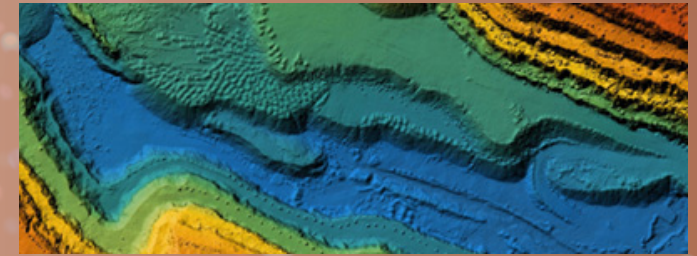# I4 MINING

Mining + Industry 4.0:
AI + IoT's role in reaching a profitable net-zero future.

Discover why, how and where the mining sector should get started with Industry 4.0 technology - and just what it is.

The only constant is change.

The mining sector is changing - and it needs to.

The starting pistol for the paradigm shift that's being demanded of miners was fired on 22 April 2016 in Paris with the signing of The Paris Agreement.

Whilst there have been agreements before, the Paris Accords' scope and ambition is unparalleled (195 countries are now signatories, agreeing to achieve net-zero emissions by 2050), and its signing marks not just a win for the science, but also for the people: demand for action at international, national, state and local government-levels is rapidly becoming politically, economically and socially irrepressible - the wheel has turned.

The mining sector is currently responsible for between 4% - 7% of greenhouse-gas emissions globally* and is a major target when it comes to finding the carbon savings necessary to achieve governments' targets.

Ironically, however, this threat to the sector also presents it with its biggest opportunity.

Achieving net-zero emissions will be impossible without energy transition: the movement from fossil-fuel powered energy generation to renewables and zero-carbon technologies. To succeed in it, many things will be required, but chief among them is a range of materials that only the mining sector can provide, including a whole new array of rare earth minerals and elements. Needed in everything from wind turbines to solar panels, electric vehicles and the batteries upon which we will all increasingly rely to guarantee security of energy supply; the mining sector finds itself with a new role as a key enabler in making net-zero 2050 a reality.

* Source: McKinsey: Climate risk and decarbonization - January 28, 2020

Contents.

I4 MINING

Zero carbon is only half the story: zero harm + zero waste.

It would be easy to suggest that net-zero carbon targets are the sole reason for why the mining sector needs to change, but the truth is more complicated, as the mining sector has been facing a series of internal and external challenges in recent years that are further forcing its hand.

Mine productivity rates have been dropping, costs have increased and capital for expansion is hard to come by. Over the past 15 years, the average cost of producing copper has risen by more than 300% with its grade dropping by 30% during the same period*. Mineral extraction at existing operations is also becoming more challenging with the richest seams now found further underground or in harder to access areas. In this context, zero waste and productivity measures have become all the more critical in ensuring that operations remain profitable.
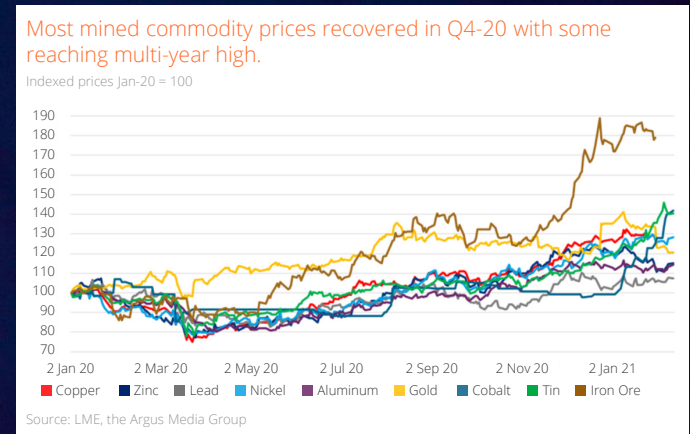
Not only this, the rise in importance of environmental, social and governance (ESG) is also having a huge impact: zero harm.

Many of the world's easily-mineable sites have now been tapped and potential new sites with minerals of sufficient volume and quality to warrant investment are generally in either more environmentally sensitive areas, could come in direct conflict with the needs of the local population, or are in parts of the world considered difficult to do business.

This could be described as a maturation of the industry and it has come at the same time as...

...governments, spurred on by the likes of The Paris Agreement and other global agreements, are demanding much more of businesses across all sectors; enacting compliance powers that frequently reach extraterritorially to protect people and the environment in lieu of their national governments doing so.

For miners, beyond the public relations battles that are seen in the media, it's made access to the cheap capital required to fund new mineral extraction and refinement projects difficult to come by and has meant that they need to do much more than pay lip service to their own ESG initiatives, implementing zero harm goals for both employees, the environment and the communities in which they operate.

Most mined commodity prices recovered in Q4-20 with some reaching multi-year high.

Indexed prices Jan-20 = 100

Legend: Copper, Zinc, Lead, Nickel, Aluminum, Gold, Cobalt, Tin, Iron Ore

Source: LME, the Argus Media Group

It would be easy to suggest that net-zero carbon targets are the sole reason for why the mining sector needs to change, but the truth is more complicated.

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The mining sector's window for change.

If this paints a bleak picture, the truth is that the mining sector has never been in a better position.

