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RIDING THE DIGITAL WAVE: MAKING MINING "COOL" AGAIN

UP MINERS

FIFTH NATIONAL GEOLOGY AND
MINING ENGINEERING CONVENTION

07 MARCH 2020

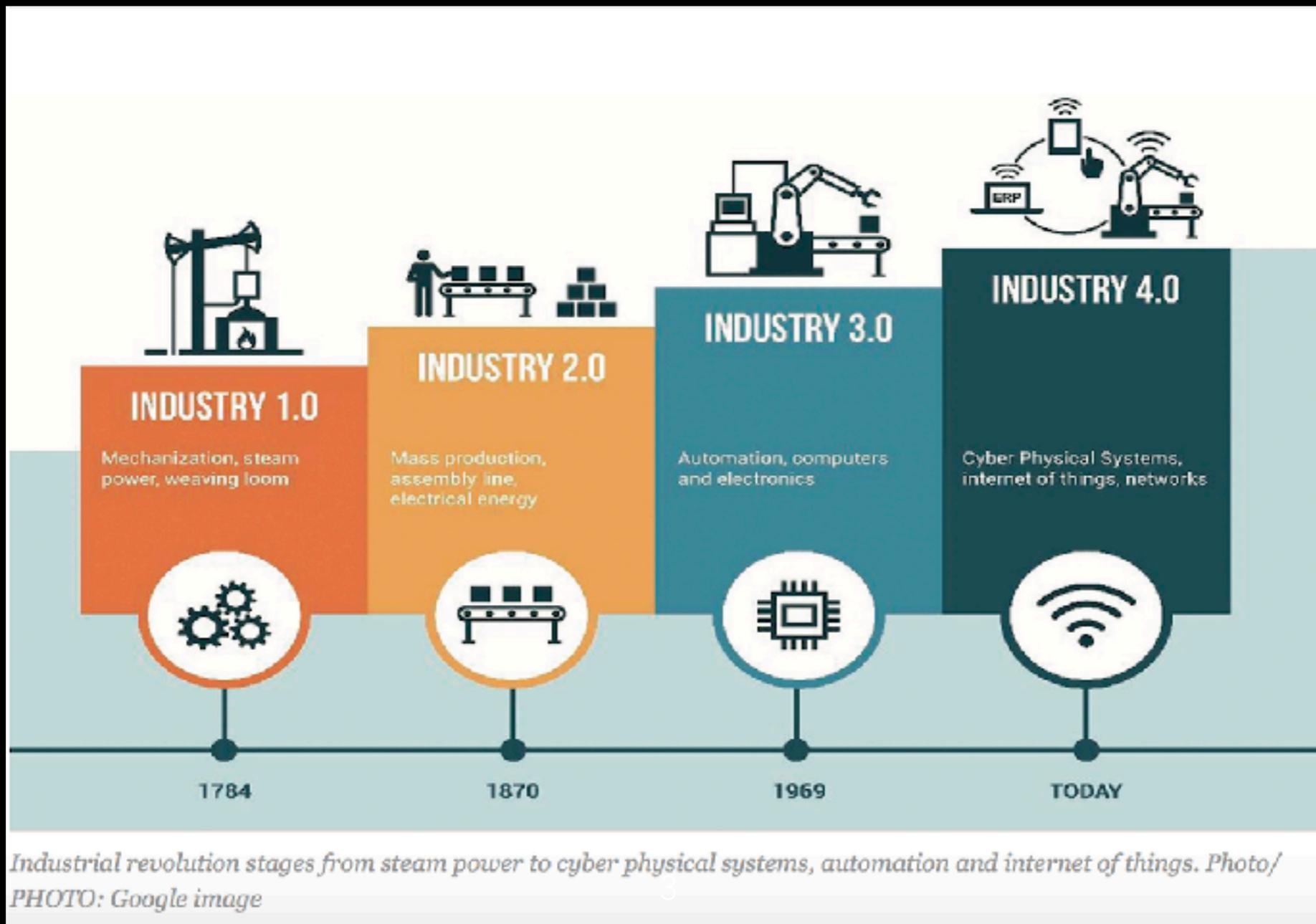
ABOUT THE SPEAKER

- Master of Laws (Univ. of Melbourne), Bachelor of Laws & BS Geo, (UP)
- Group's Legal Counsel Philippines and General Manager for Business Development, Polyard Petroleum International Group Co. Ltd
- Past President, Geological Society of the Philippines
- VP and Trustee, Philippine Mineral Exploration Association
- Legal Counsel - National Geothermal Association of the Philippines and Philippine Chamber of Coal Mines
- Legal Committee, Petroleum Association of the Philippines
- Former Director, International Geothermal Association
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Fourth Industrial Revolution

THE CURRENT AND DEVELOPING ENVIRONMENT IN WHICH DISRUPTIVE TECHNOLOGIES AND TRENDS SUCH AS THE INTERNET OF THINGS (IOT), ROBOTICS, VIRTUAL REALITY (VR) AND ARTIFICIAL INTELLIGENCE (AI) ARE CHANGING THE WAY WE LIVE AND WORK.



