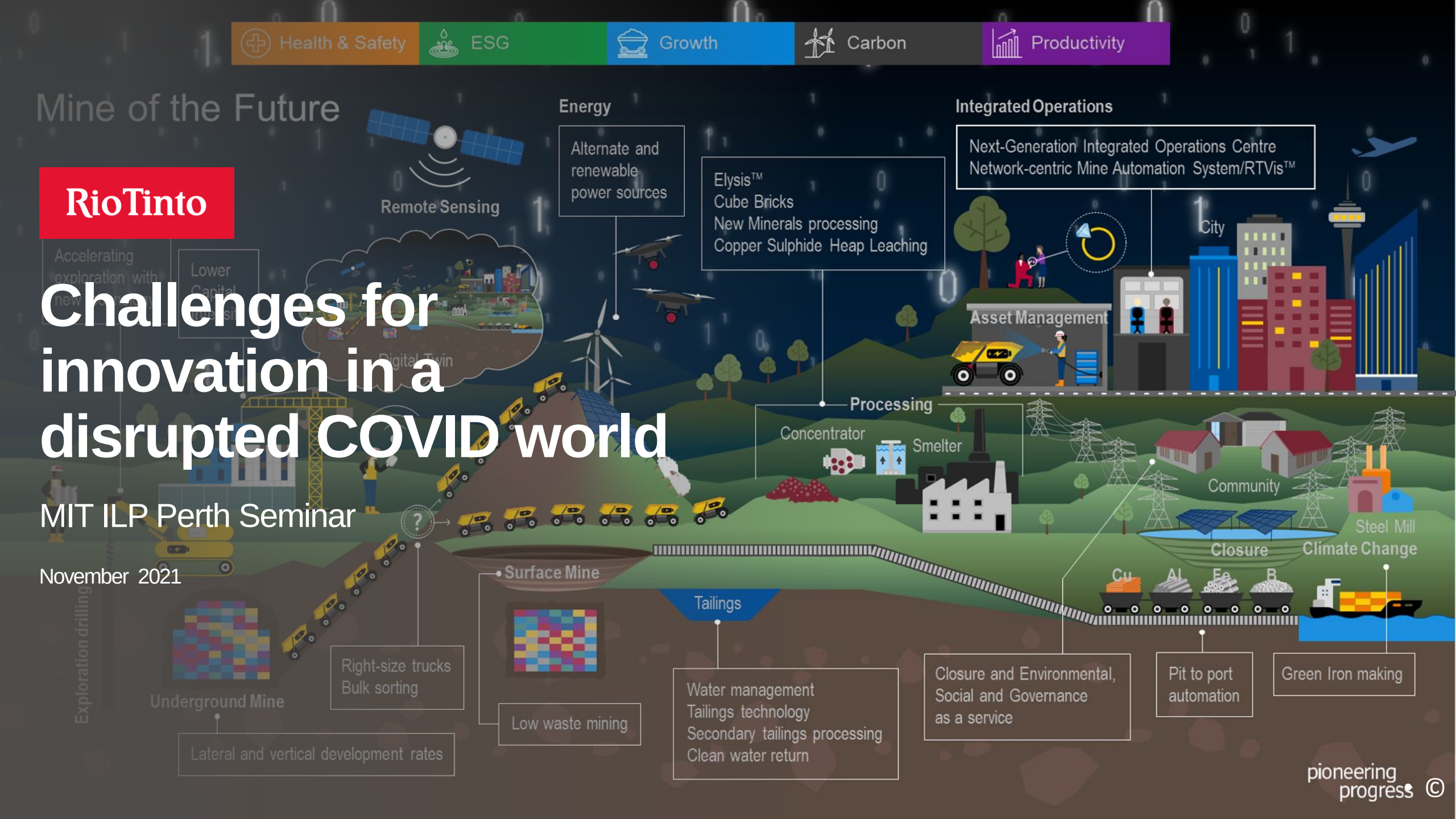
