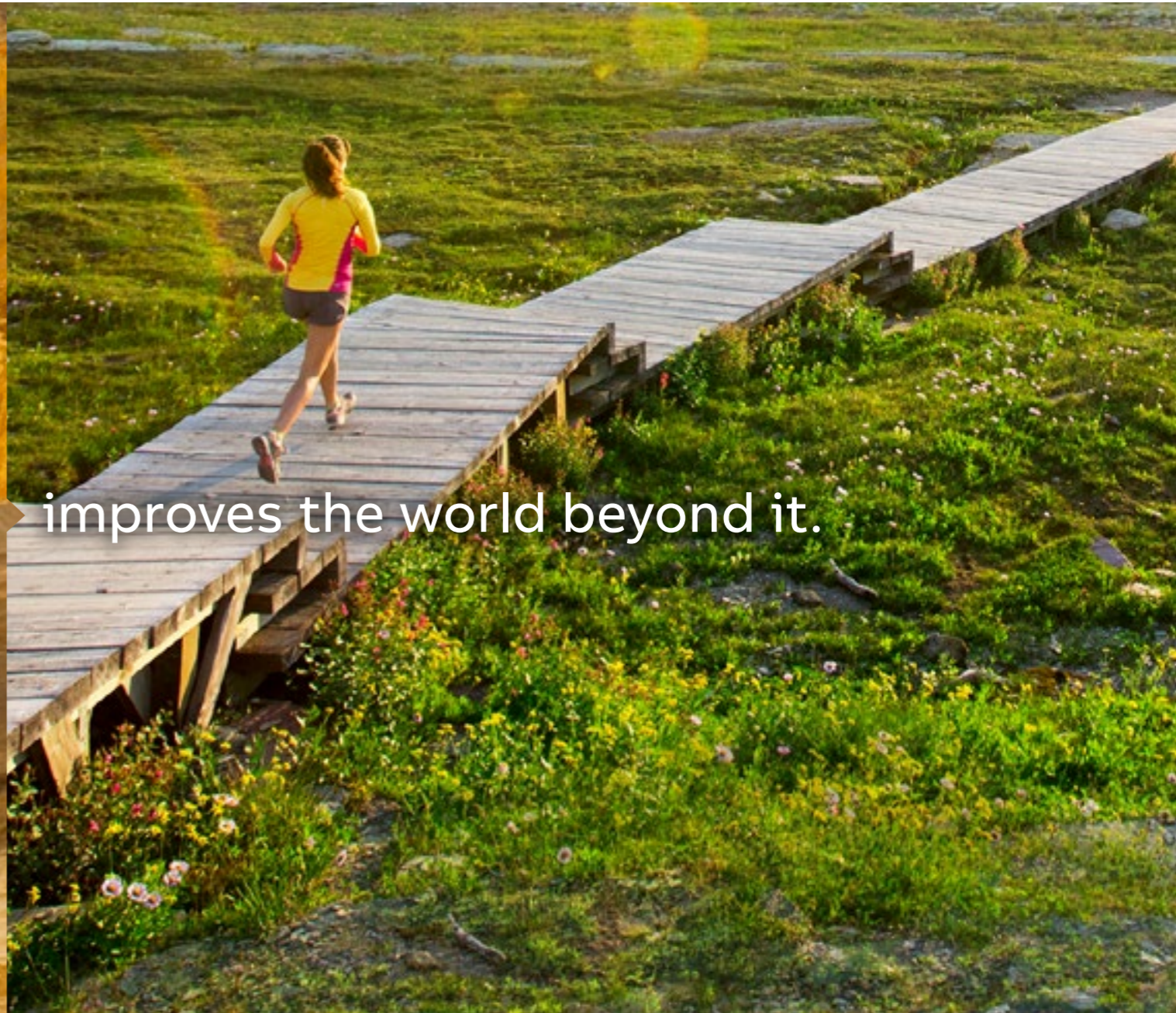




Electrifying your mine also



improves the world beyond it.

ABB eMine™. For your world, and mine.



Mining is essential for a sustainable world.

Cellphones, electric vehicles, batteries, wind farms...virtually every aspect of modern life relies on the ores mined from the earth. But that same industry accounts for up to 7% of all greenhouse gas emissions. This at a time when the Paris Agreement and national regulations are calling for emission reductions. Current methods aren't as efficient as they can be. And they come with an extremely high energy cost.

The energy needs of the modern mine simply cannot be sustainably met with diesel machinery alone. There must be a transformation. And ABB is committed to working with mines to bring about that transformation.



 Mining accounts for up to **7% GHG emissions***

*Source: [mckinsey.com/business-functions/sustainability/our-insights/climate-risk-and-decarbonization-what-every-mining-ceo-needs-to-know](https://www.mckinsey.com/business-functions/sustainability/our-insights/climate-risk-and-decarbonization-what-every-mining-ceo-needs-to-know)

ABB eMine™. For your world, and mine.

We are committed to a more sustainable future for mining.

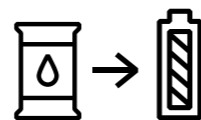
At ABB, we care as much about the health, safety and well-being of our environment as we do for the people who inhabit it. To that end, we embed sustainability into everything we do. We aim to enable our customers to avoid 600 megatons of CO₂e through products sold from 2022 to 2030, while we are setting science-based, net zero targets by 2030 and 2050.



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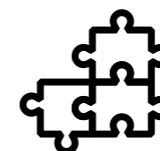
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It means we work hand-in-hand with our customers and partners to convert existing mines from fossil fuel energy to all-electric; while still keeping them competitive and ensuring high productivity at the highest safety standards.

130 yrs

It means we draw upon our 130 years of experience in mining and our world-class electrification, automation and digital solution portfolio to design state-of-the-art mines.



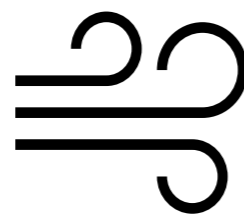
It means we develop integrated and tailored systems specific to a mine's operational needs—from grid to wheel—including various mine applications such as hoist, grinding and conveyors.



It means we optimize overall mine design, integrating stable and efficient systems to provide the right technology and maximize productivity and energy efficiency.

We are committed to a more sustainable future for mining.

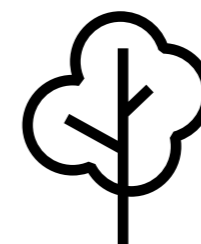
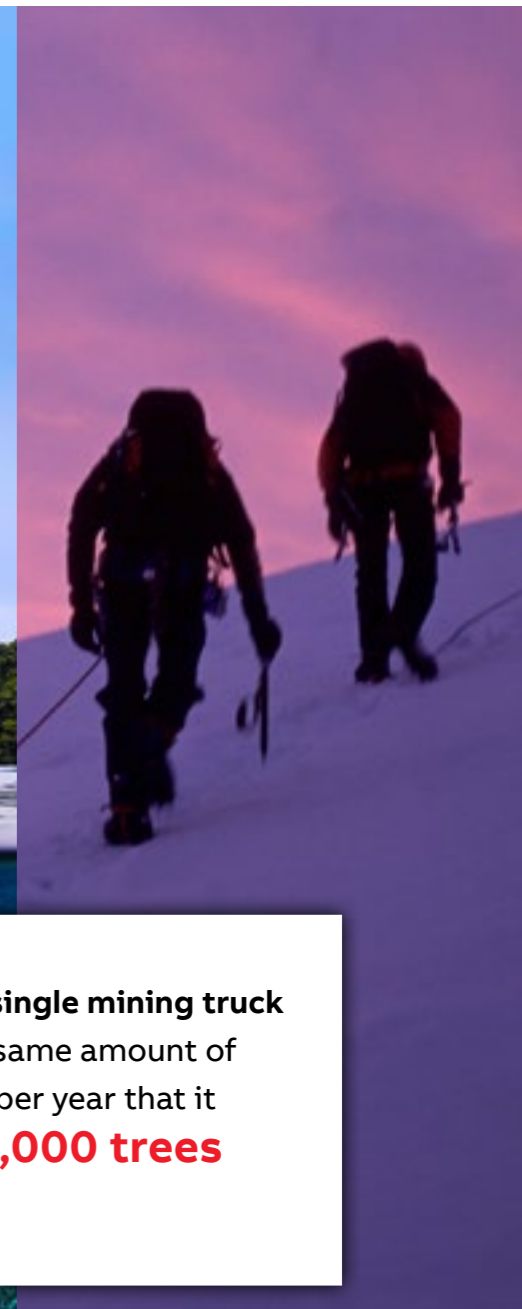
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If every truck in every mine were electrified, we could remove **198,000 tons of CO₂** every day from the air we breathe.