GENERATION Z

- iGen, post-Millennials, Centennials, born starting in 1995
- Grew up with technology, internet and social media, true digital natives, “wired and woke”
- prefer “cool products” more than “cool experience”
- entrepreneurial and tech-savvy
- exploit high level of mobilization technology, “gig economy”, ethical consumers, App Economy
- Search for the “truth” is at the root of all Gen Z’s behavior, social justice warriors
- **vulnerable to mental health disorders**



Today's young people differ from yesterday's.



Baby boomer
1940–59



Gen X
1960–79



Gen Y (millennial)
1980–94



Gen Z
1995–2010

	Baby boomer 1940–59	Gen X 1960–79	Gen Y (millennial) 1980–94	Gen Z 1995–2010
Context	<ul style="list-style-type: none">• Postwar• Dictatorship and repression in Brazil	<ul style="list-style-type: none">• Political transition• Capitalism and meritocracy dominate	<ul style="list-style-type: none">• Globalization• Economic stability• Emergence of internet	<ul style="list-style-type: none">• Mobility and multiple realities• Social networks• Digital natives
Behavior	<ul style="list-style-type: none">• Idealism• Revolutionary• Collectivist	<ul style="list-style-type: none">• Materialistic• Competitive• Individualistic	<ul style="list-style-type: none">• Globalist• Questioning• Oriented to self	<ul style="list-style-type: none">• Undefined ID• “Communaholic”• “Dialoguer”• Realistic
Consumption	<ul style="list-style-type: none">• Ideology• Vinyl and movies	<ul style="list-style-type: none">• Status• Brands and cars• Luxury articles	<ul style="list-style-type: none">• Experience• Festivals and travel• Flagships	<ul style="list-style-type: none">• Uniqueness• Unlimited• Ethical

NEW DIGITAL TECHNOLOGY

- **Mobile access in the mine site.** Mobile technology connectivity between workers and management facilitates communication in the mines, which is vital in ensuring a safe and productive working environment.
- **Data-driven decisions.** Mining companies are revolutionizing how they collect data in the field with the help of the Internet of Things (IoT), which are smart data solutions that help management to relay important data such as water pressure, temperature, concentration of gases and other information.
- **Cloud technology** allows management and employees to quickly access and alter essential information, wherever and whenever needed.
- **Robotics** allow more autonomous vehicles and machinery to make operations smoother resulting in better safety, greater efficiency and cheaper running costs. In engineering industries which require hard labour intensive tasks, robots will be able to take over and do things faster and more efficiently than humans ever could.



NEW WORKFORCE

- While automation and data analytics technologies may increase efficiency, these will require a workforce that is skilled in data science, analytics, predictive modeling and mechatronics.
- Current workforce will also need retraining as knowledge resources and will be required to possess a new set of skills needed to operate new machinery and technology, or work along-side and support automated systems.
- Universities and data science companies that develop innovations could gain an edge in exploration.
- Within ten years, mining companies could employ more PhD-level data scientists than geologists and mining engineers.



NEW THREATS

- While digital technologies will make mines more efficient, mining companies will have to allocate budgets for cybersecurity and devote additional resources to improve their defenses and work harder in embedding security-by-design due to the increasing potential of cyberthreat.
- Increased global connectivity means that anyone with access to company data, anywhere in the world, can exploit weaknesses in data security. Organizations' critical digital and physical assets are therefore at greater risk of theft, damage and manipulation than ever before.
- Cybersecurity is important because there is a heightened exposure to fraud, corruption and other related risks.