In 2020, when many industries were being hammered financially by the COVID-19 pandemic, net profits amongst miners rose by 15% and market capitalization increased by 64%, with 2021 expected to be an even bigger boon - with revenue expected to increase by 29% and profits 68%*.

These figures are a result of surges in commodity prices and new revenue streams coming from the ever-increasing demand for minerals used in clean energy technology - something that's expected to increase 6-fold in the next 20 years alone.

In fact, Wood Mackenzie predict that, for the world to achieve its net-zero goals, the aluminum, copper and nickel industries would have to double in size by the late 2020s, while lithium and cobalt mining would need to increase five-fold[†]. According to the World Bank Group, clean energy needs will escalate the demand for rare earth minerals by nearly 500% by 2050.

If this wasn't enough good news, the data is also beginning to come in and it shows that businesses with an ESG focus are outperforming those without it - and did so even throughout the global pandemic (see chart to the right).

The net result of these factors is that many of the world's largest diversified miners have never been in a stronger financial position. With no immediate...

...end in sight for the commodity price boom or demand, despite a volatile 2022-2023 period in some commodities being expected (a fallback in iron ore prices and temporary reduction in demand for steel off the back of microchip shortages slowing electric vehicle production**), short-term profitability is all but guaranteed.

This makes now the time for the mining sector to be investing in its future and to be putting in place transformation programs that will enable it to fulfil its role in helping the world achieve energy transition, as well as meeting its own zero carbon, zero harm and zero waste ESG targets.

Failure to seize this opportunity will result in existential challenges that at present are in the medium-to-long term looming into view at a point where it will be too late for some businesses, particularly in the West, to alter course.

Whilst this is a known known, there still seems to be significant inaction. Wood Mackenzie have stated that there is currently insufficient investment from miners in these new spaces for the world to be able to meet its net-zero 2050 targets ["The key question is whether the industry at large is investing enough capital to drive the transition from the 'carbon electron' to the 'green electron' at anything close to a level that will achieve a 2 °C pathway. The simple answer is no."[‡]] and there is a real risk that if miners don't start moving the needle themselves, that someone else might start setting targets which are somewhat more challenging (and costly) to...

...achieve. There is even the risk that other sectors powered by new technologies - such as scrap utilization - might start eating the mining sector's lunch sooner than predicted.

Obtaining capital from the financial sector needs to be easier, with investors needing to take a longer-term view than their previous activities, and it could be that government support for green initiatives may well need to play more of a role - but the key for the world's miners is that they need to start doing more than simply trying to improve what they're doing now if they're to plot a profitable path that secures their futures.

Relative performance of companies with an ESG focus.
Indexed prices Jan-20 = 100
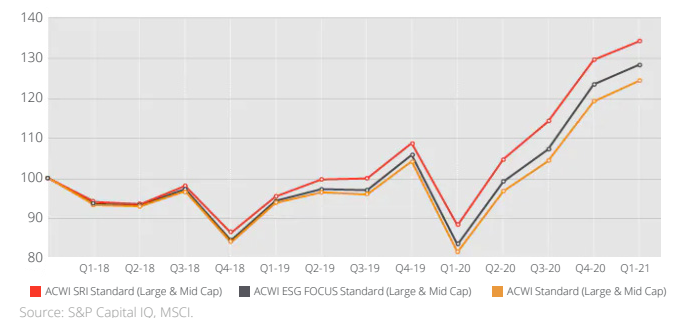
Source: S&P Capital IQ, MSCI.

This makes now the time for the mining sector to be investing in its future and to be putting in place transformation programs...

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What Industry 4.0 in mining looks like.

The fourth industrial revolution - where businesses build upon their use of computing power and automation with the adoption of intelligent, autonomous systems that can leverage complex data sets and machine learning to deliver AI-driven enhancements in real-time - will have an enormous impact on the mining sector.

There are a vast number of opportunities for miners to transform - both operationally and strategically, via IT and OT - and their ability to do so will play a key role in enabling success in the present whilst plotting a profitable, long-term future.

McKinsey estimates that by 2035 autonomous mining using data analysis and novel technologies like AI will save the mining sector between US$290bn - US$390bn annually* and, compounded with the benefits of other technologies, investments in these new solutions are fast becoming financially prudent decisions.

Whilst it's possible to overhaul your entire operations at once, it's likely to be far too costly, risk-laden, and not give you sufficient time to conduct an effective change management exercise, meaning that Industry 4.0 status will never be achieved.

No, Industry 4.0 status in the mining sector will be reached with the successful application of new transformational technologies incrementally by adopting a suite of use case-specific solutions that can be deployed and then integrated with one another piece-by-piece, providing both strategic and operations leaders with what they need to do their roles better on a function-by-function basis.

Successful transformation is about finding better ways of doing things by recalibrating ways of working, improving the way that data is used, and enhancing how people interact with it and each other - it's not about the technology per-se, rather reengineering how you function using it to achieve business goals.

One thing that will be needed, however, is a piece of new technology that can sit in the middle of every business and/or operation: an integrated AI + IoT platform. This platform will be critical, as it's the central place where all of an organization's data (both historical and real-time, from any system, sensors or data store) can flow through, where machine learning algorithms can be leveraged, and where cross-functional decisions - made by human or AI - can be orchestrated and executed: an organization's brain.