We are committed to a more sustainable future for mining.

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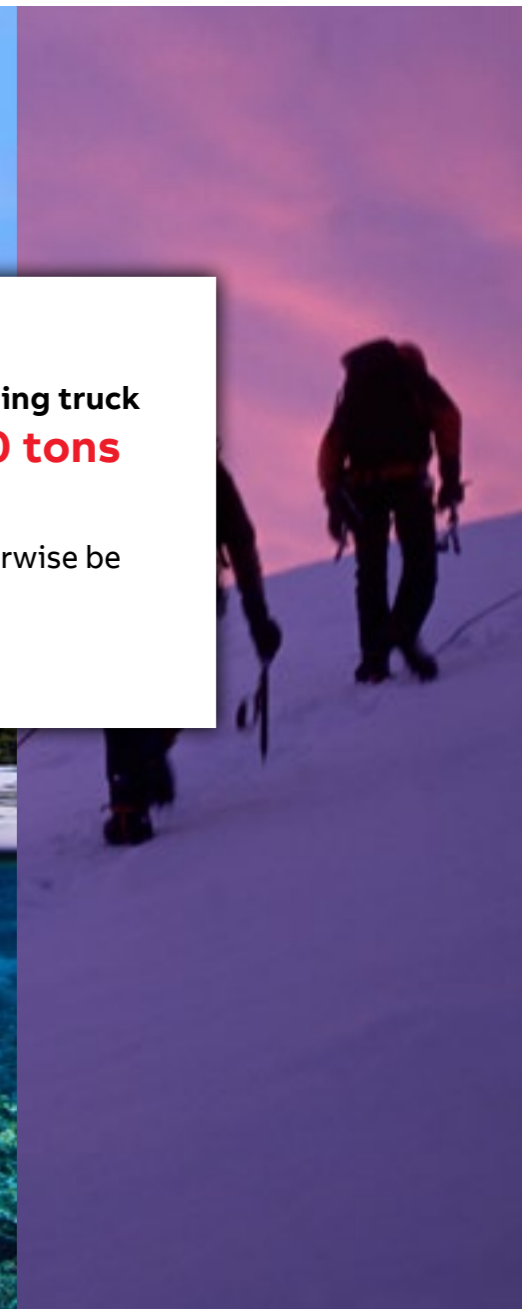
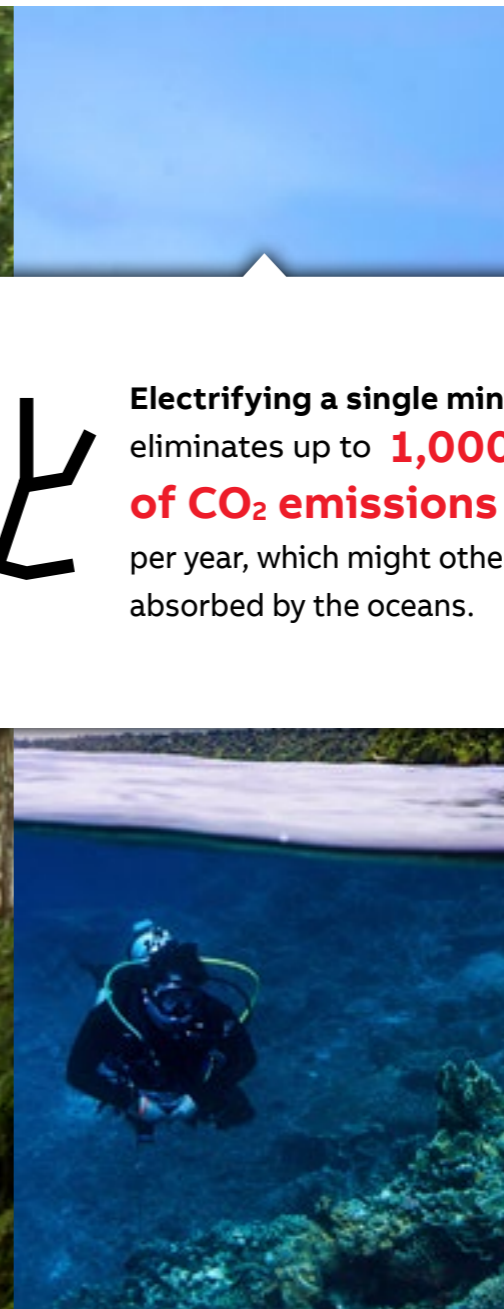


Electrifying a single mining truck eliminates the same amount of CO₂ emissions per year that it would take **46,000 trees to absorb.**

ABB eMine™. For your world, and mine.

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Electrifying a single mining truck eliminates up to **1,000 tons of CO₂ emissions** per year, which might otherwise be absorbed by the oceans.

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Electrifying a single mining truck eliminates enough CO₂ emissions per year to save **3,000 m² of arctic ice.**

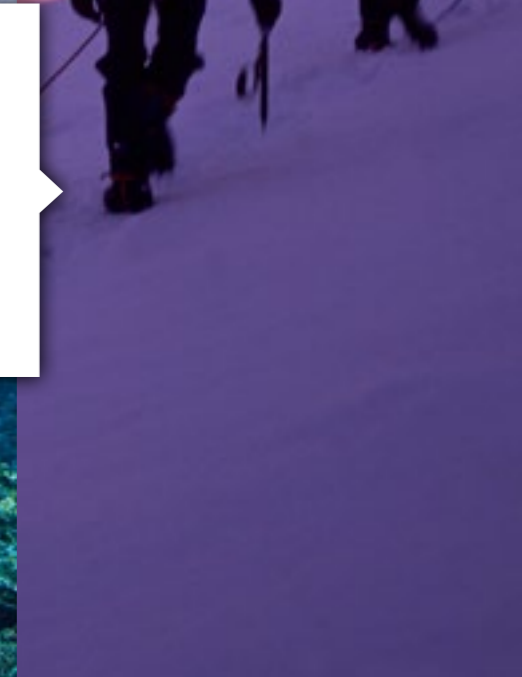
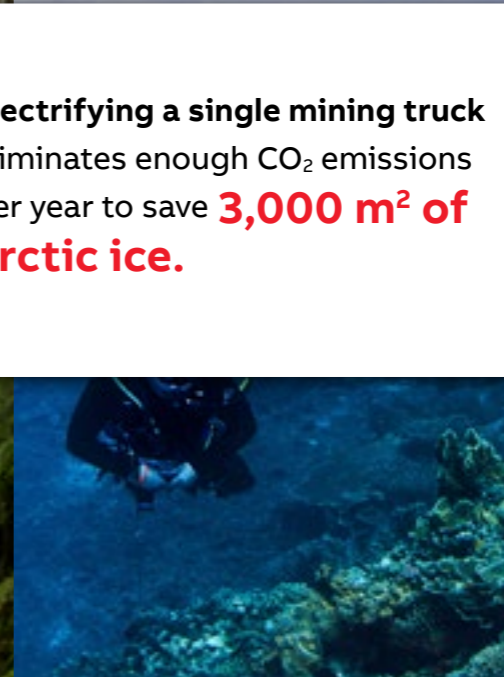


ABB eMine™. For your world, and mine.

