



# Transform Your Mine into a Digital Industrial Company



The operating climate for mining facilities has never been more challenging. Mine sites are faced with cost volatility, shrinking profit margins, and constantly changing buyer preferences. In addition, mining operators are challenged with compressed cycle times, increased price pressure, demands for customization, knowledge attrition, and growing environmental scrutiny. As a global industrial leader, GE faces these same challenges every day.

In response, GE is reimagining how industrial companies, including many GE companies, operate plants and deliver products using data as the fuel and advanced analytics as the growth engine. We embrace the vision of the Industrial Internet and the promise of driving disruptive, positive changes across the industrial landscape.

Modern mines are collecting terabytes of data—but they are not digital. They are under pressure to increase efficiency and produce at the lowest possible cost.

Solutions are needed that:

- Reduce unplanned downtime
- Optimize operations
- Enable proactive processes

What if anomalies were predicted and maintenance was performed only when needed? What if every plant performed like your best plant?

## This is GE's Digital Mine

GE Mining introduces the Digital Mine, a suite of technologies that can improve safety, performance, availability and reliability, and operations. GE Mining rests on four key focus areas: leading surface propulsion systems and underground

mining equipment, mining electrification, water infrastructure products, as well as our world-class Industrial Internet solutions. Digital Mine solutions include Asset Performance Management (APM), Operations Performance Management (OPM), and Safe Technologies.

With this suite of solutions, the Digital Mine team's purpose is to collaborate with you to understand your operations, identify your specific issues, and develop strategies that integrate, automate, and optimize your operations by providing real-time, data-driven insights.

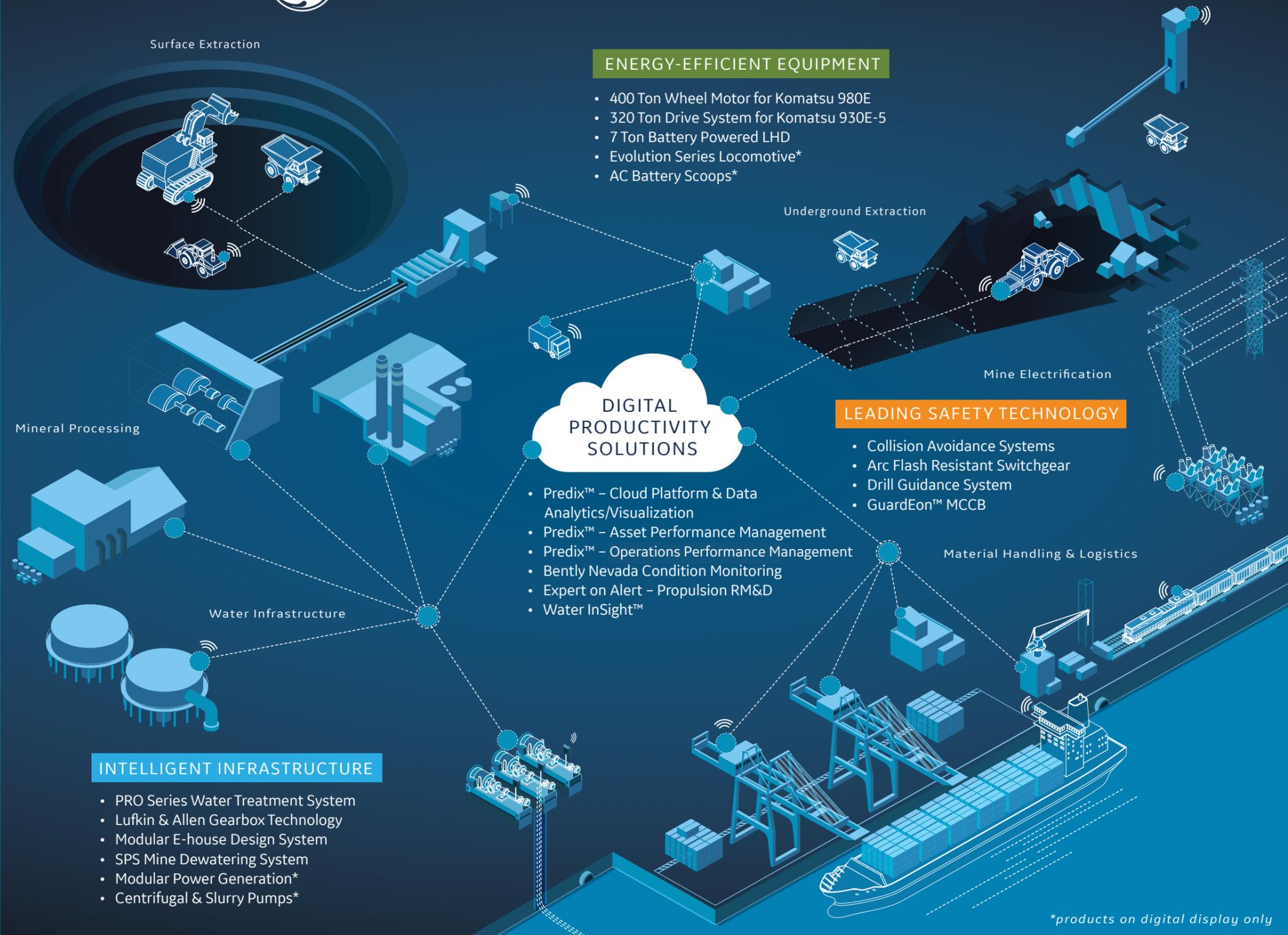
Intelligent real-time monitoring across the mine allows your operators to make data-driven decisions that improve equipment reliability and optimize mine operations. It combines machine sensors, connectivity, data capture, visualization, and analytics to support management of all your critical assets.