There are a vast number of opportunities for miners to transform - both operationally and strategically, via IT and OT...

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Why Industry 4.0 is about AI <u>and</u> IoT.

IoT and AI technology are often talked about on their own or without context to the other. Frequently, they're two sides of the same coin.

To simply dissect the two:

> **IoT:** Collecting the right data.

+

> **AI:** Using machine learning to do something with it.

IoT: IoT or IIoT (Industrial Internet of Things) technology is about enabling miners to collect vast quantities of real-time data about their operations via infield sensors, through links from OT and IT, as well as via third party resources providing relevant information (such as weather). This generally goes into a platform through which it is combined and can be examined via dashboards to assess performance i.e. real-time asset, plant and personnel monitoring.

IoT in itself presents miners with opportunities for transformation and improvement, removing the need for people to enter hazardous environments to take measurements and facilitating the collection of minute-by-minute accurate readings so that productivity rates can be maintained. Whilst this is transformation, it's questionable whether it can be classified as Industry 4.0 - it's probably closer to 3.5 - as it lacks the critical decision-making and analysis required to meet the definition.

AI: The AI element of an Industry 4.0 solution is about the applications and subsequent actions

taken (whether by human or via automation based on pre-programmed business logic) as a result of the use of machine learning algorithms being applied to data sets.

Once you have in place a way to record all of the potential variables that go into an operation, it's possible to design and deploy machine learning algorithms that analyze them all within the context of the other data sets to determine:

- If the data is accurate (and if it's not, what the values should be)

- What data is actually impacting performance

- Predict the likely outcomes of changes to operations or third-party variables (e.g. the impact of various precipitation rates)

- Find optimal ways of achieving objectives.

Over time (and with growing data sets) machine learning algorithms find new and more effective ways to operate - they get better - and multiple ones can be applied to the same data to experiment with new use cases or test alternative hypotheses and optimizations (via digital twins).

Technological advances have enabled the data that AI needs to function to be collected in real-time (usually with a critical IoT component) and so platforms have developed that can apply machine learning algorithms to this data to give immediate insights and direct improvements or action based on programmed objectives, e.g. preventing accidents or ensuring plant uptime etc.

On its own, machine learning can be applied to historical data sets to find optimizations, but it is its ability to use it on real-time data sets that makes it Industry 4.0 as, once there is trust in an algorithm, it can be enabled to exert real-time control via automation. This is what is at the heart of what people mean by AI: machine learning-led automated interventions that self-optimize over time on an ongoing, incremental basis.

> This is what is at the heart of what people mean by AI: machine learning-led automated interventions that self-optimize over time on an ongoing, incremental basis.

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What goes into a complete Industry 4.0 solution.

Each Industry 4.0 solution has an AI + IoT platform at its core, but multiple technologies are needed for it to succeed.
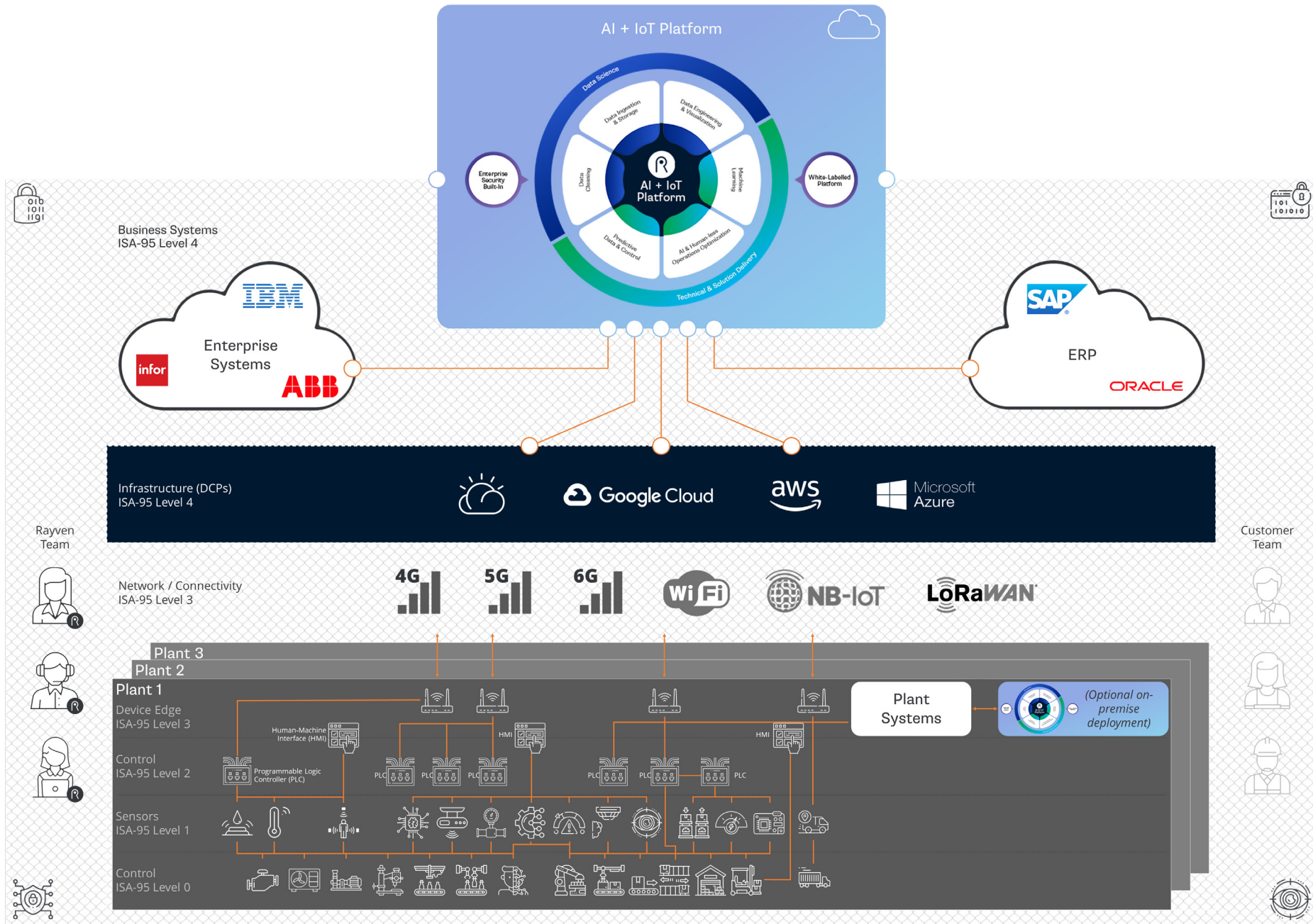
Mining's COVID-powered path to Industry 4.0-status.

