, momentum is building, there are already tangible solutions for immediate action and the commercial case is strong to help any mine site decarbonise part or all of their operations.

Technology plays a significant role in mining decarbonisation. Understanding current and emerging technologies, and their applications, is an ongoing imperative, given the pace of change and the individual circumstances of each mining operation.

There are still some barriers to full adoption in the market. Emerging technology, such as battery-electric vehicles, are either more expensive or only available in pilot scale, while manufacturers of these technologies await the commercial scale and technology maturity required to make these technologies readily available.

But collaboration can be an effective tool to reduce these hurdles. A concerted and regular push by mining companies to adopt these technologies en masse will provide the market signal both research communities and manufacturers need to mass produce these technologies and in turn lower costs.

We've already begun to see the seeds of collaboration on mine sites bear fruit. Rio Tinto, for example, has teamed up with Caterpillar to develop zero-emissions autonomous trucks and BHP has also been active, partnering with Toyota on a light EV trial at its Nickel West operation in Western Australia.

The use of decarbonisation pathways to form a roadmap provides a structured approach for decision makers. An effective roadmap prioritises emission avoidance ahead of reduction or mitigation, is context driven - budget, scope, timeline can alter the types of emissions reduction activities a mine is willing to undertake, prioritises technologies that are low risk while being flexible and anticipating the rapidly evolving technology landscape, and is analysis driven supported by engineering grade, techno-economic assessments.

ENGIE Impact understands this and works with mining companies to address the transformations necessary to reduce their carbon footprint on their Net Zero journey. Through strategic consulting, global reporting and analytics, and market-leading technical engineering, ENGIE Impact is a strategy to implementation partner for organizations working toward ambitious sustainability goals.

By being involved in each aspect of the decarbonization journey—from establishing actionable roadmaps to managing on-the-ground execution—ENGIE Impact can help mine sites reduce carbon contributions and maximise the asset's return on investment.



SUSTAINABILITY – OUR COMMITMENT

At MRIWA, we are constantly challenging ourselves to explore new ways to improve. Reducing emissions and minimising our impact on the environment requires us all to take action.

In recognition of this, we have made several active purchasing decisions:

- We have selected an inner city venue with excellent public transport links
- Our lanyards are manufactured from a natural bamboo fibre, with no plastic card holders
- Our event programs are printed on recycled paper
- We have opted not to provide conference bags to minimise waste
- Our venue:
 - Recycles all organic waste through SUEZ
 - Reduces water usage in line with its Water Efficiency Management Plan
 - Donates all excess food to OzHarvest

For future events, we will be assessing what worked, and what didn't, and where we can continue to advance our commitment in this space.

Have suggestions on things we could consider?
Let us know at conference@mriwa.wa.gov.au

GET CONNECTED



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*We're working for
Western Australia.*



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