DECARBONIZING THE MINING SECTOR

The 5th annual alternative energy for mining conference

http://worldcongress.energyandmines.com
Dear Colleagues,

We are excited to provide details of the Energy and Mines World Congress - the 5th annual Toronto summit for mine energy experts and alternative energy providers.

The risks associated with GHG emissions regulations and insecurities around energy use, cost and supply are now material to the mining business. With carbon and renewables legislation in place in key mining markets and increased shareholder pressure to address climate change, mines are actively exploring alternative energy and storage as a means of cutting CO2 emissions and addressing power pricing and supply concerns.

The Energy and Mines World Congress is a unique event for mining’s energy experts to engage with solution providers from low carbon and green-tech energy sectors. We are excited to provide a platform to show-case new case studies, new initiatives and new technologies for the mining community as they respond to the challenges and opportunities of low-carbon and energy focused operations.

I look forward to meeting you in Toronto in November,

Adrienne Baker
Director, Energy and Mines
adrienne.baker@energyandmines.com
Legislation in the form of cap and trade and carbon taxes are now in place in Canada and are impacting numerous mining projects. Many see these developments as a precursor to GHG rules elsewhere in the world and are watching closely how Canadian mining companies respond. The World Congress will explore how the global mining sector is responding strategically to climate change legislation and how Canadian mining companies are acting now.

As more projects are being evaluated and commissioned, the World Congress will showcase new case studies of energy innovation in mining. Featuring examples at pre-feasibility through to operational projects, attendees can engage with mine energy experts and technology providers at the frontline of the shift towards low-carbon, low-cost and reliable energy for mining.

With announcements planned just before the World Congress, Natural Resources Canada will soon launch the Clean Growth in Natural Resource Sectors Program. This initiative aims to support clean technology research, development, and demonstration in Canada’s energy and mining sectors. NRCan will be present at the conference to outline this and other sources of funding available to the mining sector as it seeks to reduce energy consumption and GHG emissions.

Is it renewables, nuclear or gas? This Congress will bring together mine energy experts to present five, 5-minute TED-Talks on their visions for the mine of the future and its ideal energy mix. The TED-Talks will be followed by a broader, interactive audience discussion on this topic and the role that renewables can play in solving the global resource sector’s energy dilemma.

Seen as a key driver for energy efficiency and cost reductions, mine electrification is a critical part of decarbonizing mining and unlocking the potential for renewables integration. Additionally, harnessing the potential of digital technology will allow mines to optimize energy efficiency, eliminate carbon emissions and collect reliable data to assist in the development of renewables infrastructure. The congress will provide critical insight from mining leaders currently investing in and exploring electrification and digitization options.

Growing global demand for low-carbon energy production and the commensurate development of cost-effective renewables and storage solutions has meant that renewables microgrids are becoming increasingly commonplace for a range of remote and grid-tied mining applications. This session will provide an overview of the latest developments in microgrid technologies and updates on mining deployment and project economics.
NEW FOR 2017

IMPROVED NETWORKING

- Dedicated meeting zones for one-to-one private meetings
- Improved online app for connecting with attendees before during and after the event
- Premium networking events: Themed Opening Reception, Energy and Mines World Congress VIP Dinner

IMPORTANT AND TIMELY CONTENT

- Carbon in mining: strategic and operational response, impact on energy choices
- Electrification and digitization: solving the mining energy challenge
- Alternative energy solutions: new case studies on renewables and alternative energy in mining
- Funding sources: engage with those responsible for new mine energy project finance opportunities
- Global and domestic perspectives: new mine energy decision-makers from Canada and across the world.
- Market outlook for alternative energy in mining from Bloomberg and the World Bank
- Updated workshop - Essential introduction to mining for renewables professionals

MEET OVER 300 ATTENDEES FOCUSED ON ENERGY IN THE MINING SECTOR

Contact andrew.slavin@energyandmines.com, +1 613 627 2787
"The Energy & Mines World Congress in Toronto permitted us to meet a mining Vice-President looking for new technologies to resolve a challenging project. Our proposal immediately corresponded to their needs and started a new business relationship."

STEPHAN TAPP
MARKET DEVELOPMENT MANAGER, G+ PLASTICS

For information on sponsorship, exhibition, thought-leadership and branding opportunities at the World Congress 2017 contact

John Hodgkins
Sales Director
john.hodgkins@energyandmines.com
Tel: +44 7516 113339

http://worldcongress.energyandmines.com
Industry Breakdown

Mining 31%
Developer/IPP/EPC 24%
Equipment Supplier/Manufacturers 14%
Financial and Legal 15%
Government/NGO 6%
Other 10%

Typical Mine Representative Job Titles

Chairman, CEO, President, COO, VP Exploration, Managing Director, Director Capital Projects, VP Operations, Energy Manager, Energy Coordinator, CFO, Mine Manager, Operations Controller, Director Sustainable Development

Previous attending mining companies:


Glencore, Goldcorp, Grupo Mexico, IAMGOLD Corporation, Kinross, Argentex, Mac Resources, MGX, Newmont

Previous attending manufacturers and developers:

ABB, Advisian, aggreko, CanadianSolar, Caterpillar, enel, Solar Reserve, Stornetic

Hatch, juwi, Deloitte, Lightsource, res, Sart, Sandvik, Siemens, sunSHIFT
Since the first event in 2013, Energy and Mines has held 11 summits on alternative energy in mining in the key global mining markets of Canada, South America, UK, South Africa and Australia.