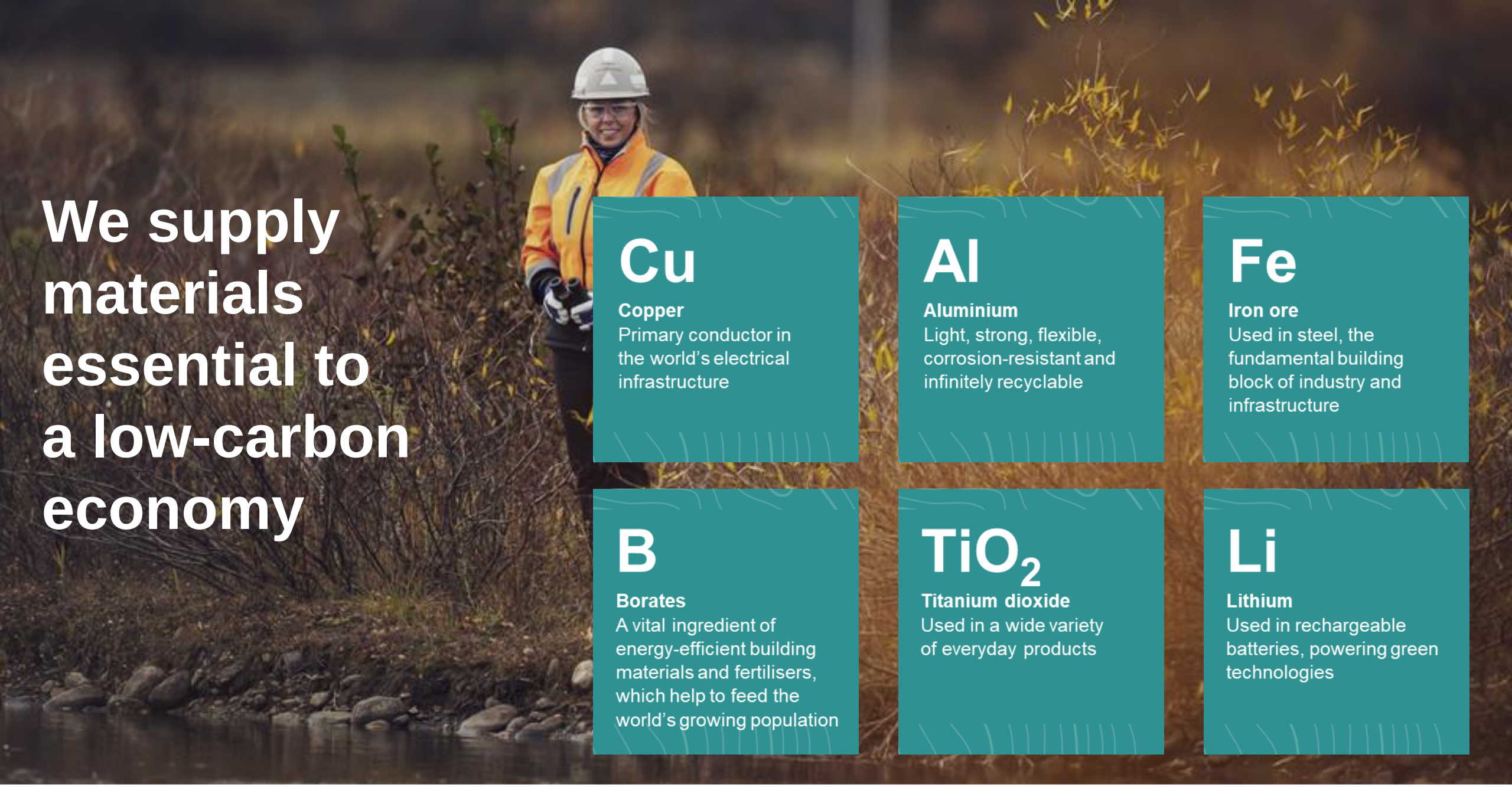

