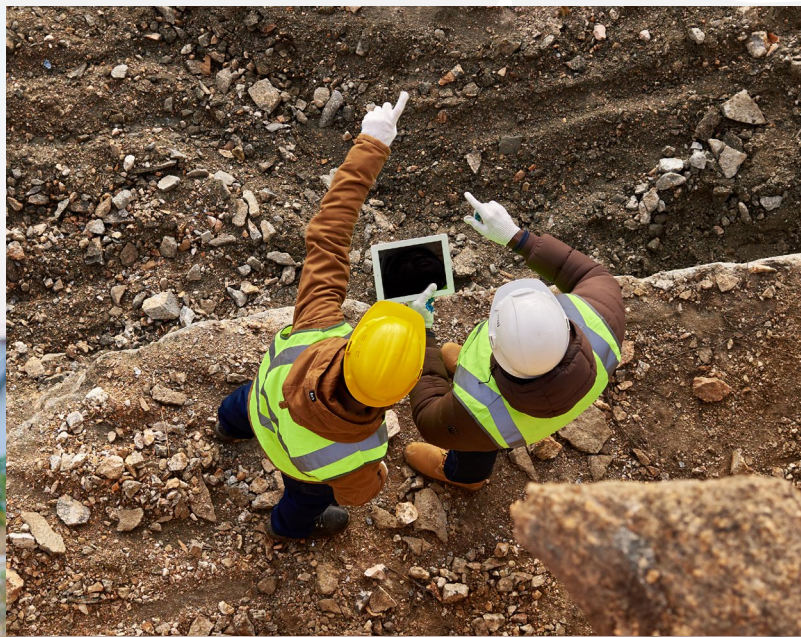
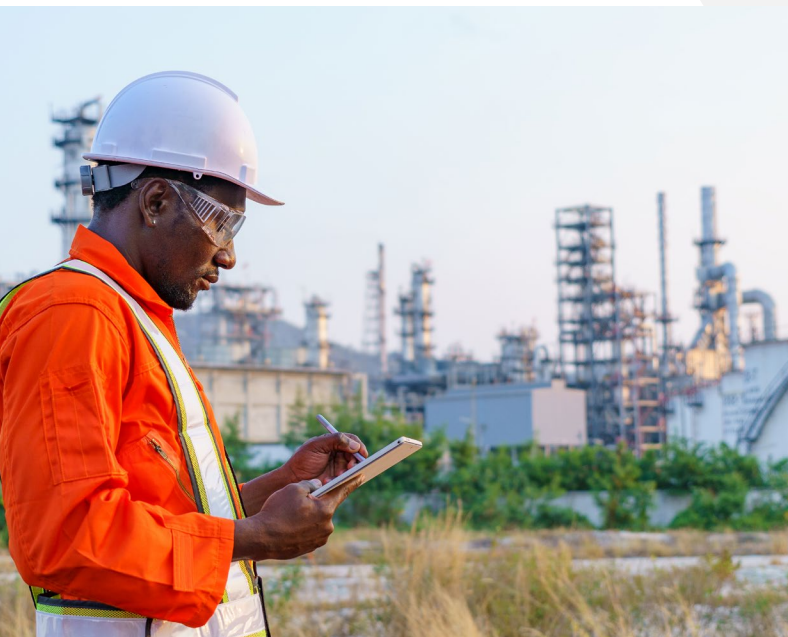


Scaling digital twins for energy and resources

From concept to reality—creating digital twins that elevate human potential



“Innovations like digital twins will be instrumental to optimize four key areas; production, waste, profits, and emissions.”¹

Industry backdrop

The energy and resources sector is at a pivotal juncture, marked by a race for supply, efficiency, sustainability, and safety amidst record levels of demand for energy and many essential commodities. Utilities, oil and gas, chemicals, and metal and mining companies face unprecedented pressure to achieve production targets without compromising the health of their employees, safety of their operations, nor the environment in which they operate.

Digital twins,² coupled with security and AI, are emerging as a transformative technology, offering real-time digital representations of physical assets, business processes, and the organization as whole.

No sector requires scaling digital twins as much as energy and resources because of its capital-intensive nature and global demand for energy and essential resources set to grow to record levels.³ The ratio of gross plant, property, and equipment (aka machines) published in any asset owner’s annual report compared to the number of employees (aka man), on average, is \$2 million gross PP&E per employee and rapidly growing. In comparison, all other industries average \$200,000 of gross PP&E per employee, a difference in magnitude of 10x. Analyzing annual reports across this sector, most companies have seen this ratio increase between 40 and 100 percent over the last decade.