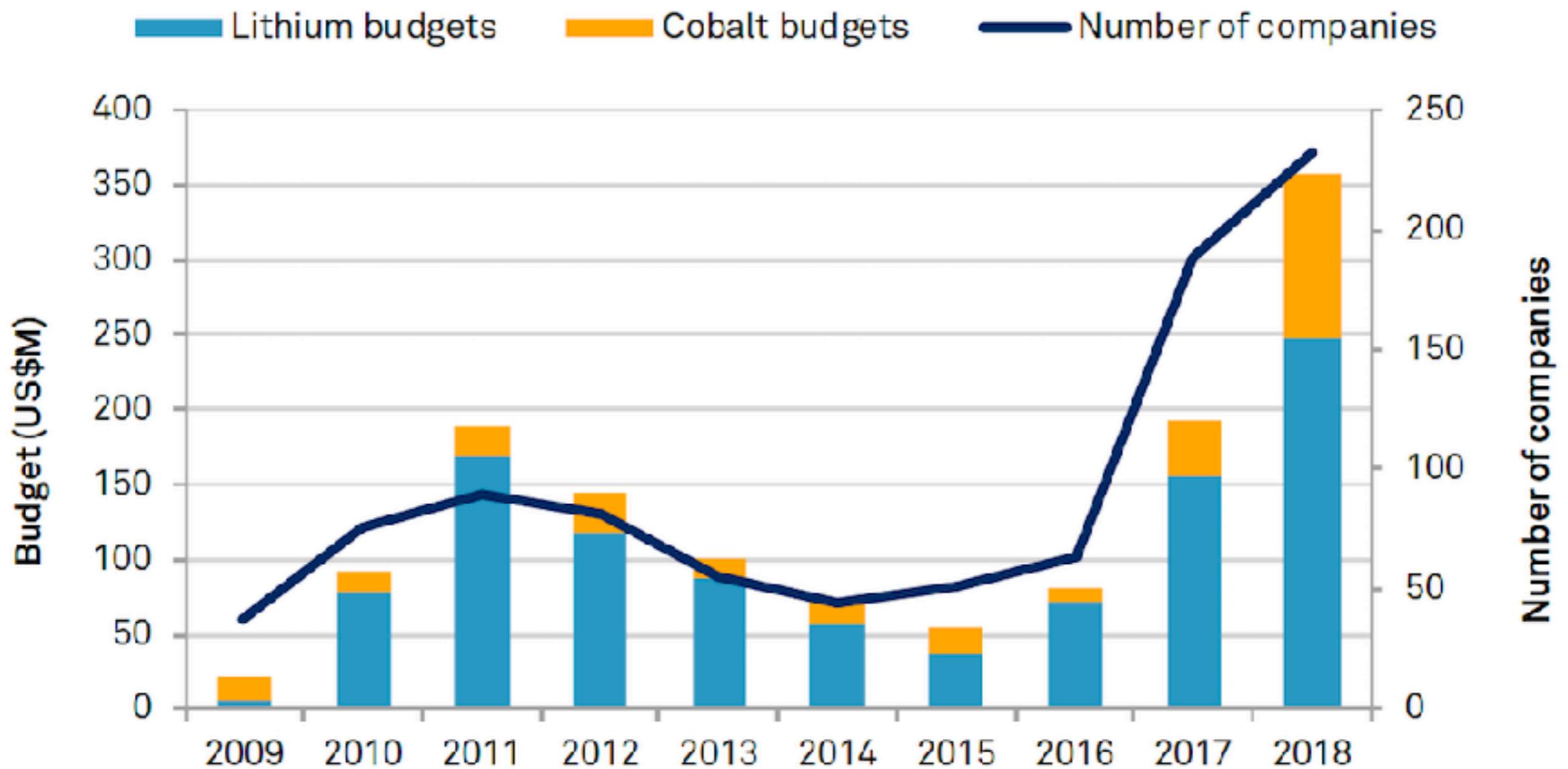


NEW WORLD COMMODITIES

- Digital technologies have resulted in a change in commodity demand for critical minerals such as cobalt, lithium and copper. These minerals are required to manufacture energy conversion and storage equipment needed to supply the renewable energy industry.
- The rise of electric vehicles and the production of an ever-growing variety of high tech and green technologies, from batteries, smart phones and laptops to advanced defense systems have also boosted demand and competition for new world commodities.



LITHIUM AND COBALT EXPLORATION BUDGETS 2009-2018



Data as of Jan. 18, 2019.

Source: S&P Global Market Intelligence

NEW MINERS

- With the advent of digital technology and rising demand for new world commodities, the business of mineral exploration, development and production will not be conducted solely by traditional mining houses and junior companies.
- Technology companies may become direct or indirect investors as a way of shoring up and securing supply. With scarce new world commodities supply like cobalt and lithium and other rare earth minerals, cash-rich technology companies will venture into mining to ensure that they can continue to produce their products.
- Using blockchain technology, new technology entrants can engage in mining without owning any mines or distribution infrastructures in the same way that Uber does with no cars and Airbnb, with no real estate listings.