Over 3500 mine energy experts, alternative energy developers and finance professionals have participated in this series of events connecting the mining and energy industries.

Our 2016 report suggested to shows around 1000 MW of renewables is currently installed for mine operations. Mining companies are also large investors in renewables as part of mine reclamation and diversified business streams.

The 2017 World Congress includes new case studies from Canada, Namibia, Mexico, India and South Africa. Join this innovative and engaged community in Toronto in November.
### 10 KEY DRIVERS FOR ALTERNATIVE ENERGY IN THE MINING SECTOR

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
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<tbody>
<tr>
<td><strong>1</strong></td>
<td>On average, energy costs represent 15% of the total cost of production for mines. In metals mining, this increases to between 20% and 40%. Energy price and stability is a significant factor in mine profitability. Mines are actively seeking energy alternatives that provide stable power at stable prices.</td>
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<td><strong>2</strong></td>
<td>High electricity prices in mining centres such as South America, Europe, Asia, and Australasia already mean that renewables have reached grid parity with fossil fuels.</td>
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<tr>
<td><strong>3</strong></td>
<td>Power quality for grid-tied mines in developing countries leads to frequent outages and loss of production driving the mining sector to explore more reliable, self-supplied power.</td>
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<tr>
<td><strong>4</strong></td>
<td>The increased demand for metals and minerals has forced mining companies to more remote sites and to sites with lower grade ore. The proportional cost of energy in production is on an upward trend and a greater focus for the sector.</td>
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<tr>
<td><strong>5</strong></td>
<td>The mining and renewable sectors are inextricably linked. Every installed MW of solar PV requires 7 tons of copper. The production of 1 ton of copper requires 4 MWh of electricity. The copper inside 1 MW of solar requires 16 MWh of power.</td>
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<td><strong>6</strong></td>
<td>The social license to mine is now a major factor in mine planning. Mining companies are very conscious of their reputation and showcase the use of renewables and its benefits beyond the fence and mine lifetime.</td>
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<td><strong>7</strong></td>
<td>Governments and development banks are willing to fund renewables in mining projects. ARENA in Australia and NRCan in Canada are just two such examples of a global trend for high-level support for these types of projects.</td>
</tr>
<tr>
<td><strong>8</strong></td>
<td>Renewables is becoming more accepted by the risk-averse mining sector. There are now numerous working examples of renewables at mine sites delivering stable power at affordable prices.</td>
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<tr>
<td><strong>9</strong></td>
<td>PPAs (Power Purchase Agreements) and energy service provider business models are now seeing greater traction in the mining sector, enabling faster adoption and de-risking the investment for the mining sector.</td>
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<tr>
<td><strong>10</strong></td>
<td>All major mining companies now use a shadow carbon price in their mine planning and are actively seeking alternatives to carbon intensive energy sources.</td>
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MARK DAWE
MANAGING DIRECTOR, NAMIBIA, B2GOLD
SOLAR CASE STUDY
Mark Dawe is the Managing Director and Country Manager for B2Gold Namibia – a position he took up in February 2015. He will present on B2Gold’s new 7 MW solar project for its Otjikoto Mine which will be one of the largest solar installations in Namibia. Dawe has worked in Namibia for 30 years and has extensive experience working with the government both as a Managing Director and as twice former President for the Namibian Chamber of Mines.

ROBIN GOAD
PRESIDENT & CEO, FORTUNE MINERALS
TED-TALK
“Envisioning the Mine of the Future and its Ideal Energy Mix” is the topic of Robin Goad’s brief TED-Talk. He is a professional geologist with 30 years of experience in the mining and exploration industries. Prior to founding Fortune in 1988, Robin worked for large companies including Noranda and Teck, and as a consultant in the resource industry. He is a director of the NWT and Nunavut Chamber of Mines and has served as President and director of other TSX listed mineral exploration and development companies.

IGNACIO CASTRO FOULKES
VICE PRESIDENT, BUSINESS DEVELOPMENT, GRUPO MEXICO ENERGIA
SOLAR CASE STUDY
The role of solar in building a more sustainable extractive industry is the key focus of Castro Foulkes’ presentation in 2017. Grupo México is the largest mining corporation in Mexico and the third largest copper producer in the world through ASARCO. Last year, the company took home the award for best use of wind in mining (> 50 MW AND < 100 MW).

JOHN MULLALLY
DIRECTOR OF GOVERNMENT RELATIONS AND ENERGY, GOLDCORP
CARBON CASE STUDY
How is carbon risk driving innovation and improved performance across the mining sector? Mullally, Director of Government Relations and Energy for Goldcorp, will address this critical topic at this year’s Congress. An accomplished international advisor, Mullally assists Goldcorp’s Operations to integrate government relations, issues management, stakeholder relations and corporate social responsibility into their overall corporate strategies.

BILL ALLEMON
GLOBAL VICE PRESIDENT OF ENERGY MANAGEMENT & ELECTRICAL ASSET INTEGRITY, ANGLOGOLD ASHANTI
TED-TALK
Bill Allemom, Global Vice President of Energy Management and Electrical Asset Integrity at AngloGold Ashanti, came to the mining sector four years ago after two decades at Ford Motor Company. At Ford, he fine tuned his expertise in pulling out energy costs from manufacturing operations. This experience has been instrumental in his new position that sees him heading strategic and operational energy choices for AngloGold Ashanti’s global mining operations. His TED-Talk is on “Envisioning the Mine of the Future and its Ideal Energy Mix”.