# GE solutions across the mining value chain



Transforming your mine's operations together



## The Industrial Internet changes everything

- Your mine sites are “brilliant”—giving you real-time visibility and control over all manufacturing processes
- Your mining facilities replace scheduled maintenance with just-in-time, predictive maintenance to prevent unplanned outages
- Your industrial data, control networks, and applications are protected from malicious software threats—automatically and continuously
- Your analytic capabilities are infinite and can be customized using open tools and pluggable software services—allowing you to minimize downtime, optimize performance, and react to market changes with flawless agility

**This is the Industrial Internet.** It is here now. It’s powered by Predix, the platform for the Industrial Internet. It will change the face of global industries for generations to come.

## Get Connected, Get Insights, Get Optimized, Get Results

The starting point for your digital industrial transformation journey is getting connected to build digital twins—digital models of your machines and processes within your mining

facility. Sensors then can transmit data from your assets securely to your chosen storage topology: on premises, on the Predix industrial cloud, or a hybrid. You can then use GE Digital’s application suites for APM, OPM, and Safe Technologies for your assets and operations. You can also create custom analytic applications by assembling prebuilt Predix software services and building new Predix services from scratch.

## Predix: The platform for the Industrial Internet

Digital Mine works on GE’s Predix, the platform for the Industrial Internet, combing the scalability of cloud computing, big data management, and advanced analytics to power new generations of industrial mining facilities.

Born from GE’s own experiences as a global industrial leader, Predix is a purpose-built, hardened cloud platform that provides the connectivity, security, and performance needed to drive advanced industrial applications for your mining site. Using Predix-powered applications, you can quickly gain insights about the availability and performance of your industrial assets, reduce downtime, and optimize agility and scale.

## Get Connected

GE’s Digital Mine offers Starter Kits to digitally enable your equipment and devices and provides the Predix Field Agent appliance for collecting data from a wide variety of devices and securely delivering it to your chosen storage topology: on-premises, on the Predix industrial cloud, or a hybrid. The Predix platform includes advanced features for maintaining security while data is in flight and at rest.

## Get Insights

Leveraging advanced data management and analytic tools, Predix-powered applications unlock the power of your data to reveal critical insights. Gain instant visibility using GE Digital Mine’s APM, OPM, and Safe Technologies; assemble custom apps from pre-packaged Predix services for machine learning, heuristic analysis, and physics- and engineering-based modeling; and roll your own Predix apps using popular programming/analytic languages.

## Get Optimized

By delivering a pre-built, secure, scalable platform for industrial analytics, Predix puts you in charge of your digital industrial journey. Whether you’re leveraging GE Digital’s Predix-powered application suites, assembling apps from pre-built Predix services, or building custom applications from scratch, Predix does the heavy lifting so you can focus on using your data to achieve measurable outcomes –improved uptime, reduced operating costs, increased market agility, and profitable growth.



# Digital Mine: Portfolio at a glance

## Asset Performance Management

- Machine & Equipment Health
- Reliability Management
- Compliance & Integrity Management
- Asset Strategy Optimization

## Operations Performance Management

- Operational Intelligence
- Forecasting & What-if Analysis
- Process & Performance Optimization

## Safe Technologies

- Collision Alert Systems
- Surface & Underground
- Drill Guidance Solutions

Predix

Cyber Security

Automation



### Extraction

- Surface
- Underground
- Materials handling



### Water

- Supply
- Distribution
- Discharge



### Electrification

- Production
- T&D
- Consumption



# The Digital Mine solution

Within our Digital Mine offering, we offer three basic solutions:

## 01 **Asset Performance Management**

## 02 **Operations Performance Management**

## 03 **Safe Technologies**

**Asset Performance Management (APM)** is about optimizing the reliability, performance, and service operations for assets that are critical to the mining pit. The solution covers the full range of APM needs—Machine & Equipment Health, Reliability Management, Compliance & Integrity Management, and Asset Strategy Optimization—to help asset-centric mining facilities increase uptime, decrease costs, and reduce operational risks.