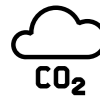
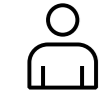



We know what it takes to build an all-electric operation.




There are many reasons to transition to an all-electric mine. And just as many elements to consider before you begin the journey. ABB not only understands these requirements, we can also equip you to meet them.

ABB eMine™. For your world, and mine.



Social drivers

-  • Government regulations on gas emissions and carbon footprint
-  • Improve working environment of people in the mine (reduce gas and noise)
-  • Push for electric vehicles

Technology drivers

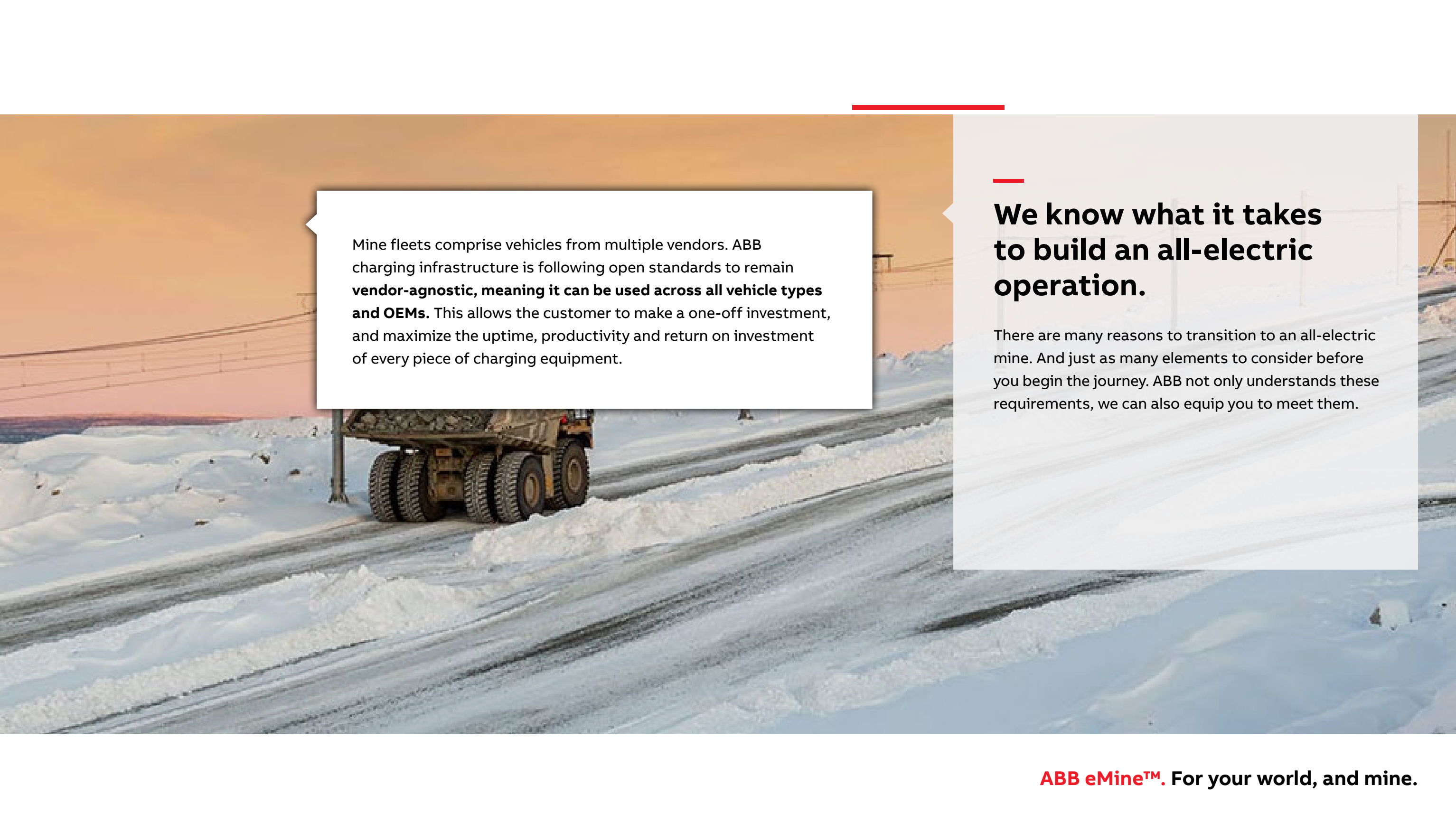
-  • Industry development of EV production platforms with proven and mature technology of onboard drive train, as well as charging infrastructure or battery swapping
-  • Battery evolution with high energy and power density, as well as longer electric range and lower cost
-  • Increased performance and efficiency

Financial drivers

-  • Reduced maintenance costs
-  • Reduced reliance on fuel

We know what it takes to build an all-electric operation.

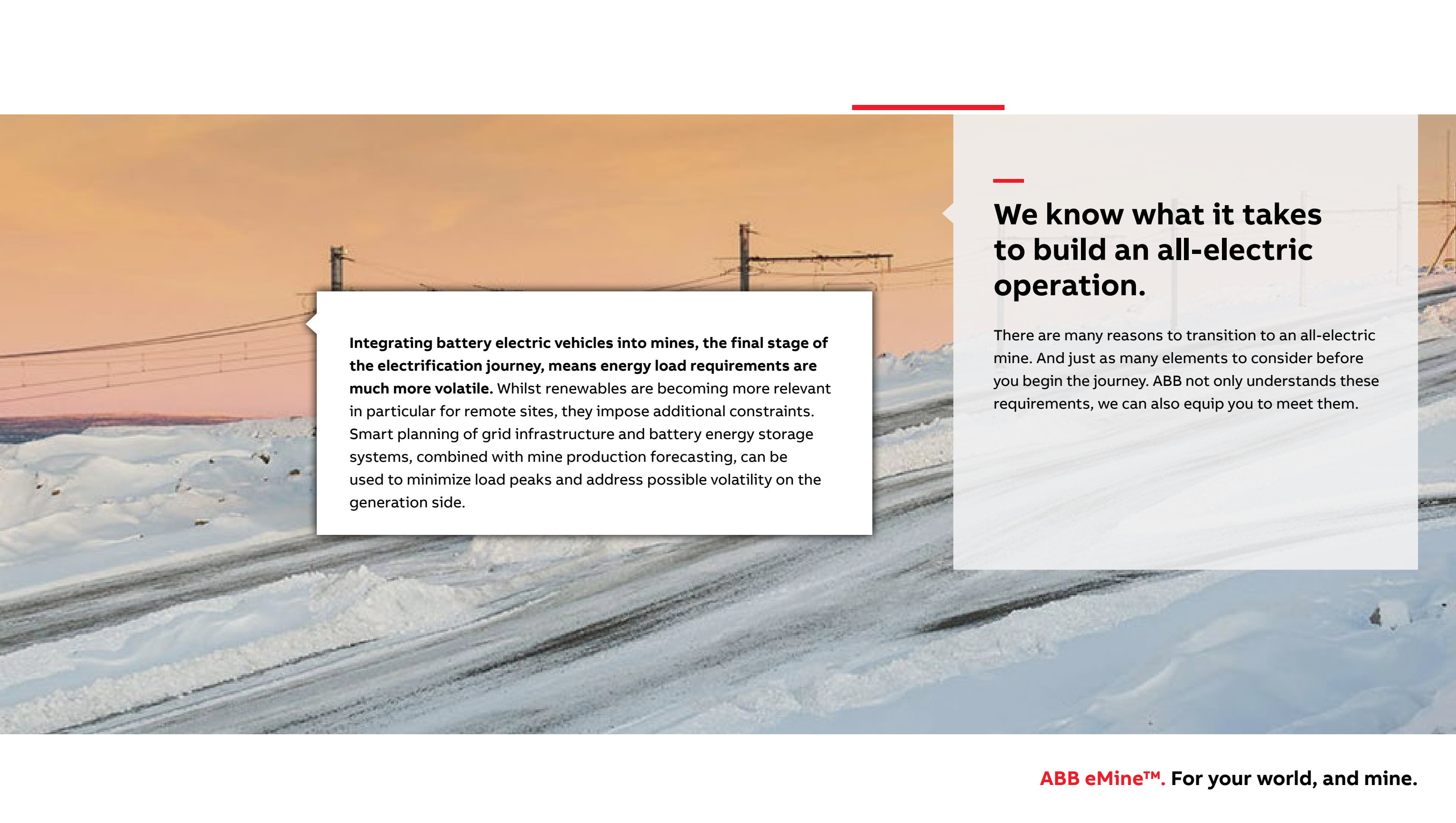
There are many reasons to transition to an all-electric mine. And just as many elements to consider before you begin the journey. ABB not only understands these requirements, we can also equip you to meet them.