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OVER 50 INDUSTRY EXPERTS FROM AROUND THE WORLD INCLUDING:

SENIOR MINING LEADERS

STAN PILLAY
GROUP MANAGER, CLIMATE & ENERGY
ARCELORMITTAL

ANDREW COOPER
ENERGY SPECIALIST
NEW GOLD

RUSSELL BLADES
DIRECTOR, ENERGY AND CLIMATE CHANGE
BARRICK GOLD

JON LYONS
VICE PRESIDENT OF REGULATORY AFFAIRS AND STRATEGY
ERDENE RESOURCE DEVELOPMENT

CHRISTOPHER GROVE
PRESIDENT
COMMERCE RESOURCES

MARK AYRANTO
EXECUTIVE VICE PRESIDENT
VICTORIA GOLD

GILLES COUTURE
MANAGER ENERGY AND QUALITY
ARCELORMITTAL

MARK WISEMAN
VICE PRESIDENT, SUSTAINABILITY
AVALON ADVANCED MATERIALS

STEVE LETWIN
PRESIDENT & CEO
IAMGOLD
OVER 50 INDUSTRY EXPERTS FROM AROUND THE WORLD INCLUDING:

RENEWABLES, GOVERNMENT AND FINANCE EXPERTS

DANIELE LA PORTA
SENIOR MINING SPECIALIST
THE WORLD BANK GROUP

RORY JOHNSTON
COMMODITY ECONOMIST
SCOTIABANK

BRENDAN MARSHALL
VICE PRESIDENT ECONOMIC AND NORTHERN AFFAIRS
THE MINING ASSOCIATION OF CANADA

RACHEL JIANG
SENIOR ANALYST, ENVIRONMENTAL AND POWER MARKETS
BLOOMBERG NEW ENERGY FINANCE

EMILY KREPS
HEAD OF INVESTOR INITIATIVES - NORTH AMERICA
CARBON DISCLOSURE PROJECT

ALEX SMITH
ACCOUNT MANAGER
CISCO

MARC WICKHAM
 ENERGY SCIENCE & TECHNOLOGY PROGRAMS
NATURAL RESOURCES CANADA

MATT NEJATI
MICROGRIDS TECHNICAL SALES SPECIALIST
ABB

JOHN MATTHIESEN
VICE PRESIDENT, POWER & NEW ENERGY, AMERICAS
ADVISIAN

MICHEL CARREAU
DIRECTOR, HYBRID POWER
HATCH

MICHHELLE LEVESQUE
SENIOR ENGINEER, MINING ENERGY EFFICIENCY
NATURAL RESOURCES CANADA

LAURIE REEMEYER
PRINCIPAL CONSULTANT
RESOURCEFUL PATHS
“The Energy and Mines Toronto event opened my eyes to renewable energy possibilities that exist for mining projects. A great forum for dialogue with users and key potential partners.”
– Keith Boyle, COO, CHIEFTAIN METALS

“The roundtable provided a forum for corporate energy managers to compare strategies and challenges in a non-sales environment.”
– Bill Allemon, VP-Energy & Electrical Asset Management & Reliability, ANGLOGOLD ASHANTI

“Definitely a great conference with a matchup of both renewable developers and storage options for mining companies to review. A premium event to see the latest innovations in both the on grid and off grid opportunities.”
– Bill Fisher, Executive Chairman, GOLDQUEST MINING

“It was a fantastic event. It was well organised, informative and it covered a wide range of issues that are challenging the industry today while offering up real solutions for the future of energy.”
– Nick Boyle, CEO, LIGHTSOURCE

“The conference reached more mining companies from all over the world and the quality of the presentations were at its best.”
– Michel Carreau, Director Energy, HATCH

“The Energy & Mines Congress permitted us to meet a mining Vice-President looking for new technologies to resolve a challenging project. Our proposal immediately corresponded to their needs and started a new business relationship.”
– Stephan Tapp, Market Development Manager, G+ PLASTICS

“I really enjoyed it. I hope I can contribute to next years event. It was the best conference I have been to this year.”
– Lyndon Frearson, EKISTIKA

“Thank you for organising such a well run and insightful event. I must say, it has helped me crystalize some thinking around how renewables can play a role in our power supply mix.”
– Michael Pitt, NEW CENTURY RESOURCES
## THREE KEY DAYS OF KNOWLEDGE SHARING AND NETWORKING WITH 50+ SPEAKERS

<table>
<thead>
<tr>
<th>Sunday November 26</th>
<th>Monday November 27</th>
<th>Tuesday November 28</th>
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<tbody>
<tr>
<td>Workshop: An Essential Introduction to Mining for Energy Professionals</td>
<td>How is Carbon Impacting Profitability in Mining?</td>
<td>How are Canadian Mines Responding to Carbon Pricing?</td>
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<tr>
<td>Mining Fundamentals</td>
<td>The Strategic Role of Carbon in Shaping Energy Choices for Mines</td>
<td>Realizing Energy and Carbon Savings with Mining Microgrids</td>
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<tr>
<td>Energy Requirements in Mining</td>
<td>Market Fundamentals for Mining and Renewables</td>
<td>Energy Storage: Mining Applications and Economics</td>
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<tr>
<td>Social and Environmental License in Mining</td>
<td>Case Studies: Renewables in Mining</td>
<td>The Role of Electrification in Meeting Mining’s Energy and Carbon Goals</td>
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<tr>
<td>Congress Opening Reception</td>
<td>World Congress Drinks Reception</td>
<td>Congress Wrap-Up</td>
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<td>Energy and Mines World Congress VIP Dinner</td>
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"It was a fantastic event. It was well organized, informative and it covered a wide range of issues that are challenging the industry today while offering up real solutions for the future of energy."