In recent years, miners have been at the vanguard of technology adoption. Many firms have embraced automation and novel 'smart mining' technologies, however recent AI advances, old fleets and the need to electrify assets means that many operations, processes, and approaches must be looked at afresh to lower CO2e and increase tonnage.

COVID-19 forced many miners to move faster. Some operations required the rapid setting up of new remote work capabilities, saw the implementation of remote control rooms and operational centers, as well as relied on the further use of autonomous fleets to undertake new roles.

Whilst the long-term impact of the pandemic is far from certain, the process of change that it has begun is unlikely to stop until entire operations have been put under the microscope to see if there are efficiency savings and optimizations to be found that will enhance profitability and short-to-long-term success.

Immediate efficiency savings and yield increases can be simply and rapidly achieved through the adoption of intelligent Industry 4.0 technologies that harness the power of machine learning to analyze large data sets (in real-time) and then direct manual optimizations or AI-led interventions.

Using Industry 4.0 AI + IoT technology, miners can drill-down and identify individual assets that might be causing operational problems today, predict...

those that will tomorrow, and provide decision-makers with a true single source of truth and the means to analyze and de-risk their operations like never before - in real-time - so that they can achieve critical strategic and operational goals.

Not only this, but the technology also enables the sector to integrate all real-time and historical data sources (and leverage new ones); guarantee data completeness and accuracy via machine learning; and then apply adaptive and predictive analytics to give senior-management the insights they need to design a roadmap that plots their path from miners to commodity providers, all whilst managing and minimizing environmental and workforce harm, successfully.

Immediate efficiency savings and yield increases can be simply and rapidly achieved through the adoption of intelligent Industry 4.0 technologies...

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Industry 4.0 technology applications in the mining sector.

Industry 4.0 technology will enable the mining sector to achieve zero goals, improve productivity, increase efficiency, uncover optimizations, create better workplaces and allow themselves to scale to meet the challenge of energy transitioning, unlocking sites and workforces' potential in the process.

Enabling remote, real-time operation oversight.
Industry 4.0 technology enables miners to integrate every data source (IT, IoT and OT) into a single platform through which adaptive and predictive analytics can be applied to uncover optimizations and enable better in-field (and strategic) decision-making, as well as enabling the application of AI-led control to prevent adverse events.

Autonomous vehicles & plant enhancement.
Autonomous vehicles have been operating in mines for some years now. In that time, they've demonstrated fuel efficiency savings and kept workforces out of harm's way, but there are numerous assets and plant that are yet to be transformed. Offering productivity, safety and real-time monitoring benefits, autonomous assets present the sector with multiple opportunities to enhance their bottom-line results.

Adopting predictive maintenance.
AI + IoT Industry 4.0 technology enables miners to implement predictive maintenance regimes that maximize asset and plant uptimes, reduces maintenance costs, and prevents catastrophic failures that can cause considerable harm to both operators and the machines itself.

Enhancing mineral processing.
Using Industry 4.0 technology, it becomes easier to identify valuable extracted products from low yield rocks. The result is that it takes less processing to turn the minerals into desired concentrated end-product, reducing processing times and fuel usage.

Real-time monitoring and mitigation of social & environmental harms.
Industry 4.0 technology enables miners to develop more accurate impact plans, find better ways to mitigate them and then monitor critical environmental measures in real-time to prevent breaches and harm from occurring via manual or AI-led automated interventions. Should the worst occur, the technology can also direct miners to rapid, effective clean-up work based on previous learned performance of mitigation efforts and the sites own individual circumstances.

Cheaper, more efficient mineral exploration.
Industry 4.0 technology can provide miners with efficient, effective means to find, assess and explore new sites. This saves time and money, enables better assessment as to potential, and enables miners to be more accurate in excavation and predicting potential side effects of operations (plus how to mitigate them).