The ratio between “man and machine” will continue to rapidly rise across this sector because of the vast amount of capital investment into new and existing facilities reaching record highs.⁴ This is fueling a rapid rise in the global market for digital twin technology, which is estimated to grow 60 percent annually to reach \$74 billion by 2027,⁵ aimed at supporting companies in reaching production and profitability targets safely.

Several additional key trends will drive the adoption of digital twins in the energy and resources sector, including:⁶

- Rising operational costs and pressure to improve efficiency.
- Increasing complexity of industrial equipment and systems requiring a simplified and accurate digital representation.
- Growing skills gaps as experienced workforce retires, taking valuable expertise with them.
- Supply chain resilience enhanced through predictive modeling.
- Regulatory pressure to improve safety and environmental performance.

This paper explores how information management technologies and best practices will help companies across this sector to scale digital twins and elevate human potential across their organization.

1 World Economic Forum, *AI-powered digital twins are about to change the face of industrial ecosystems*, 2024

2 Gartner, *Glossary, Digital Twin*

3 International Energy Agency, *World Energy Outlook 2024*

4 McKinsey & Company, *Global Energy Perspective 2023, 2024*

5 McKinsey & Company, *What is digital twin technology*, 2024

“Digital twins go beyond being a mere application or data aggregator; they are rooted in robust information governance, involve deep integrations, span a wide array of use cases, are secure by design, and scalable to manage high volumes of data efficiently.”

Phil Schwarz,
OpenText Sr.
Industry Strategist,
Energy & Resources

The OpenText vision for digital twins in energy and resources

Humans require machines. And machines require humans. Just as both humans and machines need to be managed to achieve their highest performance, so does the information that is generated and used by either one of them. The better that information is managed, the more the digital representation of the machine (or digital twin) and the workflows that directly support its operational performance will be trusted, autonomous, and secured. Moreover, adding the power of AI and LLMs will maximize the value of digital twins to confidently predict and safely act on machine performance.

It's often misconceived that a digital twin of a machine is a function of only its real-time sensor streams and a predictive model that learns how good, bad, or cautionary performance looks. While any digital twin certainly incorporates real-time measurements of its performance, there are many more aspects to creating and scaling true digital representations of machines and entire industrial assets. Digital twins go beyond being a mere application or data aggregator; they are rooted in robust information governance, involve deep integrations, span a wide array of use cases, and are secure by design and scalable to manage high volumes of data efficiently.

Financial systems of record, such as ERP, contain the information to create a digital twin of the machine's financial record over time. Asset maintenance systems of record, such as EAM, contain the information to create a digital twin of the machine's maintenance record over time. GIS applications hold the information to create a digital twin of the machine's geospatial record over time. PI systems have information to create a digital twin of an asset's performance over time.

These examples of digital twin characteristics are very important to creating digital twins, yet still contain information gaps to create digital twins at scale that are trusted, autonomous, and secure. These examples of software applications are designed and specialize in structured data (organized in rows, columns, and tabs) within their respective domains and act as vertical threads of a digital fabric representing a digital twin of a single machine, a process unit, an entire industrial asset, and enterprise.

Every fabric has horizontal threads and is true for digital fabrics as well. Below, are seven information management components that act as horizontal threads across a digital fabric, which are critical to create trusted, autonomous, and secure digital twins of any asset, of any size, and across its entire lifecycle at scale. A true digital twin sits at the center of connected ecosystems, the internet of clouds, and embodies information governance, security and AI.

Uncover content in context

An AI-ready content management solution enables organizations to eliminate information silos and leverage critical information across a project or operation lifecycle of an asset. Digital twins of assets, business processes, and the entire enterprise provide content at employees' fingertips. Equipment manuals, engineering drawings, SOPs, and so much more are critical information elements that fuel trusted digital twins. Execute content-driven business

processes faster, including engineering change orders, training validation of critical SOPs and ingestion of critical supplier documents energize the digital twins of assets and the digital twins of business processes that support those assets.

Digital twins are more than a digital representation of people, processes, and things. They're virtual and intelligent assistants that humans can engage with and ask questions, expecting trusted and secure answers in return. Leveraging an AI-powered intelligent assistant, users quickly find answers to questions contained within asset documentation, benefiting from chat-based conversational search, content summarization, and translation for any worker, regardless of their location in regional or global operations.