Health & Safety
ESG
Growth
Carbon
Productivity
Mine of the Future
RioTinto
Challenges for innovation in a disrupted COVID world
MIT ILP Perth Seminar
November 2021
Remote Sensing
Accelerating exploration with new
Lower Capital
Digital Twin
Exploration drilling
Underground Mine
Right-size trucks
Bulk sorting
Lateral and vertical development rates
Surface Mine
Low waste mining
Energy
Alternate and renewable power sources
Elysis™
Cube Bricks
New Minerals processing
Copper Sulphide Heap Leaching
Tailings
Water management
Tailings technology
Secondary tailings processing
Clean water return
Integrated Operations
Next-Generation Integrated Operations Centre
Network-centric Mine Automation System/RTVis™
City
Asset Management
Processing
Concentrator
Smelter
Community
Closure
Steel Mill
Climate Change
Cu
Al
Fe
B
Closure and Environmental, Social and Governance as a service
Pit to port automation
Green Iron making
pioneering progress ©

We supply materials essential to a low-carbon economy



Cu

Copper
Primary conductor in the world's electrical infrastructure

Al

Aluminium
Light, strong, flexible, corrosion-resistant and infinitely recyclable

Fe

Iron ore
Used in steel, the fundamental building block of industry and infrastructure

B

Borates
A vital ingredient of energy-efficient building materials and fertilisers, which help to feed the world's growing population

TiO_2

Titanium dioxide
Used in a wide variety of everyday products

Li

Lithium
Used in rechargeable batteries, powering green technologies

A long history in innovation in technology

1880 – 1910 // 1960s // 1990 – 2000 – 2010 – 2010+

New industries


UNITED STATES PATENT OFFICE.

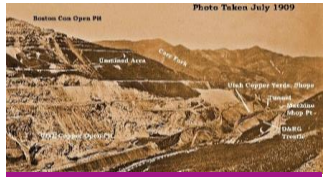
PAUL HÉROULT, OF LAUFFEN, SWITZERLAND, ASSIGNOR TO THE UNITED STATES ALUMINIUM METAL COMPANY, OF NEW YORK.

APPARATUS FOR PRODUCING ALUMINIUM OR OTHER METALS.

Hall-Heroult process


Saguenay development


Continuous Casting



Bulk mining Bingham Canyon

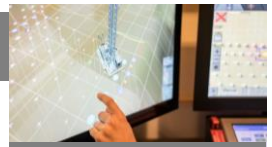

SAG Mill & Electrowinning


Mount Tom Price (1966)

Volume efficiencies ….


High amperage designs

Major HME Size Increase


Pilbara Automation

Recent developments

Al Smelting
- AP60 Smelters
- ELYSIS™

Climate
- Heliogen™

Automation
- Drills
- Trucks
- Locomotives
- MAS™, Automation Platform
- Water Truck

SO_2
CO_2

Inert Anode

Access new ore-grades


Sulphide heap leach

Utilise ore-body


Ore sorting Granular haulage

COVID-19 environment

Rose

- Geographic barriers lower - everyone works remote
- Travel reduction
- More disciplined interventions
- Increased scouting (visit one per day vs multiple webinars)

Accelerated discovery

Thorn

- Unable to touch/feel problem
- Start up due diligence (slide ware)
- Physical innovation, pilot plants/prototype etc.
- Long hours
- Supply chain issues, physically harder (eg pilot plant)
- Employee engagement

Physical presence
Need to cluster?

Bud

- Need for readily accessible data
- Collaboration/consortia
- Wider reach
- Work the timezones

Accessible data
Collaboration

Innovation Environment

Accelerated discovery

Extending the life of carbon anodes

BELL BAY ALUMINIUM, TASMANIA, AUSTRALIA

Aluminium is made using a process where carbon anodes create a chemical reaction, changing alumina into the shiny, lightweight metal used in everything from food packaging to cars. Through the smelting process, the carbon anodes are consumed.

For many years our Bell Bay aluminium operation has been pioneering a coating for carbon anodes to help reduce consumption, and therefore waste. Through the Pioneer Portal, the team sought a world-first solution to automatically apply their protective coating on baked carbon anodes.

Companies offered solutions ranging from immersion to spraying. The Bell Bay team is now working with a company to introduce robotic manufacturing technologies – like those used in the automotive industry – to apply the protective coating on their anodes.

Physical presence

Rio Tinto targets low-carbon steel production with new technology

14 October 2021

SHARE

MELBOURNE, Australia--(BUSINESS WIRE)-- Rio Tinto is progressing an innovative new technology to deliver low-carbon steel, using sustainable biomass in place of coking coal in the steelmaking process, in a potentially cost-

novative new technology to deliver low-
lmaking process, in a potentially cost-

s that combines the use of raw, sustainable
ring the steelmaking process. The patent-
ry to lower emissions in the steel value chain,

e for this technology to be scaled

early testing results of this new process,
our Pilbara iron ore.

customers process our iron ore into steel,
rld's economies decarbonise. So, while it's
re keen to explore further development of this

Rio Tinto's process uses plant matter known as lignocellulosic biomass, instead of coal, primarily as a chemical reductant. The biomass is blended with iron ore and heated by a combination of gas released by the biomass and high efficiency microwaves that can be powered by renewable energy.

Rio Tinto researchers are working with the multi-disciplinary team in the University of Nottingham's Microwave Process Engineering Group to further develop the process.