Enabling real-time plant monitoring.
Through sensors monitoring different aspects of plant performance, miners can not only track how it's performing and its efficiency, but also to pinpoint under utilized machinery, judge asset classes, improve maintenance regimes and reduce total cost of ownership.

Achieving workforce safety zero targets.
Beyond taking humans out of potential harm's way, Industry 4.0 technology enables miners to leverage a vast array of real-time data sources to assess workforce safety at any given moment, giving you the means to develop real-time safety controls and accountability scores, identify employees who may need retraining, and predict and prevent injuries from occurring.

Uncovering & seizing production improvement.
Advanced Industry 4.0 technology has been in use in the manufacturing sector for sometime and much of the technology can be readily employed in the processing and refinement portions of the mining and metals sector. Using the technology, it's possible to analyze real-time production and processing performance, get real-time OEE measures, accurately predict yields and use machine learning to prevent production losses.

Facilitating digital twin modelling.
Creating a digital copy of operations, miners can model the effect of operational and strategic changes, measure their likely success, as well as apply machine learning to find optimal approaches. This can be done in real-time and historically, allowing miners to maximize productivity at any given moment.

Bespoke solutions.
Mining operations, goals and organizations are unique. Leading Industry 4.0 AI + IoT platforms are easy to use, develop and optimize; facilitating mining companies to develop the digital mining solutions that they need in-house.

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Key considerations when analyzing Industry 4.0 technology in the mining sector.

Realizing the need to change and understanding how investment in these technologies will help the mining sector to achieve its business goals is essential, but so is preparing the organization ahead of any technology implementation to mitigate the challenges that it can bring - it will also support the sector when exploring its options.

Considerations:

- **Security & operational risks -** New technology brings with it threats. The potential for new outages that stop operations should be considered, as should the potential cybersecurity threats from private and government actors. There are ways to mitigate these risks, notably with effective enterprise security, closed-loop systems, as well as back-up and DR planning; however, the adoption of Industry 4.0 technology will inevitably increase an organization's attack surface and security should always be a key consideration when examining any new piece of technology.
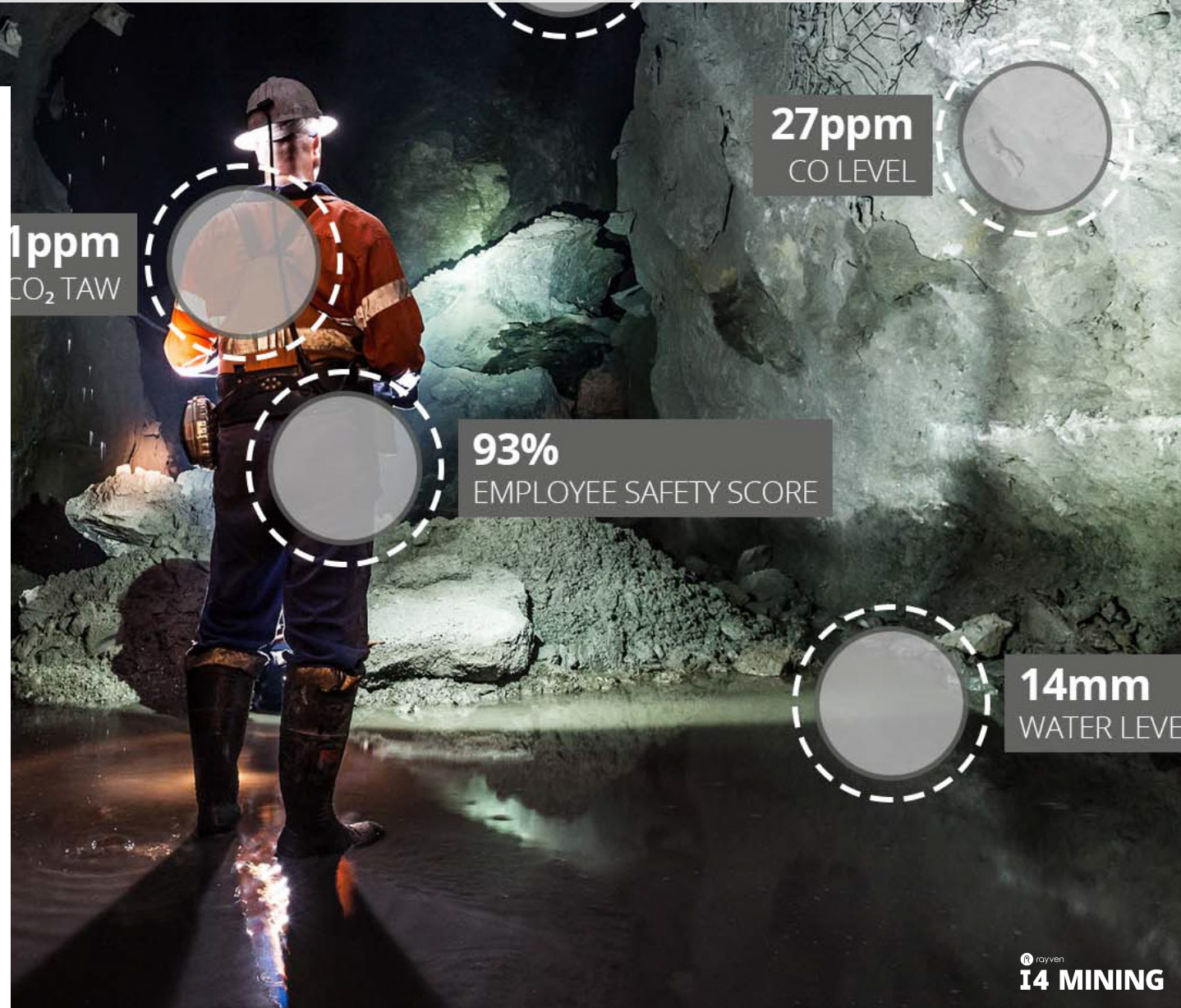
- **Workforce skills -** Few industries' workforces are adequately prepared for adoption of Industry 4.0 technologies. There is a large skills gap when it comes to the technologies that are likely to drive it, meaning internal teams will need to be retrained and new skills acquired if the mining sector is to be able to adopt, run and optimize AI + IoT technology. Whilst it's always possible to buy these skills, long-term success will require more of these to exist in-house, close to the operations or in the field.