- Nick Boyle, CEO, LIGHTSOURCE
Workshop objectives
The aim of this workshop is to provide energy professionals with a comprehensive understanding of the mining industry. Participants will gain a greater understanding of the operational practices pivotal to the mining industry. Participants will be taught essential terminology and be provided with a clear understanding of the key concepts involved. Mining professionals will also benefit from having a broader understanding of the mine energy issues and how these relate to larger changes across the energy landscape.

Who should attend?
- Business developers from power engineering, procurement and construction (EPC), independent power producers, O&M and renewable developers
- Manufacturers: engineering equipment of mining and renewables, energy storage and electric vehicles
- Electric companies, government mining and energy officers, industry associations, renewables R&D
- Mining professionals looking for a better understanding of the “Mine of the Future”

Learned outcomes
This course is essential for energy professionals currently involved, or who would like to be involved in energy and mining. The workshop has been enjoyed by a cross-section of professionals involved in energy, mining and trade. At the completion of this course participants will be able to:
- Appreciate the significance of energy in the mining industry (grid-tied and off-grid)
- Understand frequently used terminology
- Describe the use of energy for open pit and underground mining methods
- Understand the principles of mine design, planning, operation and closure
- Understand the impact of energy on social (CSR) and environmental considerations
- Understand the production chain of mining from processing to extractive metallurgy and from pit to port
- Figure out and develop specific solutions based on benchmarking processes linked to relevant case studies
- Undertake international network development with other professionals and former attendees of the 7 previous workshops

Workshop Presenter
Dr. Arnoldus M. van den Hurk has a Ph.D. in Geology from Barcelona and Tubingen Universities and MBA from Madrid – Shanghai. For 30 years, Arnold has been an adviser and professional in geo-mining, renewable energy, and financial analysis. He has worked in Europe, South America, the Caribbean, Africa and China. He has wide knowledge and experience in the renewables and mining sectors. He is passionate about connecting these two sectors to improve the triple bottom line efficiency of mining, reducing uncertainties and risks and mitigating climate change.

Workshop Agenda

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
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<tbody>
<tr>
<td>8.30</td>
<td>Registration</td>
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<tr>
<td>9.00</td>
<td><strong>UNIT A: INTRODUCTION TO MINING CYCLE</strong></td>
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<tr>
<td>9.40</td>
<td>Session 1: Minerals, Metals, Ore and Mine Lifecycle</td>
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<td>9.40</td>
<td>Session 2: Mining Exploration</td>
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<td>9.40</td>
<td>Session 3: Mining Planning</td>
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<td>9.40</td>
<td>Session 4: Mining Operation</td>
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<td>9.40</td>
<td>Session 5: Mining Closure</td>
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<tr>
<td>10.40</td>
<td>Break</td>
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<tr>
<td>11.00</td>
<td><strong>UNIT B: MINING ENERGY USE, DEMAND, STORAGE &amp; FUTURE DEMAND</strong></td>
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<td>11.00</td>
<td>Session 6: Open Pit Mining Energy Requirements &amp; Future Trends</td>
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<tr>
<td>11.00</td>
<td>Session 7: Underground Mining Energy Requirements &amp; Future Trends</td>
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<tr>
<td>11.00</td>
<td>Session 8: Off-grid Mining Energy Requirements &amp; Future Trends</td>
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<tr>
<td>11.00</td>
<td>Session 9: Mineral Processing Energy Requirements &amp; Future Demand</td>
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<tr>
<td>11.00</td>
<td>Session 10: Water &amp; Transport Energy Requirements &amp; Future Demand</td>
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<tr>
<td>12.30</td>
<td>Lunch</td>
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<tr>
<td>1:00</td>
<td><strong>UNIT C: MINING SOCIAL &amp; ENVIRONMENTAL LICENCE</strong></td>
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<tr>
<td>1:00</td>
<td>Session 11: Renewables &amp; Mining Environmental Responsibility</td>
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<td>1:00</td>
<td>Session 12: Renewables &amp; Mining Social Responsibility</td>
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<td>1:00</td>
<td>Session 13: Renewables to Mine Closure &amp; Reclamation</td>
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<td>1:00</td>
<td>Session 14: CSR in Mining Corporations &amp; Market Structure</td>
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<td>1:00</td>
<td>Session 15: Renewables &amp; Mining Supply Chain CSR</td>
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<tr>
<td>3:00</td>
<td><strong>UNIT D: RENEWABLES &amp; MINING MARKET SCOPE</strong></td>
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<td>3:00</td>
<td>Session 16: Mines and Mining in Canada</td>
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<td>3:00</td>
<td>Session 17: Renewables for mining self-consumption</td>
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<td>3:00</td>
<td>Session 18: Renewables for Utilities to Mining Consumption</td>
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<td>3:00</td>
<td>Session 19: Renewables to Mining Power Companies</td>
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<tr>
<td>3:00</td>
<td>Session 20: Final summary &amp; conference recommendations</td>
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<tr>
<td>3:45</td>
<td>Closing Networking Drinks</td>
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Attending the pre-conference workshop provided to be a very valuable decision. Arnoldus was able to give important and detailed industry insights which greatly benefited not only the conference discussions thereafter but our business approach in general. We highly recommend attendance for everyone looking to be active at the crossroads of mining and renewables!