The University's Head of Department, Chemical and Environmental Engineering, Professor Chris Dodds, said, "It is really exciting to have the opportunity to be part of a great team working on a technology that, if developed to commercial scale, has the potential to have a global impact through decarbonising key parts of the steel production process."

The use of raw biomass in Rio Tinto's process could also avoid the inefficiencies and associated costs of other biomass-based technologies that first convert the biomass into charcoal or biogas.

Lignocellulosic biomass includes agriculture by-products (i.e. wheat straw, corn stover, barley straw, sugar cane bagasse) and purpose-grown crops, which would be sustainable sources for the process.

Importantly, the process cannot use foods such as sugar or corn, and Rio Tinto would not use biomass sources that support logging of old-growth forests.

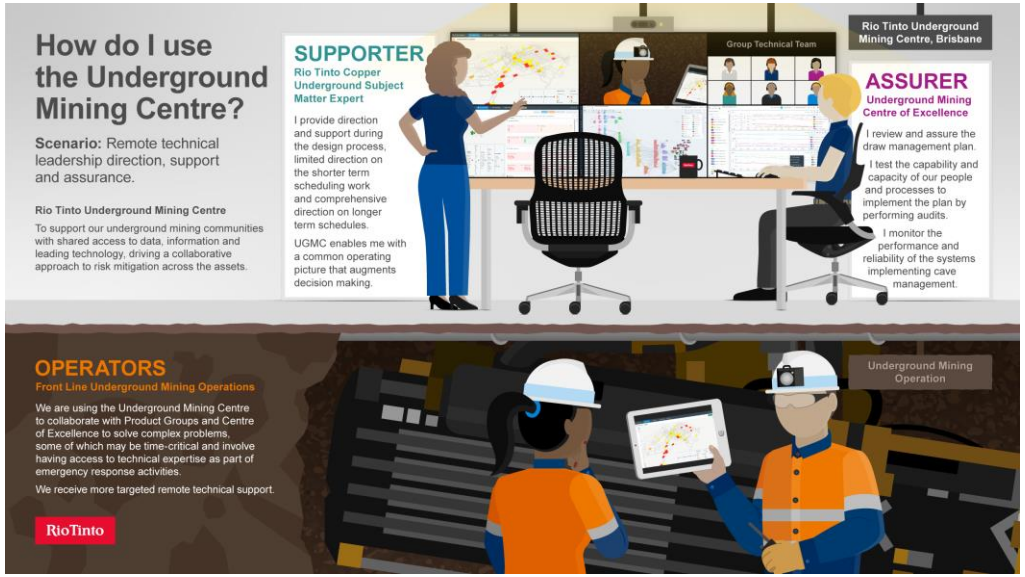
Simon Trott said, "We know there are complex issues related to biomass sourcing and use and there is a lot more work to do for this to be a genuinely sustainable solution for steelmaking. We will continue working with others to understand more about these concerns and the availability of sustainable biomass."

If developed further, the technology would be accompanied by a robust and independently accredited certification process for sustainable sources of biomass.