- **Interoperability -** Many of the out-of-the-box solutions that offer Industry 4.0 functionality exist in closed technology ecosystems. Whilst they may integrate with general business technologies (CRM etc.) and other systems in their product suite, what they don't provide is a platform through which it is possible to integrate anything and everything. To develop a true best-in-class Industry 4.0 approach that fits operations perfectly in every way, it is necessary to adopt a central AI + IoT platform that's capable of integrating with any technology on a real-time basis, effortlessly.

- **Existing technologies & plant -** A lot of the world's mines and processing plants are running old, antiquated technologies. Whilst the electrification of operations will demand changes, some assets will be capable of being retrofitted with IoT devices, connected to gateways, networks and communication technologies that can extend their working lives. For those that can't, the cost of replacement will need to be considered or, minimally, the connectivity status of assets and plant be considered in the buying processes.

- **Speed and deployment -** Many providers' technology roll-outs go at a pace that means that commitment to an Industry 4.0 technology needs to be complete and long-term. Whilst this is great for the technology provider, the miner is always at a disadvantage and long-running transformation projects are invariably unsuccessful ones as costs get sunk into the roll-out, rather than the optimization. Pilot projects and solutions that can be in the field and operating in weeks will give a higher probability of success, because they will be able to be optimized to meet the real-world faster, learning operations, and uncovering new ways to solve complex problems.

- **Scalability -** Technologies that aren't scalable or capable of handling the data volumes needed to process an entire operations' data cannot achieve true Industry 4.0 status. Similarly, if the costs involved with operating at scale are likely to eclipse marginal gains, then those solutions will never achieve the scale needed to benefit fully from the technology. Miners need to be aware of capabilities, options for Edge processing, as well as cost structures before committing capital to projects.

- **Self-sufficiency & partner ecosystem -** Many providers of specialist mining technology do so with a siloed view as to how that technology should be developed, deployed, run and/or optimized. What this means is that the technologies are too complicated to be used, modified or enhanced by all but the most highly-trained - or not at all inhouse. As previously mentioned, to succeed with Industry 4.0 technology, the cherry picking of technologies to best fit individual organization needs is critical. The mining sector should be looking at technologies that boast a global partner network to support faster, wider roll-outs, as well as the technology's own ease-of-use to get teams up-and-running, end-to-end.

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Business case: start at I3.5 and move to I4.

33.8688° S, 151.2093° E
ASSET GPS LOCATION

203°C
TEMPERATURE

432 hours
TIME TO FAILURE

As with any novel technologies, making the business case is often the most difficult part of getting a solution off the ground: there's far too much cost, risk and uncertainty involved; and it's always going to be a best guess as to how it will perform in that precise environment.

The safest way for the mining sector to circumvent and mitigate these problems is to run low-cost, rapidly-deployable pilot programs. By identifying a precise use case for the technology (that relates to a clear, measurable business goal), deploying only the technology necessary to determine the various variables' impact on the businesses bottom-line and then directing optimizations from the insights, it is possible for a project to be able to demonstrate a clear, measurable ROI rapidly.

From there, as long as the technology is built with scalability in mind, it will be easy to compound the benefits by capitalizing and extending the solutions by growing the solution across operations to meet other business problems/goals.

Within the mining sector, as previously discussed, there's key 'zero' measures that can be applied to different scenarios and through that lens, the business case may be easy to make. To achieve zero measures, however, it may be necessary to think laterally about Industry 4.0 technology adoption.

For example, a common place within the mining sector to start with Industry 4.0 technologies is with predictive maintenance on plant. Whilst improving asset performance is always likely to be of benefit by improving uptime (which directly relates to productivity), it's also likely to be closely tied to zero harm measures by preventing catastrophic, hazardous failures.

Cited results from implementing a predictive maintenance regime within the mining sector:

- McKinsey 'Mining Productivity Index' has stated that they've identified operating efficiency improvements amounting to 70% of output due to breakdowns and stalled production.

- PwC stated in 'Balancing Uptime and Working Capital: Maintenance and Inventory Strategies in Mining' that effective condition monitoring of critical equipment can reduce maintenance spend by 14%.