A large yellow mining truck is driving on a snowy road at sunset. The truck is in the middle ground, moving away from the viewer. The road is covered in snow with deep tire tracks. The sky is a mix of orange and blue, indicating the time is either dawn or dusk. In the background, there are some industrial structures and power lines.

Mine fleets comprise vehicles from multiple vendors. ABB charging infrastructure is following open standards to remain **vendor-agnostic, meaning it can be used across all vehicle types and OEMs**. This allows the customer to make a one-off investment, and maximize the uptime, productivity and return on investment of every piece of charging equipment.

We know what it takes to build an all-electric operation.

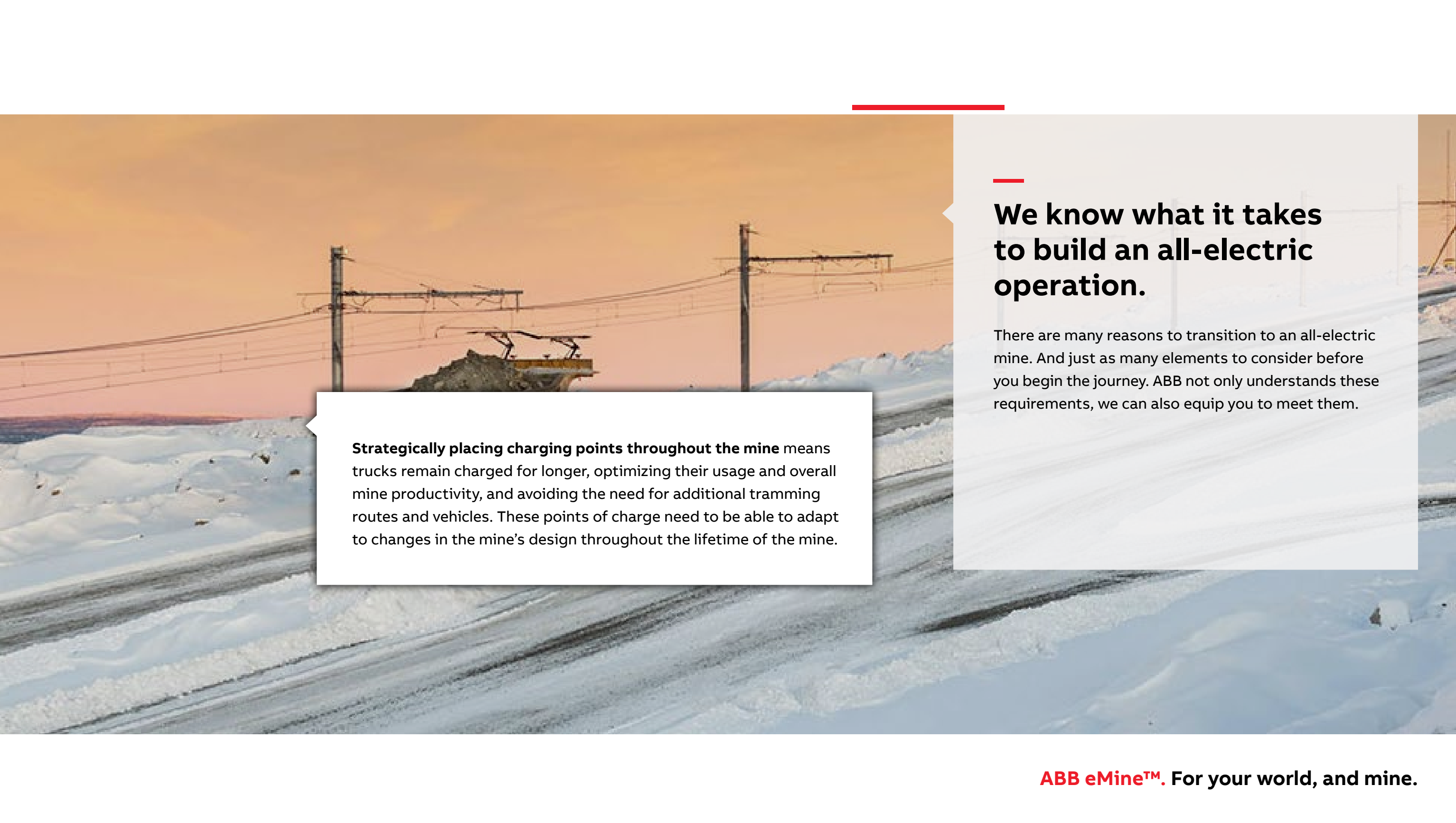
There are many reasons to transition to an all-electric mine. And just as many elements to consider before you begin the journey. ABB not only understands these requirements, we can also equip you to meet them.



Integrating battery electric vehicles into mines, the final stage of the electrification journey, means energy load requirements are much more volatile. Whilst renewables are becoming more relevant in particular for remote sites, they impose additional constraints. Smart planning of grid infrastructure and battery energy storage systems, combined with mine production forecasting, can be used to minimize load peaks and address possible volatility on the generation side.

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There are many reasons to transition to an all-electric mine. And just as many elements to consider before you begin the journey. ABB not only understands these requirements, we can also equip you to meet them.



Strategically placing charging points throughout the mine means trucks remain charged for longer, optimizing their usage and overall mine productivity, and avoiding the need for additional tramming routes and vehicles. These points of charge need to be able to adapt to changes in the mine's design throughout the lifetime of the mine.

We know what it takes to build an all-electric operation.

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Ruggedized and mine-approved automated connection interfaces must be designed to withstand the harsh environmental conditions in many mines and high-power demands of large mining trucks. This requires open mechanical and electrical standards and effective collaboration with vehicle suppliers.



We know what it takes to build an all-electric operation.

There are many reasons to transition to an all-electric mine. And just as many elements to consider before you begin the journey. ABB not only understands these requirements, we can also equip you to meet them.

Adopting new technologies will change how mines and mining assets are operated. Does the civil infrastructure and operational schedule need to be changed to meet the demand of these battery electric vehicles, for example? Early-stage design thinking and planning are crucial to success.



Introducing ABB eMine™.

Electrifying your mine, like mining itself, is a process. Based on industry expertise and deep experience, our team understands the challenges facing you as you consider transitioning to all-electric. But understanding is only half the battle. eMine™ makes the all-electric mine possible with a purposeful approach, proven methods and integrated electrification and digital system solutions from mine to port.