– CONERGY

I found Arnold’s workshop to be the highlight of the conference. For those new to the mining sector, it will help you to get the most out of the conference. And for mining veterans, it helps provide perspective and clarity on corporate priorities in the industry.

– PANASONIC

The Energy & Mines workshop contains all the mining information an energy company may need compiled in a very intensive and productive session. Attendees will learn the best way to overcome miners worries, how to size the requirements for each mine and how to propose renewable solutions for mining.

– SIEMENS GAMESA

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<tr>
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<tbody>
<tr>
<td>8:00</td>
<td>Coffee &amp; Registration</td>
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<tr>
<td>8:45</td>
<td>Chair’s Opening Welcome</td>
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<td></td>
<td>Adrienne Baker, Director, ENERGY AND MINES</td>
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<tr>
<td>8:50</td>
<td>Opening Keynote: Supporting Clean Technologies and Carbon Reduction in Mining</td>
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<td>KEYNOTE PANEL: HOW IS CARBON IMPACTING PROFITABILITY IN MINING?</td>
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<td>Session Leader: Deloitte.</td>
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<td>9:10</td>
<td>Keynote Panel: How is Carbon Impacting Profitability in Mining?</td>
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<tr>
<td></td>
<td>• What are the key external and internal drivers that have elevated carbon to a top strategic concern for mines?</td>
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<td>• How do mining leaders view the impacts of carbon pricing in key mining markets?</td>
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<td>• How are corporate GHG reduction goals evolving and what plans are emerging to meet these targets?</td>
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<td>• How are climate goals and energy strategy linked internally?</td>
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<td>• How are carbon reduction goals driving new energy choices for mines?</td>
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<td></td>
<td>• How is the increased focus on decarbonisation changing the business case for renewables?</td>
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<td></td>
<td>• To what extent is renewables expected play a role in addressing corporate carbon emissions goals?</td>
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<td>• What are the current barriers for integrating renewables into your power supplies?</td>
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<td>• What other low-emission technologies are mines exploring to meet carbon reduction targets?</td>
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<td>• How are mines addressing potential exposure to carbon regulation throughout their value chain?</td>
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<td></td>
<td>• How is increased shareholder interest in climate-related disclosures influencing mining’s climate and energy strategies?</td>
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<td>Chair: Andrew Swart, Partner, Global Consulting Mining Leader, DELOITTE</td>
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<td></td>
<td>Stan Pillay, Group Manager Climate Change &amp; Energy, ANGLO AMERICAN</td>
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<td>Russell Blades, Director - Energy and Climate Change, BARRICK GOLD</td>
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<td>Mark Wiseman, Vice President of Sustainability, AVALON ADVANCED MATERIALS</td>
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<td>Mark Passi, Manager, Energy, GLENCORE CANADA CORPORATION</td>
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<tr>
<td>9:50</td>
<td>Audience Q&amp;A with Session Speakers</td>
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<tr>
<td>10:00</td>
<td>Networking Break</td>
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THE STRATEGIC ROLE OF CARBON IN SHAPING ENERGY CHOICES FOR MINES

10:30 Session 1: The Strategic Role of Carbon in Shaping Energy Choices for Mines
A confluence of external factors is driving the internal sea change for mining’s carbon and energy strategies including carbon pricing in key mining markets, increased shareholder focus on climate-related disclosures, and firm carbon reduction targets from mining’s host countries. This session will bring together global mining leaders to discuss the impacts of carbon goals on energy for mines.
Session Chair: Michel Carreau, Director Hybrid Power, HATCH

10:30 How Carbon is Shaping the Mining Business
Emily Kreps, Head of Investor Initiatives – North America, CARBON DISCLOSURE PROJECT

10:50 Taking Action on Climate Change: Decreasing Mining’s Carbon Footprint
• How is carbon risk driving innovation and improved performance across the mining sector?
• Working together to build Borden Gold Mine, the first fully electric underground mine in Canada.
• What can mining companies do to transition to a low carbon economy and societal environmental expectations?
John Mullally, Director of Government Relations and Energy, GOLDCORP

11:10 The Impact of Carbon Pricing on Mining’s Energy Strategy
• How is the introduction of carbon pricing and the strengthening of domestic climate policies influencing energy choices for mines?
• Insight on Teck’s global energy and climate change strategies
• How is the drive to further reduce GHG emissions influencing operational power choices?
Chris Adachi, Manager, Sustainability Implementation & Carbon Strategy, TECK RESOURCES

11:30 Audience Q&A with Session Speakers
Chair: Michel Carreau, Director Hybrid Power, Hatch
Emily Kreps, Head of Investor Initiatives – North America, Carbon Disclosure Project
John Mullally, Director of Government Relations and Energy, Goldcorp
Chris Adachi, Manager, Sustainability Implementation & Carbon Strategy, TECK RESOURCES