- I4 Mining's solutions have lowered cost of maintenance on key plant by 9% and decreased unscheduled downtimes by 63%.

...a common place within the mining sector to start with Industry 4.0 technologies is with predictive maintenance on plant.

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# How to adopt Industry 4.0 technology successfully.

For Industry 4.0 technology to be of benefit to any business (and for it to unlock sufficient budget to invest in it), it must be able to demonstrate tangible, bottom-line benefits for your organization.

Much like Industry 4.0's cousin, 'Digital Transformation', it offers a world of promise when applied in the right way, to the right problem, but far too much time is spent talking about the technologies involved and what can be achieved, rather than what business problems they're going to solve (the use case) and what you're going to achieve (the outcome) by doing it in this new way.

Once it's clear what's trying to be achieved, then from a practical point of view, it becomes all about the data. However, it's not about MORE data, it's about collecting the RIGHT data, FAST and RELIABLY. Data is needed to not just analyze and build a business case, but to continually feed into any solution built to allow it to operate - without it, everything else fails.

In the world of 'Big Data', it's easy to capture everything and get lost in the noise - the true skill is knowing what's relevant to measure when assessing and honing in on that.

For Industry 4.0 technology to be of benefit to any business... it must be able to demonstrate tangible, bottom-line benefits for your organization.

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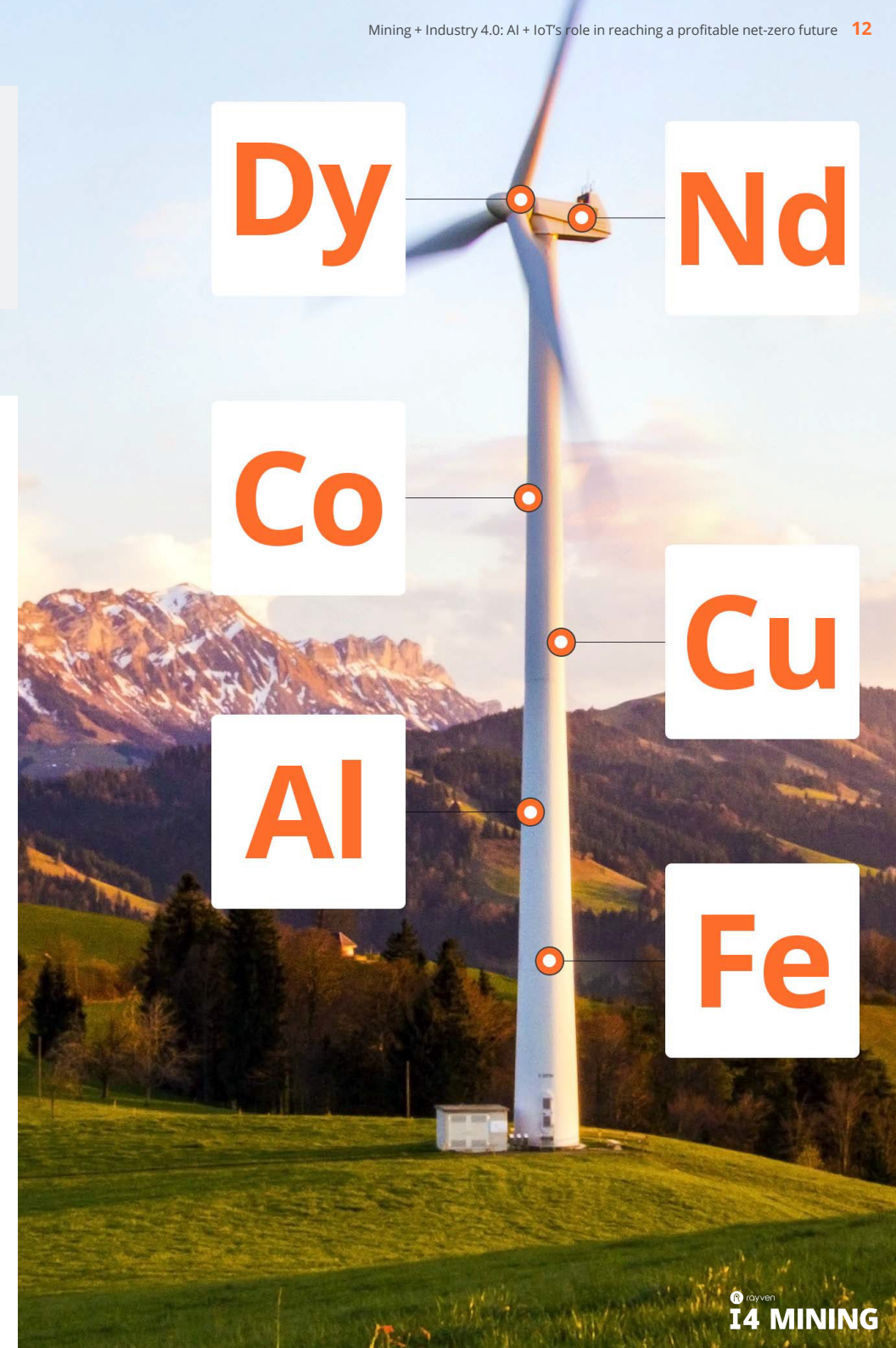
1. **Identify the business objective.** Understand the goals that are being worked towards and the outcomes that the solution is to drive, whether its efficiency, output or something else – often this decision has already been made for you because the problems are obvious and growing.