**ABB's Broad
Portfolio**

**Strategic
Collaboration**

**Consultancy
Services &
Mine Design**

**Tailored and
Fit-for-Purpose
Solutions**

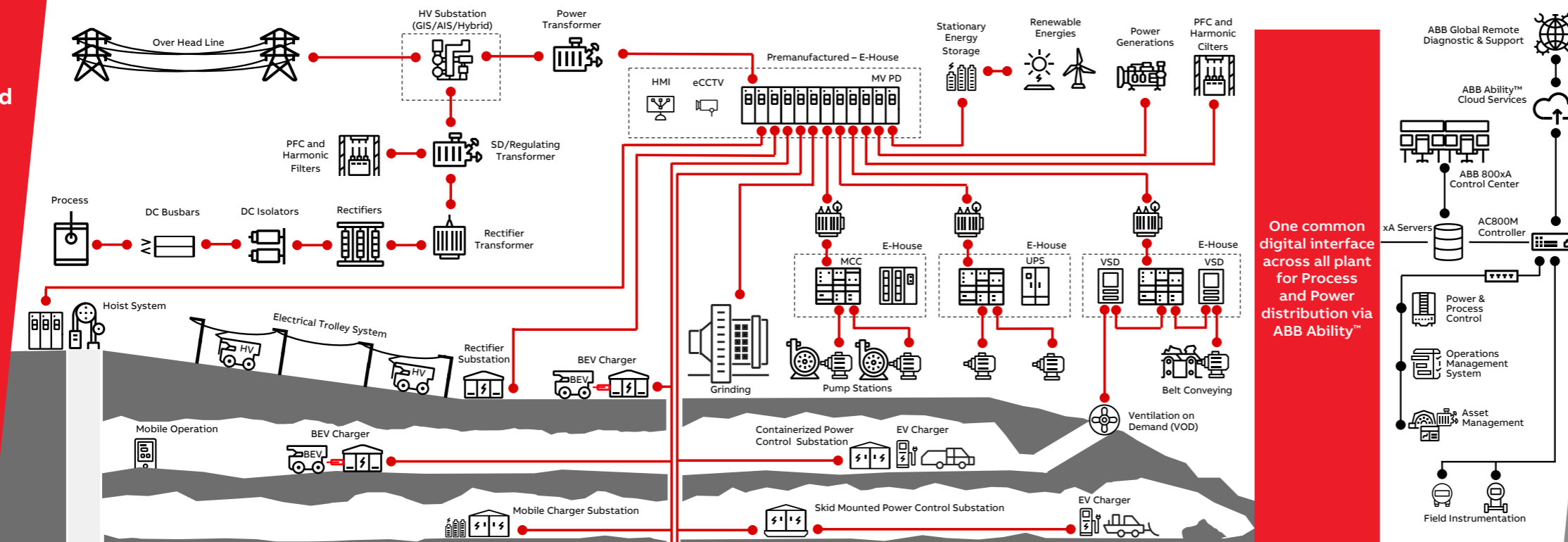
**Lifecycle
Services**

ABB eMine™. For your world, and mine.

Broad portfolio. Deep expertise.

ABB eMine™ can electrify your mining equipment, from pit to port and mine to market. Our fit-for-purpose solutions are designed to meet the operational demands of the modern mine, and they're backed by ABB's decades of real-world experience in electrifying, automating and digitally connecting mine equipment and operations. Plus, with eMine™ you get a single ABB team that can be with you through all of the phases of transitioning to an all-electric mine.

Your mine, electrified.



Strategic Collaboration

Consultancy Services & Mine Design

Tailored and Fit-for-Purpose Solutions

Lifecycle Services

ABB eMine™. For your world, and mine.



ABB's Broad Portfolio

—

One team. Layers of expertise.

ABB has a dedicated Product Management and R&D organization focused entirely on the mining industry. The group develops and maintains dedicated software, hardware and service products based on ABB's digitalization, automation and electrical platforms, ensuring state-of-the-art and best-fit technology for mining applications, while supporting the lifecycle and evolution requirements of mining operations.



Strategic Collaboration

Consultancy Services & Mine Design

Tailored and Fit-for-Purpose Solutions

Lifecycle Services



**ABB's Broad
Portfolio**

ABB eMine™. For your world, and mine.



Strategic
Collaboration

All-electric mine requires all working together.

The time to change is now. But the mining industry is clear that when it comes to electrification, nobody can make it alone. Partnerships and co-creation of solutions with OEMs, other mining companies and governments are needed to successfully integrate electrification in mines. We are working with OEMs to fast-track the development of new emissions-reducing systems with electrification and automation of the whole mining operation the goal.

Our joint development and co-creation approach leverages the domain expertise of key partners to meet a wider range of needs:



Mining
Company



Mechanical



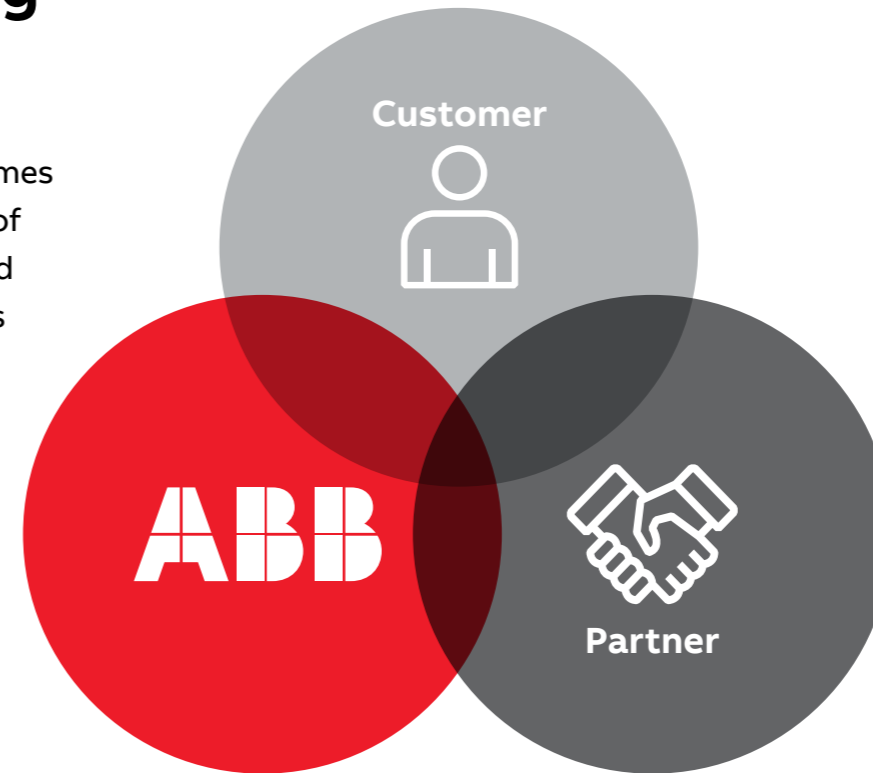
Infrastructure
and Civil



Vehicle OEM
or Retrofitter



Mine
Designer



Consultancy Services & Mine Design

Tailored and Fit-for-Purpose Solutions

Lifecycle Services

ABB's Broad Portfolio

Strategic Collaboration



Consultancy
Services &
Mine Design

Early engagement is the key.

An all-electric mine looks a lot different than a traditional one. Your ABB team will partner with you during the earliest stages—pre-planning and design—which will help increase added value, provide greater costs savings and reduce complexity. By getting in early, we can provide interoperable, fit-for-purpose solutions and technologies that make mines safer, smarter and reduce carbon emissions. Doing so lets us integrate electrification and automation through ABB digital applications. By integrating the whole mine digitally, we are set up to plan, monitor and control processes, optimizing operations and energy usage. We can even streamline production after the operation is up and running.



Tailored and Fit-for-Purpose Solutions

Lifecycle Services



ABB eMine™. For your world, and mine.



Consultancy
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Mine Design

Make our expertise yours.

Our team will work with you to develop an integrated design leveraging domain knowledge and our own anchor products.