Innovation Environment

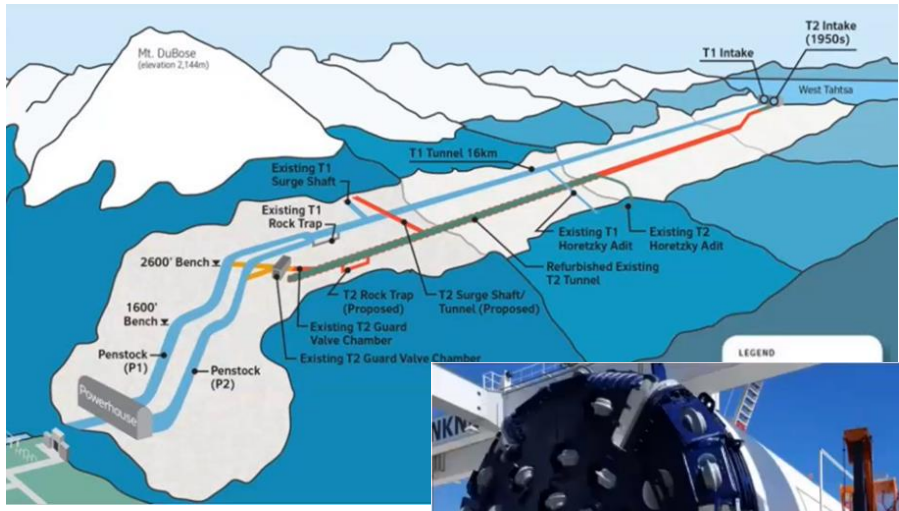
Accessible data

Underground Mining Centre



Accessible data

Kemano Tunnel Boring



Innovation ecosystem

Sources

Internal Channels

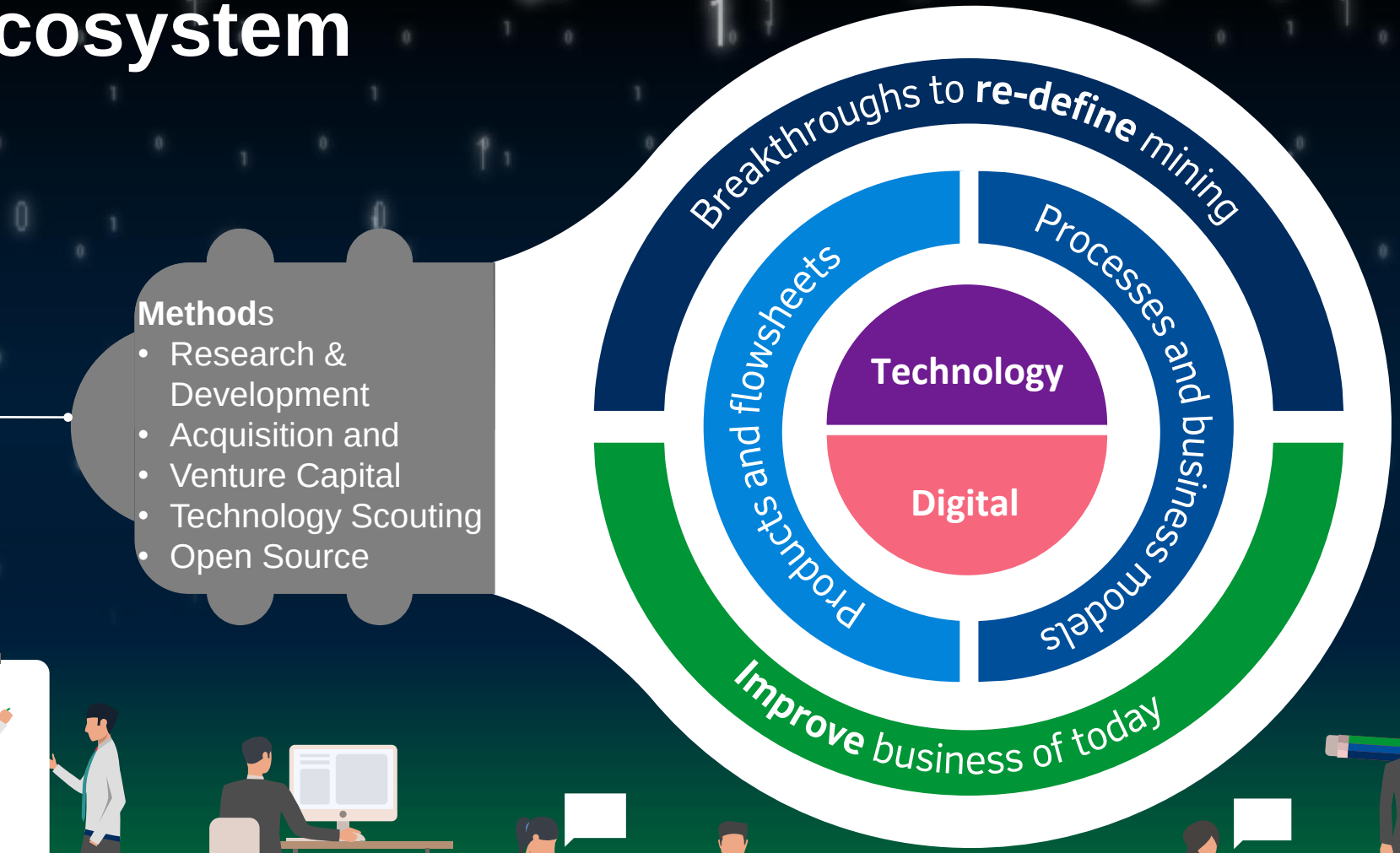
- Employees
- Technical Community
- RT Owned IP

External Channels

- Strategic Partners
- Universities
- OEMs
- Start-Ups

Methods

- Research & Development
- Acquisition and
- Venture Capital
- Technology Scouting
- Open Source



pioneering progress