2. **Pick a champion.** To drive change within any business, someone that is willing to educate key stakeholders and champion the project widely is critical. It could be a small team, but ideally they need to be P&L-focused and have both a strategic understanding of what can be achieved, as well as be interested in innovation within the sector. It will be their responsibility to not only make the business case, but then also bring the wider workforce along on the journey so that the project doesn't stumble post-deployment - change management can be the hardest piece.

3. **Explore the use case.** Consider how Industry 4.0 technology might be used in particular environments in different scenarios to achieve the overarching goal. For example, if it was to improve efficiency, there's lots of inputs that go into that, e.g. what's happening on the processing plant floor, with the furnace, transport, etc. By choosing the right use case, rather than a technology, it is easier to plan an effective, successful project.

4. **Analyze internal resources and the skills gap.** It's likely that there will be internal skill sets or existing technology roadmaps that might be of use, so this is the time to establish what the skills gap is, before drawing up a plan on how to find them before committing to a broader plan.

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5. **Find the right suppliers.** Work with organizations that know the mining sector and that have a trusted network of partners who they can call in to create the ideal solution. Any business promising a silver bullet, is advisable to be given a wider berth: Industry 4.0 solutions are complicated and one size doesn't always fit all, it's also highly-likely that they work with a network of partners to implement and run the program (if they don't, with so many skill sets and technologies needed, are they truly best-in-class solutions) ensure that they also have an eye for the long-term and aren't offering siloed non-expandable technologies.

6. **Pick a key metric and look to fill data gaps.** Pick what the key metric of success will be and then establish where there are data gaps or it's not possible to measure at present or in real-time. From here it's possible to establish what hardware and software will be needed, as well as how automation and business logic models would work in your particular business.

7. **Identify the technology stack.** As detailed earlier, there are numerous parts that go into a solution, so pick the right pieces.

8. **Start small.** Run a small pilot program to establish what the business case is. This approach reduces risk and necessary upfront investment, making it far more likely it will be able to begin. Take one function, site, or handful of assets or plant and work with it; monitoring over time to see (and measure) the impact that it's having – all with an eye on how this can scale.

9. **Make the business case.** Craft the business case with proven data points for expanding and scaling the solution to different sites, assets or products with clearly identified metrics and establish-able benefits.

10. **Scale.** Roll-out across multiple sites and capture bigger data sets from across operations, leveraging them to speed-up and enhance the optimization loop. Working with a partner that can work with you over the longer-term and, critically, knows how to scale will shorten future reduced costs, speed-up the deployment process, and reduce further development cycles.

Start small, build business cases, and utilize organizations and partners that not only work together and are experts in their field, but who are asking the right questions.

Start small, build business cases, and utilize organizations and partners... who are asking the right questions.

I4 MINING

Ready-to-go mining solutions

Discover I4 Mining's pre-built AI + IoT solutions or
speak to us about your bespoke needs.

Health + Safety

Achieve zero harm to
workforce, simply.

I4 Mining's Health + Safety digital mining solution
enables you to connect all of your people, plant and
systems to utilize historical and real-time data;
preventing workforce harm across your operations and
enabling you to achieve your zero harm objectives.

Environment + Community

Making zero harm to
environment easy.

I4 Mining's Environment + Community digital mining
solution is a complete environmental monitoring,
management and compliance solution that enables
you to monitor your operations in real-time and use AI
to predict, prevent and remediate breaches, fast.

Asset Monitor + Maintenance

Achieve 100% scheduled uptime
& increase tonnage.

I4 Mining's Asset Monitor + Maintenance solution is a real-
time asset monitoring, utilization optimization & predictive
maintenance solution all-in-one. It enables you to improve
plant performance across your operations, from drill rigs and
motor graders, to pumps and HVAC equipment.

Yield + Production

Increase yield, prevent breakdowns
and find efficiencies.

I4 Mining's Yield + Production digital mining solution enables
you to monitor and analyze all of the variables that go into
material extraction, screening and processing to uncover
improvements and then seize upon them. It Increases yields,
prevents breakdowns and finds efficiencies using the
platform's IoT, AI and adaptive real-time data analysis.

Energy + Resources

Turn real-time energy + resource data into
tangible cost and carbon savings.

I4 Mining's Energy + Resources digital
mining solution enables you to optimize the
usage of the costly inputs that go into your
operations and reduce waste; delivering
you immediate efficiencies and dramatically
improving profitability, fast.

Oversight

Get a single source of truth and advanced analytics
to reduce risk & solve compliance challenges.

I4 Mining's Oversight digital mining solution improves real-
time strategic decision-making, enhances risk assessment and
reduces the reporting burden by providing you with up-to-
date, accurate data in an easy-to-use predictive analytics
engine. Beyond that, Oversight gives you the ability to execute
those decisions, both manually or via AI-led automation.

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I4 Mining: Fast-to-deploy, highly-flexible & commercially viable at-scale.

Time-to-Deployment

Within 30 days

Cost Advantage

Up to +80%

Time-to-Value

90 days

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