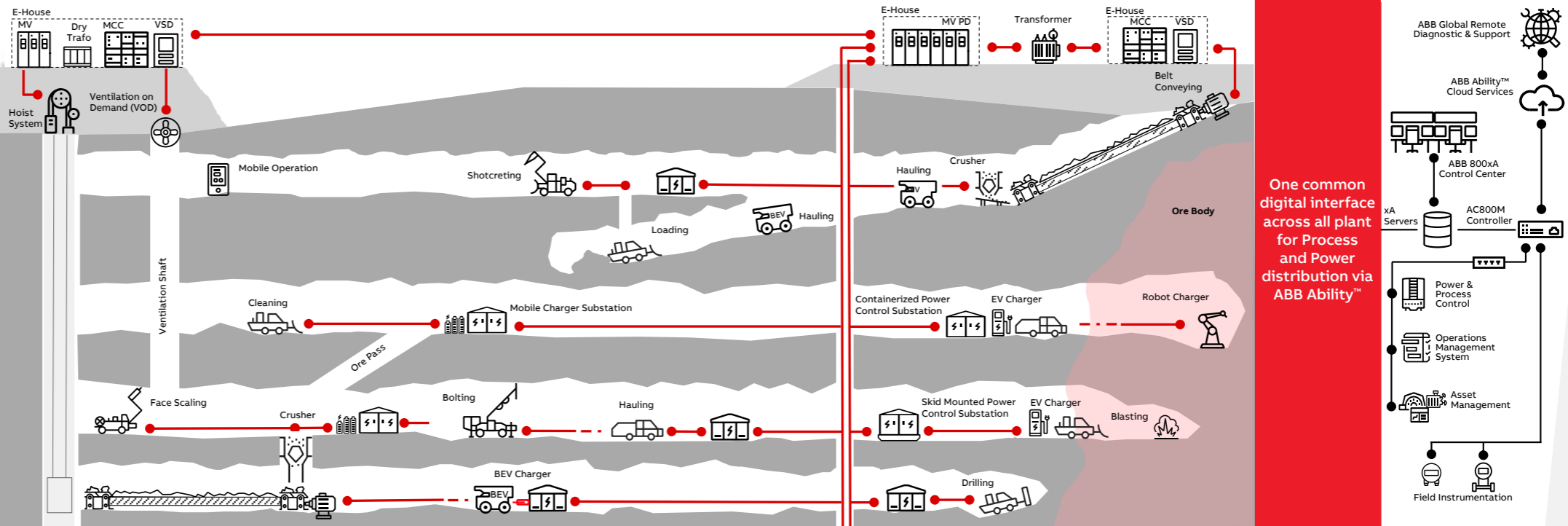
- Optimized solutions and trade-offs (e.g., hoist vs. conveyors vs. trucks) considering geology and operations
- Integrated electrical solutions considering load peaks based on duty cycle, harmonics, voltage dip mitigation and network protection
- Combined digital, automation and electrification solutions, also considering existing systems and leveraging partners
- Identification of correct technology for applications, considering energy efficiency and environmental impact
- Focus on early solution standardization



Tailored and Fit-for-Purpose Solutions

Solutions made for the unique challenges of today's mines.

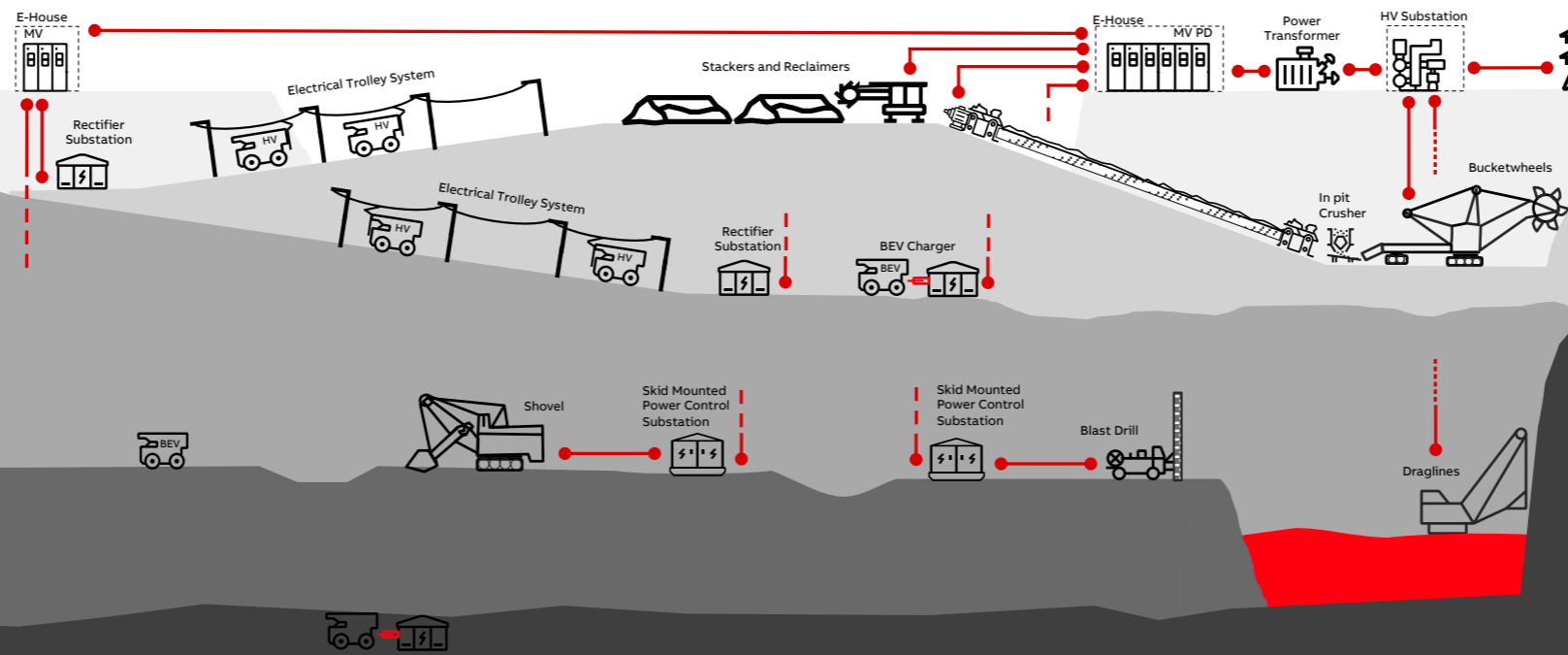
Building on decades of mining project electrification experience and expertise, and over 10 years' experience in providing charging infrastructure for buses, trucks and cars, we are able to offer solutions that are uniquely designed to handle the requirements of the mining industry based on latest technologies. And by integrating these solutions with automation and digital systems, we are set up to plan, monitor and control processes, optimizing operations and energy usage from grid to wheel.



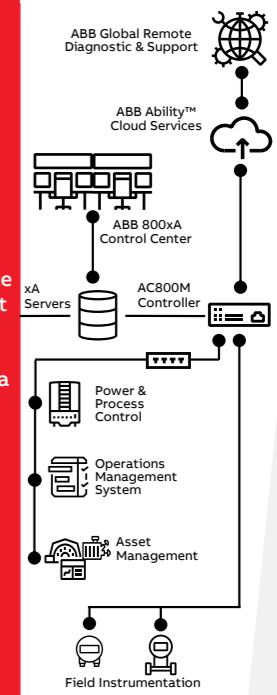
Solutions made for the unique challenges of today's mines.

Building on decades of mining project electrification experience and expertise, and over 10 years' experience in providing charging infrastructure for buses, trucks and cars, we are able to offer solutions that are uniquely designed to handle the requirements of the mining industry based on latest technologies. And by integrating these solutions with automation and digital systems, we are set up to plan, monitor and control processes, optimizing operations and energy usage from grid to wheel.


