How digital twins can **revolutionize the energy industry**

Reduce risk, improve efficiency, save money, and more transparently manage your assets

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Intro: State of the market for diverse energy producers

The energy industry is full of both risk and opportunity. Untimely equipment failure, degrading assets, and unreliable or inaccessible historical data are just three examples of the obstacles energy producers encounter daily.

The good news is that the industry is also swimming in data. And effectively collecting, organizing, understanding, and deriving value from that data can help you make higher-quality decisions faster.

Of course, that's easier said than done. Harnessing data and making it actionable requires a solution that can:

- → Capture crucial insights to inform your strategy
- → Turn those insights into outputs that you and your experts can easily understand and implement

The balance between energy value in the market and production costs also demands better and more transparent data analysis. Are your current costs reflective of the actual cost of business or simply what you've become accustomed to spending? Does your company know what areas of the operation might benefit from better information transparency and analysis?

Imagine being able to see and understand when to make the right repairs and replacements for your equipment to maximize its utility, all while reducing downtime from failure. How much money would that save you each year?

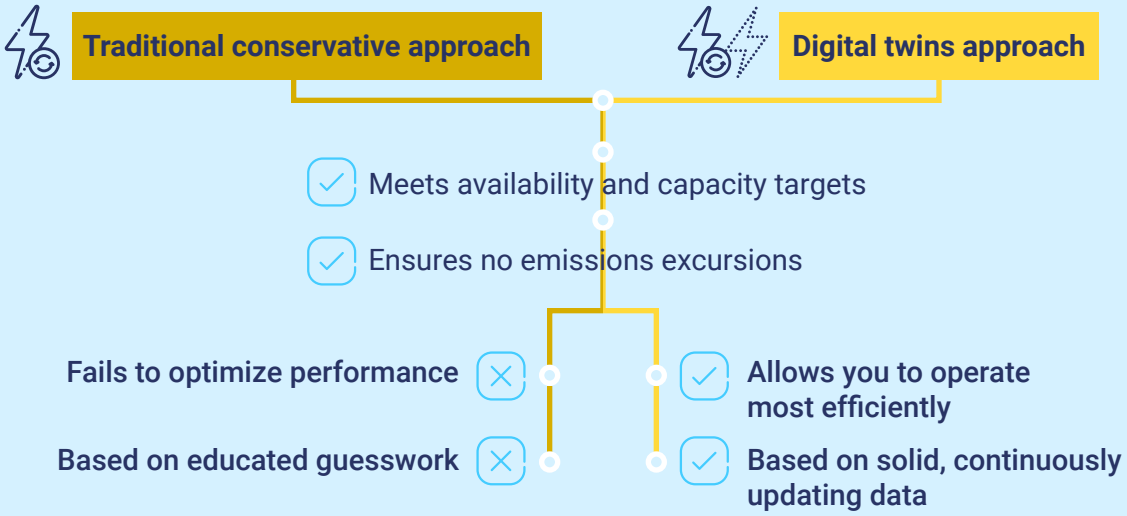
Energy generators also face pressure from a range of stakeholders — including investors, consumers, and financial institutions — to become more sustainable. In general, these companies primarily apply energy-related digital twins toward efficiency or decarbonization (59%) and secondarily for profit, throughput, or quality (36%).

While your own sustainability journey may involve long-term shifts toward a more diverse fleet of assets, improving your efficiency now will immediately get you closer to those goals and save you money along the way.

In this eBook, we'll look at the risks and demands of power generation and explore the potential of next-generation digital solutions to solve the industry's most pressing concerns.

Leveraging data to **optimize performance**

Energy companies have historically (and, for the most part, successfully) sidestepped major issues such as unavailability and emissions excursions by taking a conservative approach. But better data insights offer the opportunity for operational improvements. With more transparency, you can operate more cost effectively while maintaining the same level of confidence that you'll meet your goals. This delivers immediate — and lasting — cost savings.



With dashboards that clearly display data your subject matter in ways your experts can easily digest, digital twins keep you informed on the condition and performance of your individual assets. As iterative evaluations and alternative projections continue to flow in, you can adjust on the fly to stay ahead of real-world changes.

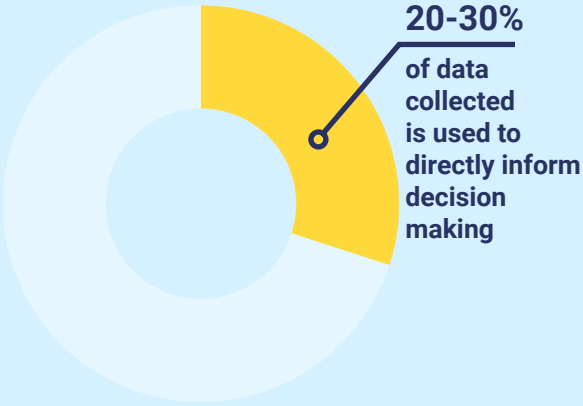
Eliminating guesswork saves you money, but also gives you the peace of mind to know you're making the most beneficial decisions at the right time.