FUNDING LOW-CARBON INNOVATION AND RENEWABLES DEPLOYMENT IN MINING

11:40 Keynote: Funding Low-Carbon Innovation and Renewables Deployment in Mining
Marc Wickham, Director, Energy Science & Technology Programs, NATURAL RESOURCES CANADA
<table>
<thead>
<tr>
<th>Time</th>
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<tbody>
<tr>
<td>12:00</td>
<td>Audience Q&amp;A</td>
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<tr>
<td>12:10</td>
<td>Networking Lunch</td>
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<td><strong>Session 2: Market Fundamentals for Mining and Renewables</strong>&lt;br&gt;Commodity price performance and renewable energy economics are fundamental drivers for energy change across the global mining sector. This session will provide an overview of these macro-economic trends as well as offer insight on how the global push to decarbonise energy will create market opportunities for the mining sector.</td>
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<td><strong>Mining’s Current Business Cycle: Pricing Forecasts for Key Metals &amp; Minerals</strong>&lt;br&gt;<em>Rory Johnston</em>, Commodity Economist, SCOTIABANK</td>
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| 1:30   | **Renewables and Storage in the New Global Power Landscape: Market Projections and Pricing Forecasts**<br>- What role are renewables and storage expected to play in grid and off-grid systems?  
- Pricing trends and predictions for alternative energy and storage technologies  
- The potential impact of low coal and gas pricing on the uptake of renewables<br>*Rachel Jiang*, Senior Analyst, Environmental and Power Markets, BLOOMBERG NEW ENERGY FINANCE |
| 1:50   | **How Will New Energy Technologies Drive Growth in the Mining Sector?**<br>- Exploring mining’s role in meeting global carbon reduction targets  
- How will the uptake of wind, solar and storage drive growth for certain metals?  
- What are the likely impacts on resource-rich developing countries?<br>*Daniele La Porta Arrobas*, Senior Mining Specialist, THE WORLD BANK |
| 2:10   | **The Changing Landscape for Renewables and Storage for Mines**<br>*Matt Nejati*, Microgrids Technical Sales Specialist, ABB |
| 2:30   | **Audience Q&A**                                         |
| 2:40   | **Networking Break**                                     |
DOMESTIC AND INTERNATIONAL CASE STUDIES: RENEWABLES FOR REMOTE AND GRID-TIED MINES

3:10 Session 3: International Case Studies: Renewables for Remote and Grid-Tied Mines
This session will showcase international case studies from mining leaders analysing or implementing renewable energy options for remote and grid-tied operations as part of broader energy and carbon management strategies.

3:10 Case Study: Reducing Fuel Consumption and Protecting Against Oil Price Volatility with Solar
B2Gold is constructing a solar plant at Otjikoto Mine in Namibia with the first phase due to be complete within 2017.
• What are the expected reductions in fuel consumption and cost savings over the mine’s estimated 12-year life?
• Insight into how the case for solar power generation was put forward successfully
• What plans does B2Gold have for further solar power generation across other sites?
Mark Dawe, Managing Director – Namibia, B2GOLD

3:30 Case Study: The Role of Solar in Building a More Sustainable Extractive Industry
• Understanding how solar can meet mining’s energy needs, particularly in remote areas
• Realizing the benefits of generating and storing energy locally including relieving grid congestion and avoiding transmission and distribution losses
• Siting solar power on mine lands: exploring the potential of closed tailing storage facilities, water rights reservation lands, and waste rock deposition
Ignacio Castro Foulkes, VP, Business Development, GRUPO MÉXICO ENERGÍA

3:50 Case Study: Assessing the Business Case for Wind in Northern Quebec
Following a successful wind data study, Commerce Resources has signed a MOU with Tugliq Energy to conduct in depth pre-feasibility studies to assess the cost-effectiveness of wind power for the Ashram Rare Earth Project in northern Quebec.
• Insight on the fuel-cost realities and carbon reduction goals driving this initiative
• What key outcomes from current studies will assure the business case for wind?
Chris Grove, President and CEO, COMMERCE RESOURCES

4:10 Audience Q&A with Session Speakers

TED-TALKS: ENVISIONING THE MINE OF THE FUTURE AND ITS ENERGY MIX

This session will bring together mine-energy experts to present four 5-minute TED-Talks on their visions for the mine of the future and its ideal energy mix. These TED-Talks will be followed by a broader, interactive audience discussion on this topic and the role that renewables can play in solving the global resource sector’s energy dilemma.
Day 1 | November 27, 2017

4:20 TED-Talk: Envisioning the Mine of the Future and Its Ideal Energy Mix
Robin Goad, President & CEO, FORTUNE MINERALS

4:25 TED-Talk: Envisioning the Mine of the Future and Its Ideal Energy Mix
Sunil Kumar, Director of Energy Strategy, KINROSS GOLD

4:30 TED-Talk: Envisioning the Mine of the Future and Its Ideal Energy Mix
Jon Lyons, Vice President of Regulatory Affairs and Strategy, ERDENE RESOURCE DEVELOPMENT

4:35 TED-Talk: Envisioning the Mine of the Future and Its Ideal Energy Mix
Steve Letwin, President & CEO, IAMGOLD

4:40 TED-Talk: Envisioning the Mine of the Future and Its Ideal Energy Mix
Bill Allemon, Global VP, Energy Management & Electrical Asset Integrity, ANGLO GOLD ASHANTI

4:45 Interactive Discussion: Envisioning the Mine of the Future and Its Ideal Energy Mix
- How do mining and renewables leaders view the mine of the future and its ideal energy mix?
- What are the main risks and barriers to energy innovation for mines?
- Why is it important for mines to begin to transform their energy systems today?
- How can mines prepare to take advantage of the benefits of renewables and storage technologies?
- What can assist in accelerating the adoption of new technologies that ensure power reliability and security for mines?
Robin Goad, President & CEO, FORTUNE MINERALS
Sunil Kumar, Director of Energy Strategy, KINROSS GOLD
Jon Lyons, Vice President of Regulatory Affairs and Strategy, ERDENE RESOURCE DEVELOPMENT
Steve Letwin, President and CEO, IAMGOLD
Bill Allemon, Global VP, Energy Management & Electrical Asset Integrity, ANGLO GOLD ASHANTI

5:30 Networking Drinks Reception
An hour long post-event relaxed reception for networking and mingling
7:00 - 9:00 Energy and Mines World Congress VIP Dinner

For mine VIPs, premium delegates and sponsors, this exciting event will be for energy and mining professionals to meet and solidify relationships. The must-attend dinner will be held in a famous Toronto venue.