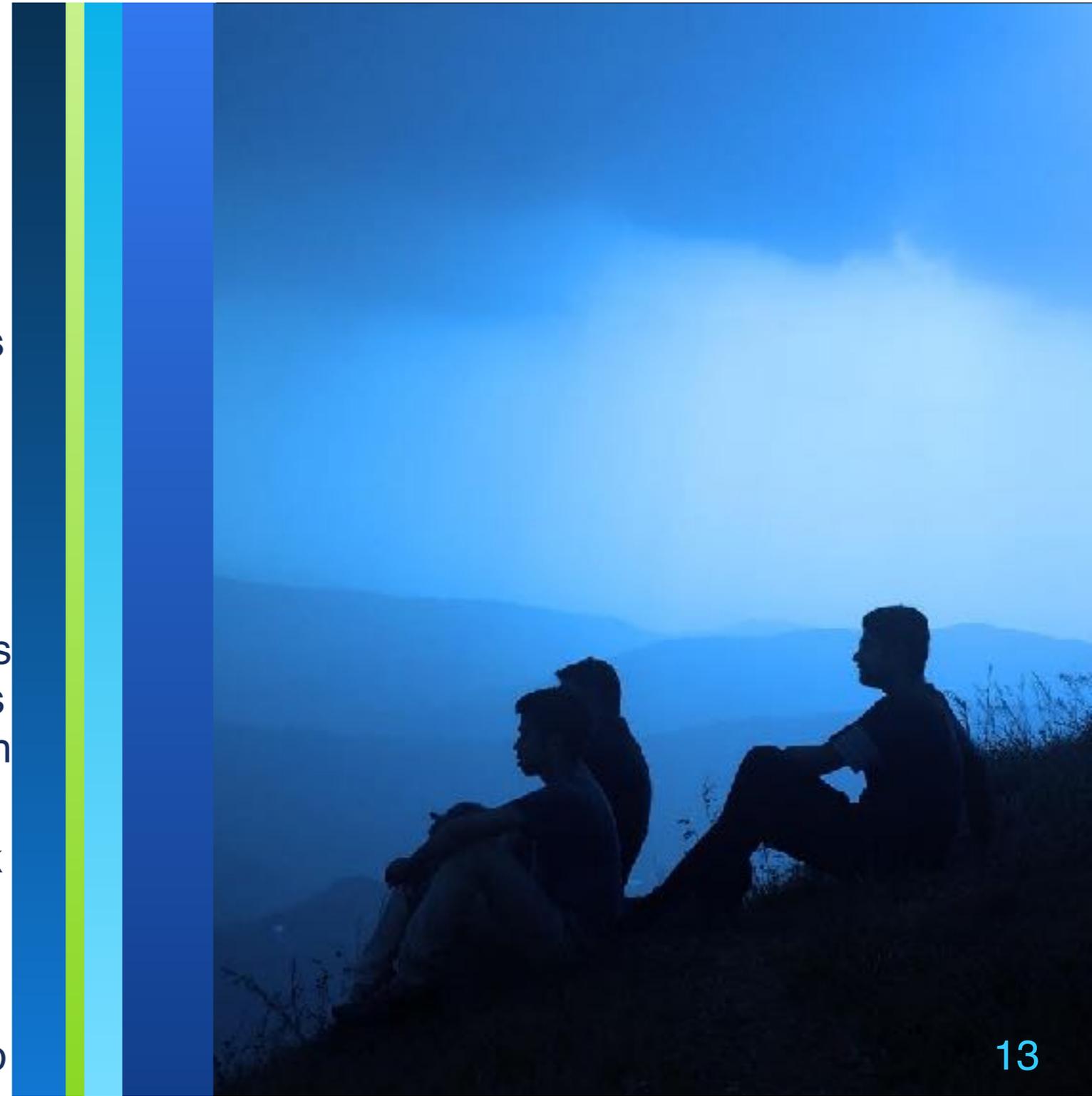
LET'S BRING BACK THE "COOL" IN MINING

- **Innovate:** consider cryptocurrency financing solutions, launch a massive open-sourced data repository that all mining companies deposit their data into, leverage the latest tools in biotechnology to further reduce our environmental footprint and hit that elusive "carbon neutral" and "zero-footprint" goal at our mines
- **Apply video games skills:** add new blood in our industry - biochemists, gamers, coders, mathematicians, computer scientists, alternative finance specialists, AI and VR experts and tech gurus
- **Change what investors think:** engage this crowd of young investors who understand new technologies; electric vehicles need cobalt, nickel and lithium-ion batteries; solar panels need copper and silver
- **Create a brand:** "Do What is Right and Be Proud", We have great stories to tell. We need more storytellers.



Conclusions

- Resources industry will continue to benefit from strong commodity prices and a positive outlook in this era of **globalization, digitization and sustainability**.
- **Demand for new world commodities** is going to increase as they become central to the production of an ever-growing variety of high tech and green technologies.
- There will be **increasing demand for *Data and Digital* literacy skills** across all phases of the mining value chain as resources companies will invest in both automation and data analytics.
- Job skills required in mining today look fundamentally different than 20 or 30 years ago. **Redesigned traditional occupations in geoscience and mining engineering** will have a role to play in the age of digital technology and renewables.





**THANKS!
ANY QUESTIONS?**

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