"The energy industry faces enough day-to-day uncertainty and volatility that's beyond your control. **Anything you can do to gain a steadier footing and more confidence in your position is a blessing."**

— **Dale Linaweaver**
Owner, Mountaineer Power Consulting, LLC & Twinify Advisory Board Member

Importance of **quality data analysis**

Energy producers have never had more access to data. But smart strategy relies on much more than just your ability to collect all that information. How reliable is your data analysis? How accessible is the information for the subject matter experts who need to understand the story it's telling? Most importantly, are you using your data to make better decisions?



Research from McKinsey indicates that only 20-30% of data collected at power plants is used to directly inform decision making. Whether that stems from data collection methods, concerns about its trustworthiness, or an inability to properly analyze and act on information, those numbers reflect an enormous window of potential improvement.

> **“The right data can be a powerful asset.** But data without the proper tools and systems to provide actionable analysis is inconsequential.”
>
> — **Tricia Bergman**
> Associate Vice Chancellor for Economic Development,
> University of Kansas & Twinify Advisory Board Member

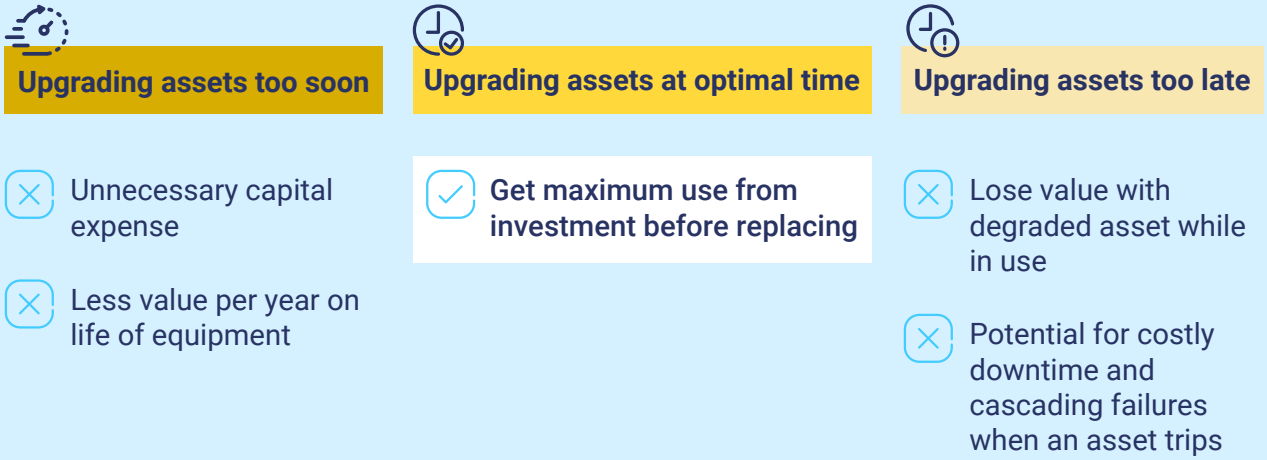
It can be tempting to try to build an in-house data solution. But that solution will only be as good as the data collection and analysis fueling it. Just as pressing, it will take a major internal effort to develop and maintain. A digital twin solution not only removes that burden — it provides a backstop to help audit your data. And with an engine fueled by AI and ML, it will build analytics on your collected data, delivering added value over time.

To effectively manage and improve your operations, your subject matter experts need to be able to bridge the information divide between raw data and actionable analysis. A digital twin solution provides easily digestible insights that don’t require a data science degree to decipher.