8:30 Chair’s Remarks

Adrienne Baker, Director, ENERGY AND MINES

8:40 Session 5: How are Canadian Mines Responding to Carbon Pricing?

The Canadian government is currently finalizing plans to impose a minimum carbon price of $10 a tonne in 2018, rising by $10 per year until reaching $50 per tonne in 2022. Diesel-reliant remote mines will be most affected by the federal price on carbon and are actively exploring new energy solutions to reduce their carbon exposure. This session will bring together remote mining leaders to discuss strategic plans and new energy solutions for addressing carbon pricing.

8:40 Joint Case Study: Exploring Fuel Options for a Remote Northern Mine

- Understanding the possibilities for keeping fuel options open at a power plant’s design phase
- Converting power systems to dual-fuel and LNG: Insights from Agnico Eagle’s Meliadine Mine

Nicholas Allen, Mechanical Engineer, BBA
Daniel Séguin, Engineering Manager, Meliadine Project, AGNICO EAGLE MINES

9:00 Panel Discussion: How are Canadian Mines Responding to Carbon Pricing?

- How will carbon pricing affect the profitability and, in some cases, viability of remote Canadian mines?
- What strategies are mining leaders developing to address carbon pricing?
- What types of carbon abatement initiatives are diesel-reliant mines currently deploying?
- What alternative fuels are mines exploring to realize further emissions reductions?
- What are the main barriers to adopting these low-carbon energy options?
- What role do mines see for carbon offsets and trading in limiting carbon liability?
- What sort of support would participants like to see for low-carbon energy for mines?

Chair: Brendan Marshall, Vice President, Economic and Northern Affairs, THE MINING ASSOCIATION OF CANADA
Mark Ayranto, Executive Vice President, VICTORIA GOLD
Gilles Couture, Manager Energy and Quality, ARCELMITTAL
Stephane Robert, Director, Regulatory Affairs, AGNICO EAGLE MINES
Martin Vroegh, Senior Director of GHG Reduction Technologies, ONTARIO CENTRES OF EXCELLENCE

9:40 Audience Q&A with Session Speakers

9:50 Networking Break
## REALIZING ENERGY AND CARBON SAVINGS WITH MINING MICROGRIDS

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<td>10:20</td>
<td>Session 6: Realizing Energy and Carbon Savings with Mining Microgrids</td>
<td>Growing global demand for low-carbon energy production and the commensurate development of cost-effective renewables and storage solutions has meant that renewables microgrids are becoming increasingly commonplace for a range of remote and grid-tied mining applications. This session will provide an overview of the latest developments in microgrid technologies and updates on mining deployment and project economics.</td>
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| 10:20 | Mobile Hybrids for Mines: Advances, Applications, and Fuel-Savings | • Understanding the latest technological advances and applications for mobile microgrids  
• What are the current expectations in terms of diesel savings  
• What type of return on investment can mines expect from mobile hybrid energy systems?  
Daniel Jäger, Manager Business Development CrossPower, PFISTERER |
| 10:40 | 10:40 Case Study: Operational Highlights and Next Steps for Renewables for Mines | • How is Sandfire Resources’ cutting edge solar and storage project performing?  
• Critical insights on mining microgrids from new projects under development  
• Understanding evolving market opportunities for behind-the-meter projects for mines  
Amiram Roth-Deblon, Head of Global Business Initiatives, JUWI RENEWABLE ENERGIES |
| 11:00 | Panel Discussion: Realizing Energy and Carbon Savings with Mining Microgrids | • How is the microgrid business evolving to meet the specific needs of industrial clients?  
• What type of fuel and carbon savings can remote microgrids offer mines?  
• What are recent examples of new mining microgrids - and what made these projects successful?  
• What needed to be aligned internally between management and operations to ensure the project moved forward?  
• How does the cost of maintaining diesel power compare to the capital costs of installing and operating a renewables hybrid?  
• What recent technological innovations are most relevant for the mining sector?  
• How are the economics and finance options evolving for mining microgrids?  
• Updates on recent collaborations between diesel generator suppliers, renewables IPPs, and technology experts - how are business models and approaches changing?  
• What are the optimal percentages of renewables penetration for these hybrid solutions?  
• When will “plug and play” microgrids for mines become business as usual?  
• Beyond remote applications, how are microgrids being deployed to improve grid stability and load smoothing for industrial users? |
| 11:40 | Audience Q&A with Session Speakers | |

http://worldcongress.energyandmines.com
The development of carbon reduction policies in key mining markets further supports the business case for energy storage for mines. With more mines exploring renewables integration and electric vehicles, energy storage is set to play an increasingly central role in the energy systems of mines. This session will provide an update on the latest developments in energy storage for application and economics for mines.

**Understanding the Economics and Applications of Energy Storage for Mines**

- Insight on the adoption of energy storage solutions by large industrial users
- The role of storage in mapping life-of-mine horizons to power need requirements
- What are the cost projections for the storage technologies most relevant for miners?
- What are the expectations of diesel savings and the latest technological advances?