**Tailored and
Fit-for-Purpose
Solutions**



**One common
digital interface
across all plant
for Process
and Power
distribution via
ABB Ability™**



Lifecycle Services

ABB's Broad Portfolio
Strategic Collaboration
Consultancy Services & Mine Design

ABB's Broad Portfolio

Strategic Collaboration

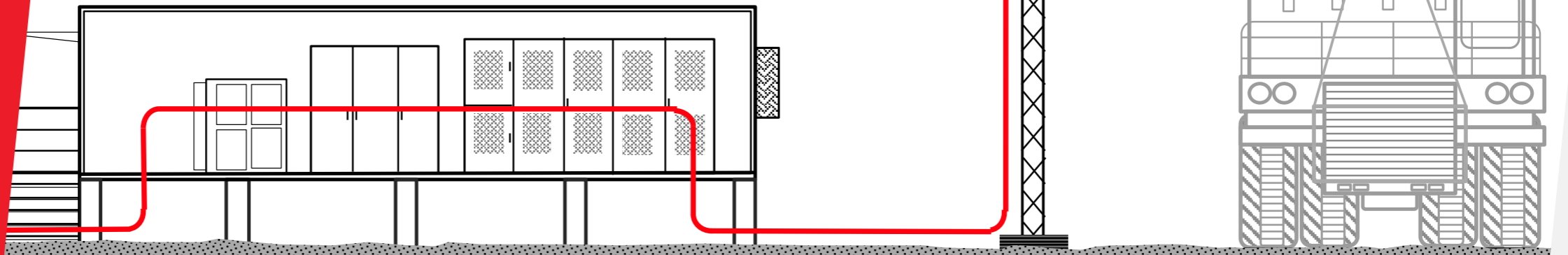
Consultancy Services & Mine Design



Tailored and
Fit-for-Purpose
Solutions

ABB eMine™ Trolley System

Today's trolley technology—based on diesel hybrids—will evolve and transform into battery-trolley hybrids over time. ABB's trolley system is the perfect technology for supporting this trend and helping you transition to an all-electric mine. Built on decades of electrification experience and expertise, ABB eMine™ Trolley system can reduce your diesel consumption by up to 90%, lowering your energy costs and your environmental impact at the same time. Plus, electrified trucks run at a higher speed and provide better speed-on-grade. The trolley system is best for heavy-duty vehicles and needed for inclined hauling—which battery-only solutions are not yet capable of.



Lifecycle Services

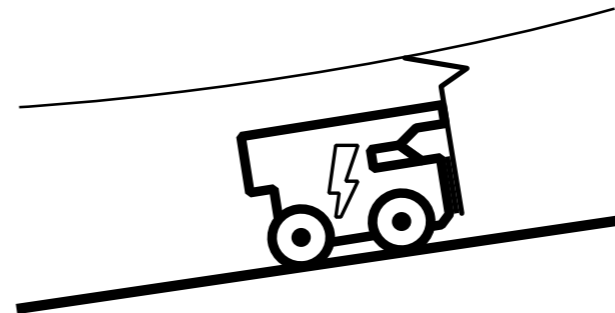
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With Trolley



Reduced CO₂ emissions



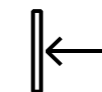
Higher speed-on-the-grade



Reduced costs



Reduced maintenance



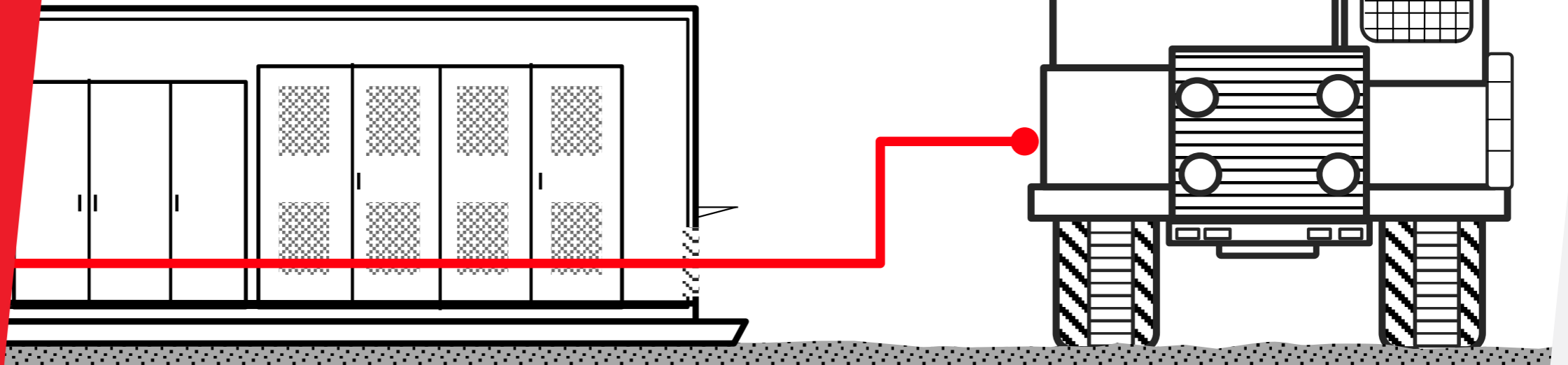
ROI 2-5 years



Tailored and
Fit-for-Purpose
Solutions

ABB eMine™ Charging Systems

A key component to keeping the all-electric mine running is making sure the equipment can perform when it needs to and the trucks can charge when they need to. ABB provides charging solutions designed to fit the needs of today's mining operations and interface with all vehicles. We are vehicle type and OEM agnostic, supporting an interoperable approach based on proven standards that can provide any sort of solution needed to charge BEVs.



ABB's Broad Portfolio

Strategic Collaboration

Consultancy Services & Mine Design



Tailored and
Fit-for-Purpose
Solutions

Electrification challenges, meet ABB Ability™ digital solutions.

Through the ABB Ability™ MineOptimize portfolio, we are able to bring together electrification, automation and digital technology like no other company. By digitally connecting all of our solutions, they can be monitored and controlled to optimize operations and energy usage in real time.



Lifecycle Services

● **ABB eMine™. For your world, and mine.**

ABB's Broad Portfolio

Strategic Collaboration

Consultancy Services & Mine Design



Tailored and
Fit-for-Purpose
Solutions

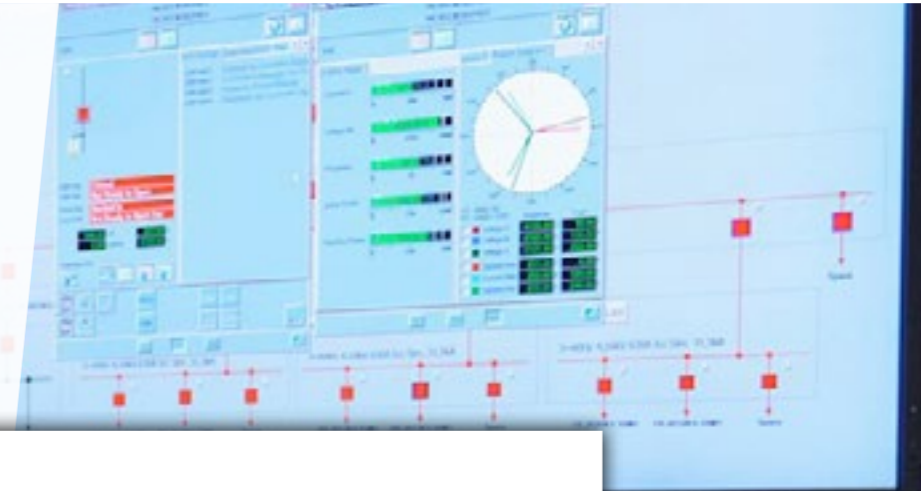
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How can you effectively manage process and power control simultaneously?

In mining, your main production assets are also your main electrical consumers. ABB delivers a highly standardized and configurable automation solution for continuous production processes and power control, with advanced integration and interoperability, enabling tight collaboration in between automation and electrification disciplines on all levels (commissioning, operation, maintenance and planning).

Results: Reduced CAPEX/OPEX



Lifecycle Services

● **ABB eMine™. For your world, and mine.**

ABB's Broad Portfolio

Strategic Collaboration

Consultancy Services & Mine Design



Tailored and
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Solutions

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How can you manage mine cyclical loads efficiently so you can increase productivity while reducing costs and emissions?