Risk management in practice

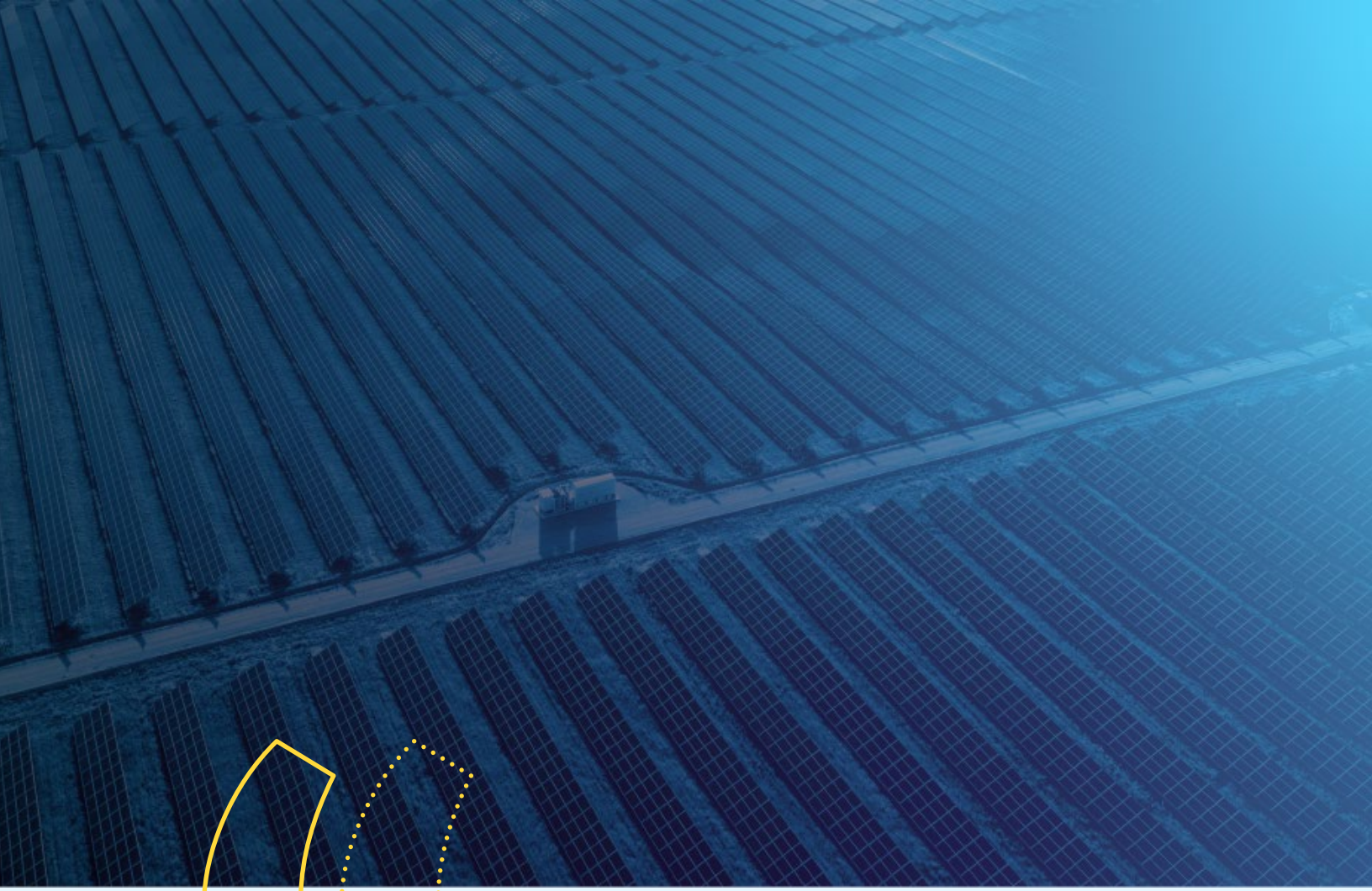
Thus far, you've seen one primary benefit of digital twins: enhancing your ability to immediately identify and remedy imminent performance degradation, saving you both diagnostic and operational downtime. But digital twins also allow you to see how your assets are performing over time and how they can be expected to perform in the future. This positions you to stay competitive in the market by identifying the optimal time to perform maintenance or implement asset upgrades.

Consider the dual benefits of AI-powered predictive maintenance. Not only can it lower unplanned downtime by as much as 35% — saving tens of millions in asset failure prevention — it has also been proven to extend a site's useful life by 10%.



The same transparency that fosters day-to-day improvements helps you make more cost-effective long-term decisions. Constantly updating, real-time data gives you a better grasp of your equipment condition and remaining life. That helps you set optimal replacement timelines, so you get the most out of your assets without unduly risking failure.

Crucially, it can also help you avoid capital spend caused by unsustainable decisions, preventing you from over-investing in low-value assets.



"Information is power. **The more you know about and understand how your systems work, the bolder you can be in your planning and decision-making."**

— **Paul Estey**
Consultant & Twinify Advisory Board Member

A more sustainable tomorrow **starts with improved efficiency today**

The transition to renewable energy can be a slow and arduous process. If your portfolio includes fossil fuel plants and you're facing daunting emissions targets, continuous operational improvements offer the best first step to immediate reductions. As you exhaust your traditional performance improvement options, next-generation digital solutions offer the most promising frontier for operational efficiency.