Mike Grunow, Vice President of Marketing, VIZN ENERGY SYSTEMS

**Panel Discussion: How Strong is the Business Case for Energy Storage for Mines?**

As the industrial energy storage market gathers momentum, mines are increasingly looking at the potential of storage to deal with renewable power intermittency, enable load smoothing and peak reduction, reduce diesel reliance and address supply constraints and power disruptions. This panel of storage experts will discuss the opportunities for mine energy storage and the potential challenges.

- What are the immediate and medium-term opportunities for energy storage for mines?
- What do storage experts see as the key business drivers for mines to integrate these technologies?
- How are existing storage projects for mines performing and what lessons can be drawn from early adopters?
- What insight can be drawn from the integration of storage by other large industrial users?
- What are the potential challenges around integration with existing infrastructure and how are these being addressed?
- How is storage being used to address power intermittency concerns for remote projects?
- How does storage further address load smoothing and peak reduction for remote operations?
- How are storage and microgrid leaders collaborating to address the complexity of managing hybrid power production and storage capabilities?
- What advice would energy storage leaders offer mining energy experts interested in exploring storage solutions?
# MINING’S ENERGY STRATEGY FOR THE DIGITAL ERA

## Session 8: Mining’s Energy Strategy for the Digital Era

Alongside energy and climate initiatives, the application of digital technologies to automate operations, drive efficiencies and improve quality and safety are transforming key aspects of mining. Digitization in combination with renewables, energy management and fuel-switching will dramatically improve mining’s capital and operating costs, carbon footprint, productivity and system reliability. This session will explore the latest innovations in digitization and automation being explored by mining leaders and offer insight on how these initiatives fit with renewables and storage integration for mines.

## 2:00 Benchmarking Mine Energy Data to Reduce Emissions and Costs

**Michelle Levesque**, Senior Engineer, Mining Energy Efficiency, **NATURAL RESOURCES CANADA**

## 2:20 Paving the Way for Next Generation Mining

**Alex Smith**, Account Manager, **CISCO**

## 2:40 Panel Discussion: The Evolution of Data-Driven Mine Energy Strategies

Harnessing the potential of digital technology will allow mines to optimize energy efficiency, eliminate carbon emissions and collect reliable data to assist in the development of renewables infrastructure. This panel will provide insight into the digital technologies and applications feeding mine energy innovation and how these initiatives fit with renewables and storage integration to realize the mine of the future.

- What are the global trends in big data innovation and digitization for mines?
- What are the benefits and challenges of integrating these new technologies and processes?
- How do these investments relate to broader mining energy and climate targets?
- What type of energy cost savings are mines realizing through digital innovations?
- How can real-time data and predictive analytics improve energy decision-making?
- How are digital technologies and applications resulting in carbon savings?
- How can big data improve the application of and underlying business case for renewables and storage integration?

**Chair:** **Laurie Reemeyer**, Principal Consultant, **RESOURCEFUL PATHS**

**Andrew Cooper**, Energy Specialist, **NEW GOLD**

**Alex Smith**, Account Manager, **CISCO**

**Russell Haycock**, Energy Manager, Red Chris Mine, **IMPERIAL METALS**

## 3:20 Audience Q&A

## 3:30 Chair’s Closing Remarks

**Adrienne Baker**, Director, **ENERGY AND MINES**
The Energy and Mines World Congress brings together key energy decision-makers from the world’s leading mining companies who are actively looking to reduce energy costs, cut carbon emissions and secure power supply. These energy leaders are seeking project specific solutions as well as strategic input on current energy and carbon problems. This year, more than ever, energy is a key strategic focus for the mining industry and the Congress will enable you to meet and network with a very hard-to-reach audience.

**WHY SPONSOR THE ENERGY AND MINES WORLD CONGRESS 2017**

- 300 attendees
- 50 speakers
- 30 sponsors & exhibitors
- 13 hours of networking

For information on sponsorship, exhibition, thought-leadership and branding opportunities at the World Congress 2017 contact

**John Hodgkins**  
Sales Director  
john.hodgkins@energyandmines.com  
Tel: +44 7516 113339
The delegate pass includes admission to the conference on November 27 and 28 plus all the listed sessions, lunches and breaks, the opening reception on November 26 and the World Congress drinks. The ticket includes all the presentations plus video recordings of all the sessions. The Premium delegate pass includes the full delegate ticket plus a ticket to the World Congress VIP Dinner on Nov 27th, plus videos and transcription of all the sessions.

**Are you new to the mining sector?**
The pre-conference workshop - An essential introduction to mining for renewables professionals will equip you with the knowledge and confidence to effectively engage with mining energy decision makers.

**Are you a mining professional responsible for energy decisions?**
We offer substantial discounts for mine energy decision-makers. Please contact andrew.slavin@energyandmines.com

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Energy and Mines is the leading global information and event media provider for energy management and operations of the mining sector. Through its global event series (Canada, South Africa, Chile, UK, Australia) web portal, awards and the technology, funding, research newsletter, Energy and Mines brings together the mining and renewable energy sectors to drive solutions for affordable, reliable and sustainable power for mines.

Over the last five years, Energy and Mines has built a reputation amongst the mining and renewables sectors as the first point of contact for connection and information on renewables in mining. We have strong links with senior mining leaders, renewable energy developers and key players driving the technology, research and development in this space.

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