Keep critical assets running

Secure B2B integration is a critical enabler of digital twins. It facilitates the secure, real-time exchange of machine sensor data and business transaction information between asset owners and their strategic manufacturing field service vendors.

This secure B2B connectivity enables your strategic vendors to support your predictive maintenance journey at the equipment level, along with automated supply chain responses to help you quickly respond to potential failures. For instance, securely sharing sensor information from rotating machinery to the manufacturers or after-market service providers of these assets enables them to support you in heading off equipment performance issues and triggers automated service or spare part replacement workflows. Secure B2B integration allows you to track the status of critical spare parts, replacement equipment, and field service all the way to arrival at your site or functional location.

Different types of equipment carry varying levels of risk, so the predictive time window of sensor data exchange required to prevent equipment failures differs accordingly. Industrial IoT orchestrates the secure exchange of sensor data between asset owners and strategic vendors, regardless of differing time windows for various types of equipment and providers. No matter the equipment or its associated risk level, potential failures can be prevented through your trusted supplier network.

True digital twins enable you to tap into the power of AI by leveraging a virtual advisor to quickly track when spare parts, replacements, or service will arrive, and surface additional information about vendor transactions that impact machines.

Gain insights at scale

Digital twins are enabled by advanced analytics at scale so that you gain insights at scale. Unlock broad insights with AI and analytics to maintain machine performance, safety, and uptime. Enrich asset documentation, analyze asset imagery for hazardous conditions, and pull analytics on large data sets on machine performance. With real-time, AI-powered business analytics, energy and resources companies boost predictive maintenance, production forecasting, root cause analysis, and other use cases at scale, turning diverse data into actionable intelligence.



Meet demand and service expectations

Emergency readiness and prompt response foster confidence and trust. Modernize service experiences by using data to inform discussions around assets via drone videos, improve technical support call quality management, and improve the use of crowd-sourced information for distributed assets. In addition, deploy a GenAI assistant to create tailored content to keep machine owners, partners, or customers up to date on recommended service to meet SLAs.

Protect against cybersecurity threats

Navigate the complex threat landscape and defend against the most sophisticated cyberattacks on energy and resource infrastructure. Agile security posture management and a unified approach to risk management streamline compliance and secure data and applications across the organization. Plus, AI-powered threat hunting and detection combines advanced machine learning models that continuously learn outpace cyberattacks at unprecedented speed and scale.

Increase IT efficiency

Bring new levels of insight and efficiency to network service and network operations management with autonomous asset discovery across a multicloud environment. By improving the oversight of devices and applications, organizations speed up device monitoring, configuration, and resolution time. And with GenAI for IT operations, use a smart virtual agent for swift issue resolution, leveraging knowledge from service tickets that address similar issues.

Scale DevOps engineering

Boost the efficiency of DevOps teams to streamline the deployment of software that enhances digital twin creation and asset representation. With AI-driven DevOps automation, energy companies benefit from faster application development and delivery, as well as automated software testing to improve the quality, reliability, and scaling of digital twins.



Why OpenText?

OpenText serves thousands of companies across the world in the energy and resources sector, including 24 of the top 25 by market cap in their journey to safely, reliably, and cost effectively deliver critical commodities to the world.

OpenText powers and protects information to give organizations the information advantage. We sit at the center of connected ecosystems and the internet of clouds, and play a critical role as our customers adopt cloud, security, and AI.

The world is in a race for energy and essential commodities, and that race is just as much about information management as it is about energy and critical resources themselves. We help organizations with the most complex information challenges to reimagine information and elevate human potential. Our solutions connect knowledge with action to spur innovation and growth across the energy and resources sector.

Proposed next steps

We welcome the opportunity to be your strategic partner in your information management journey. Together, we can outline a vision and identify opportunities to scale digital twins and elevate human potential across the organization. Below are suggested next steps to ensure your digital twins journey is in lockstep with your information management journey.

- **Introductory meeting**

Bring together the OpenText Global Account Director or Senior Account Representative with your organization's CIO, CTO, or decision maker on digital twin investments.

- **Joint roadmap exchange**

Hold a day-long information exchange with operations leaders (Directors and above) and OpenText. OpenText will gather insight about your digital twin processes and associated digital transformation initiatives, current approaches, and obstacles. OpenText will then provide an overview of information management technologies and best practices that support those initiatives.

- **Business Value Consulting workshops**

Engage OpenText Business Value Consulting with supporting lines of business to assess their current state and quantify the business impact of potential OpenText solutions to scale digital twins technology.

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