We provide a comprehensive energy management system solution, from control to optimization, connected to production demands.

Results: Reduced CAPEX/OPEX and reduce/control CO₂ emissions



Lifecycle Services

● **ABB eMine™. For your world, and mine.**

ABB's Broad Portfolio

Strategic Collaboration

Consultancy Services & Mine Design



Tailored and
Fit-for-Purpose
Solutions

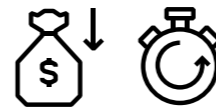
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How can you get full visibility over your complete value chain—from mine to port—and over the health conditions of multiple types of assets to ensure the highest productivity, improved maintenance costs and increased uptime?

Our comprehensive yet modular suite helps address mine needs to give a holistic view and analysis of the health of assets (components, equipment, systems, plants, fleet and enterprise) for different roles, from strategic to tactical.

Results: Reduced OPEX and increased production uptime



Lifecycle Services

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ABB's Broad Portfolio

Strategic Collaboration

Consultancy Services & Mine Design



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Solutions

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How can you efficiently manage allocation of people and assets connected to energy management requirements in a way that improves productivity while reducing costs and environmental impact?

We give you full mine operations visibility through our operations management system, which provides real-time scheduling, dispatch and tracking and that integrates the short interval control and closed-loop scheduler into the same digital platform.

Results: 5% to 10% operational efficiency and subsequent lowering costs



Lifecycle Services

● **ABB eMine™. For your world, and mine.**

ABB's Broad Portfolio

Strategic Collaboration

Consultancy Services & Mine Design

Tailored and Fit-for-Purpose Solutions



Lifecycle Services

Once we get you up and running, we keep you that way.

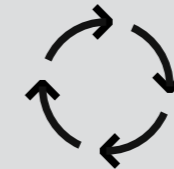
ABB services are tailored to the specific challenges of our customers. Through our advanced digital services, our mining experts can monitor your plant remotely, 24/7, to help keep your production up and running. Advanced digital mining services can collect and analyze your mining asset and operational data, providing remote expert support to identify, categorize and prioritize actions. And once you have invested in ABB mining equipment and solutions, we do everything to help you protect your investment—with an extensive training program to continuously improve staff expertise.

ABB acts as single source supplier with global integration experience for electrical, instrumentation and control. This provides a fast-track way of moving mines from costly and reactive time-based maintenance to planned preventive and predictive interventions. Through remote services, predictive maintenance and upgrades and retrofits, ABB helps mining companies ensure maximum performance throughout the mine's lifecycle.



Rapid Response

Guaranteed fast and flexible service response to maximize equipment availability.



Lifecycle Management

Provides power tools and our knowledge base to optimize and extend equipment life.



Performance Improvement

Increased productivity through usability and efficiency optimization of equipment and processes.

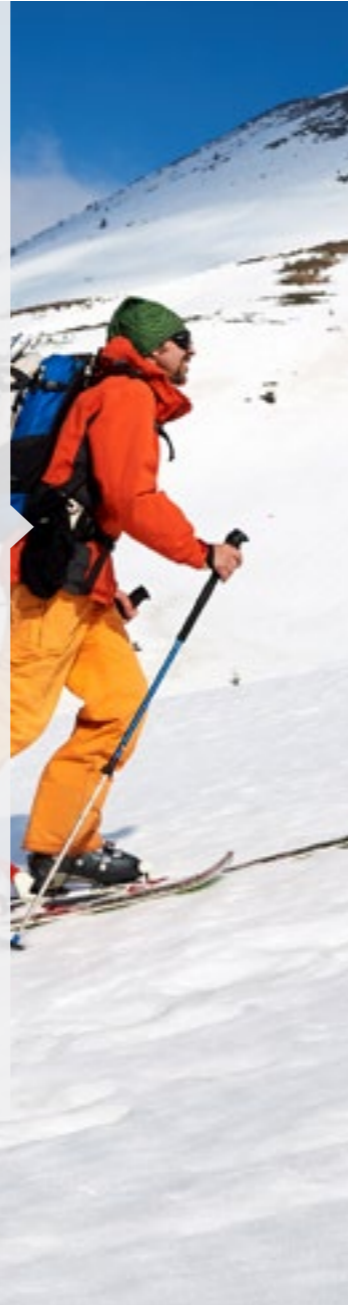
ABB eMine™. For your world, and mine.

Electrify your mine while improving the world beyond it.

Transitioning to an all-electric mine is going to take new thinking. New plans and designs. New training for your workers. And a whole new outlook on your operation.

It is not a simple task. The required technology is still relatively new and constantly developing, and the operational figures and geographical structure of each mine is unique. It typically requires comprehensive analysis to study different technological alternatives to achieve the best, most viable design for your all-electric mine.

ABB is perfectly positioned to help with that goal. With our deep and rich experience in the mining industry, we will do more than transform your mining operation. We will help transform the world beyond it.



Let's write the future of mining. **Together.**



ABB eMine™. For your world, and mine.

ABB eMine™. For your world, and mine.

Let's work together to create sustainable progress for the mining industry, and the earth it relies on.

Let's get started.

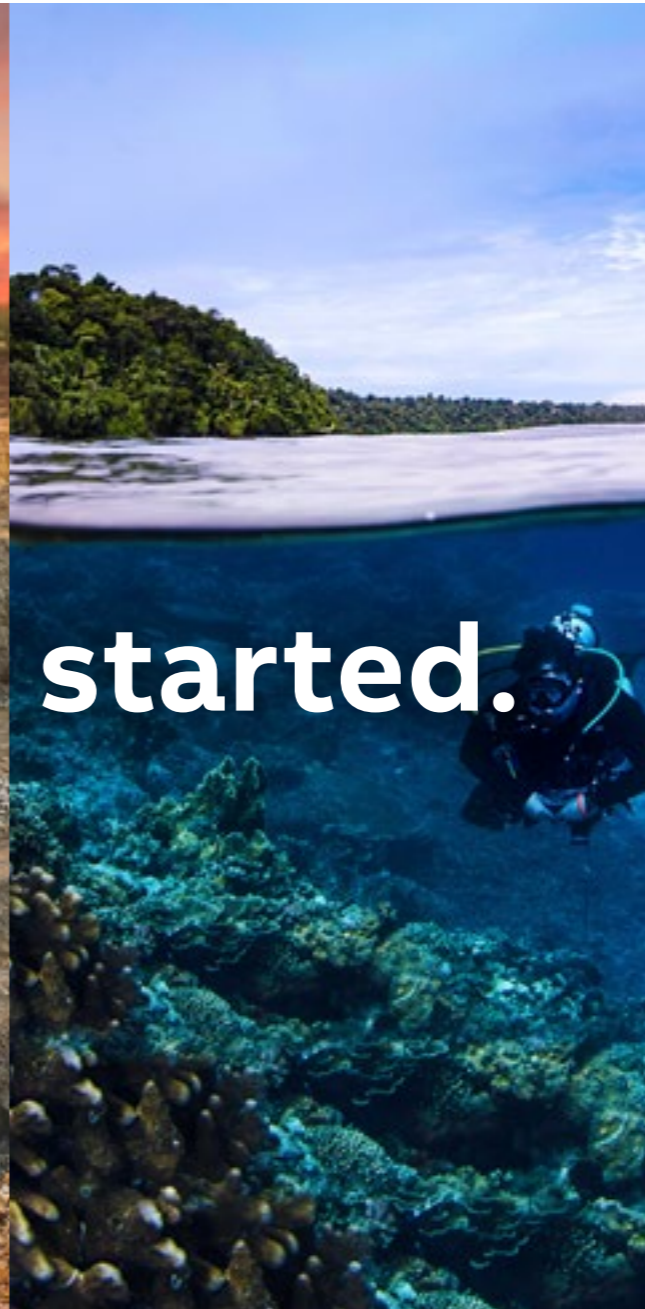


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