With APM, you will:

- First understand how your machines are currently performing within the mining site
- Move to improving your performance, while reducing costs and minimizing risks to your people and the environment
- Focus more on preventative maintenance and developing intelligent actions to fully comply with regulatory measures.
- Optimize your performance by making step-change improvements in your maintenance efficiency and effectiveness

**Operations Performance Management** is about using data and analytics to optimize industrial systems—everything from transportation logistics, to manufacturing throughput, to complex “what-if” scenario modeling, to decision-making by operators, technicians, plant managers, and executives within your mining facility. By avoiding manual process control, it is possible to reduce variability and inconsistency, thus improving efficiency and productivity.

OPM leverages the power of Predix to provide real-time operational intelligence on control, site, fleet, and enterprise levels. OPM provides you with visibility, insights to your KPIs, and the ability to look at the actions to improve performance at lower costs.

**Safe Technologies** helps safeguard your people, equipment, and infrastructure with GE Collision Management Systems, a sophisticated and adaptable collision—avoidance and reporting suite developed specifically for the mining industry.

Collision Management Systems contains a variety of proximity-detection methods, including GPS, radio frequency (RF), VLF magnetics, and cameras to provide the one of the most effective high-integrity systems on market. With GE Collision Management Systems' reporting and analytics tools to monitor and manage operator behavior, you also can improve safety culture and compliance at your mine site.

The GE Collision Management Systems suite has been proven in use over 12 years and 270 million hours of operation.



# Digital Mine tiered offering



# Benefits

With Digital Mine, onboard analytics optimize:

- Recovery
- Throughput
- Energy efficiency

The equipment data is sent to the cloud and compared to a virtual copy of the individual machine—it's digital twin:

- Which predicts when maintenance will be needed
- Which optimizes availability and reliability

Individual machine data can be viewed on a mobile device, allowing the ground technician to see when and how maintenance should be performed, enabling immediate decision-making.

As the digital revolution expands, imagine the possibilities as all your assets become connected. Predix is making this possible today. Predix enables assets and operations optimization by connecting machines, data, and people on an industrial scale.

Predix is the platform for building and managing apps. It allows you to have the scale and security you need to enable optimal productivity.

No longer will your mine experience disruptive and costly deployments and upgrades. Leveraging the full suite of Digital Mine capabilities will allow you to:

- Increase asset performance
- Optimize operations
- Proactively manage safety within your plant



# Imagine the possibilities with Digital Mine

40% Reduction in variation  
– Impala Platinum

30%-40% Increase in operational  
capacity – Lanxess

10% Increase in smelter throughput  
– Lonmin Platinum

25% Reduction in maintenance  
costs – Rio Tinto

115% Of ROI achieved in  
12 months – Joy Global

Check out our Digital  
Mine video!

LEARN MORE



# Typical benefits with Digital Mine

## Key business drivers

Increase production →

Reduce energy consumption →

Reduce reagent consumption →

Reduce yield loss →

Increase recovery →

## Typical benefits

1% - 10%

2% - 10%

1% - 10%

~25%

1% - 3%

## Additional benefits

- ✓ Increase operational security
- ✓ Reduce environment emissions
- ✓ Stabilize process
- ✓ Reduce equipment maintenance
- ✓ Improve visibility into the status of productivity
- ✓ Increment the activities planning

# Get started today

GE's Digital Mine leverages decades of experience, cutting-edge data science and analytics technology, and the scale of \$1 trillion in managed assets to offer a full suite of solutions powered by Predix, the platform for the Industrial Internet. GE's Digital Mine balances traditionally competing priorities—reducing costs, improving availability and reliability, and managing risk—to provide intelligent asset strategies that help maximize asset performance and productivity.

Are you ready to make your operations safer and more reliable while helping to ensure optimal performance at a lower sustainable cost?





## About GE

GE (NYSE: GE) is the world's Digital Industrial Company, transforming industry with software-defined machines and solutions that are connected, responsive, and predictive. GE is organized around a global exchange of knowledge, the "GE Store," through which each business shares and accesses the same technology, markets, structure, and intellect. Each invention further fuels innovation and application across our industrial sectors. With people, services, technology and scale, GE delivers better outcomes for customers by speaking the language of industry.

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