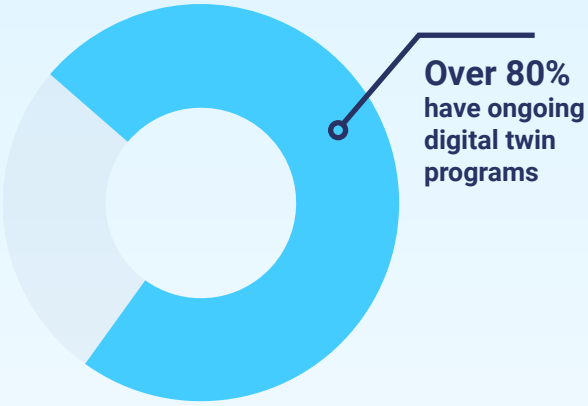
"Sustainability starts with efficiency. No matter the source of your power generation, **a more efficient operation is more sustainable, not to mention more profitable."**

— **Andy Colman**
Principal & Founder, ACEnergy Group
& Twinify Advisory Board Member

If you're transitioning to greener energy sources, investments in next-gen technology for your operational efficiency shouldn't disappear with your aging assets. That's why it's crucial to implement solutions that can grow and adapt with you. Digital twins offer integrated, scalable, adaptable interfaces that not only work with your current systems, but also seamlessly integrate with whatever energy generation you invest in next, delivering all your data to the same, user-friendly dashboards.

What it means to make your data work for you

Best of all, once you've delivered your historical data and relevant forecasts to a digital twin and deployed it to work for you, its predictions will continue to get more accurate and useful as it acquires more real-world data. Unlike purchasing new equipment, which will only degrade and lose performance as it ages, investment in digital twins continues to return more and more value.



That's one of the reasons over 80% of more than 1,000 organizations surveyed by CRI in 2022 have ongoing digital twin programs: They're an important asset right now, but also very much an investment in your future.

Digital twins drive next-generation digital operations

Gartner white paper

Published 28 January 2022 - ID G00742174

By Analyst(s): Simon Cushing, Rich McAvey

Initiatives: Energy and Utilities Technology Optimization and Modernization; Energy and Utilities Digital Transformation and Innovation operational efficiency.

Digital twins in oil and gas are emerging as the hub of next generation digital asset operations. CIOs should develop modular architectures, integration skills and governance processes to make composite digital twins viable as enablers of business value.

Overview

Opportunities

→ Digital twin adoption in oil and gas continues to grow. Some companies are now building digitally intensive assets to enable automated, remotely operated, minimally manned, highly efficient and more sustainable assets.

→ Digital twins provide a vital function at the heart of highly digitalized technology architectures that support and extend the scope of these capabilities.

→ Digital twins at the center of highly digitalized asset operations systems provide essential functions that deliver operational performance and business benefits. They require management and governance as critical systems for the whole life of the asset they model.

Recommendations

CIOs responsible for energy and utilities technology optimization and modernization should:

- → Maintain the reliability and effectiveness of digital twins by creating standards, governance processes and ownership principles that control digital integration and model development.
- → Manage digital twins as an enterprise asset and ensure they persist successfully through physical asset and organizational change by documenting development, and logging change and enabling multiple handovers of information and ownership transfer through the asset's lifetime.
- → Facilitate integration by owning and establishing development, integration and management standards for digital twins across the enterprise.
- → Tame digital twin complexity and ensure manageability by creating a technical architecture that supports modular design and development with shared components across digital twin initiatives.

What You Need to Know

Complex, composite digital twins are emerging as core to the technology architectures of a new generation of highly digitalized oil and gas assets. These types of twins may begin at the design stage, facilitate commissioning and then provide integration of information and decision support to enable highly automated and remote operation of assets while ensuring high efficiency, safety and environment performance.

Such digital twins are complex, modeling the whole asset system and integrating a wide range of information, including real-time operational data. They typically include simulation and predictive capability to support improved operational decision making (see Figure 1). These kinds of twins may not become the most common type, but where they are used they will be critical to asset operations.

Click here to read the complete Gartner report.

Optimizing sustainability and improving financial KPIs **for owners of a solar field**

Solar field use case

Challenge

OEM solutions frequently only display fault codes and offer no top-level view of the fleet's performance. The resulting data is restricted to alerting once individual components have failed, allowing only for a reactive response with no broader insights.

Facility managers lack the data to assess whether they are meeting performance, risk, sustainability, and finance KPIs, and to support operational and maintenance decision making.

Solution

Digital twins of the entire solar fleet help identify degradation and potential failure at the inverter level. The ML/AI models used go beyond fault codes, predicting causes of failure and presenting possible mitigation solutions in real time, allowing technicians to inspect underperformance issues and identify proactive fixes.

The Twinify experience aggregates KPIs, including performance degradation at the region and fleet level, and displays them in straightforward, digestible dashboards. This provides an at-a-glance understanding of system health to a wide range of stakeholders.

Without Digital Twins	With Digital Twins
Only respond to failures	Address degrading assets before failure
Operational downtime	Assess cost/benefit of repair/ replacement options
No ability to measure KPIs	Real-time understanding of operations
Poor visibility of system health	Plan long-term strategy based on holistic view

Managing maintenance, compliance, performance, and risk **for a combustion turbine plant**

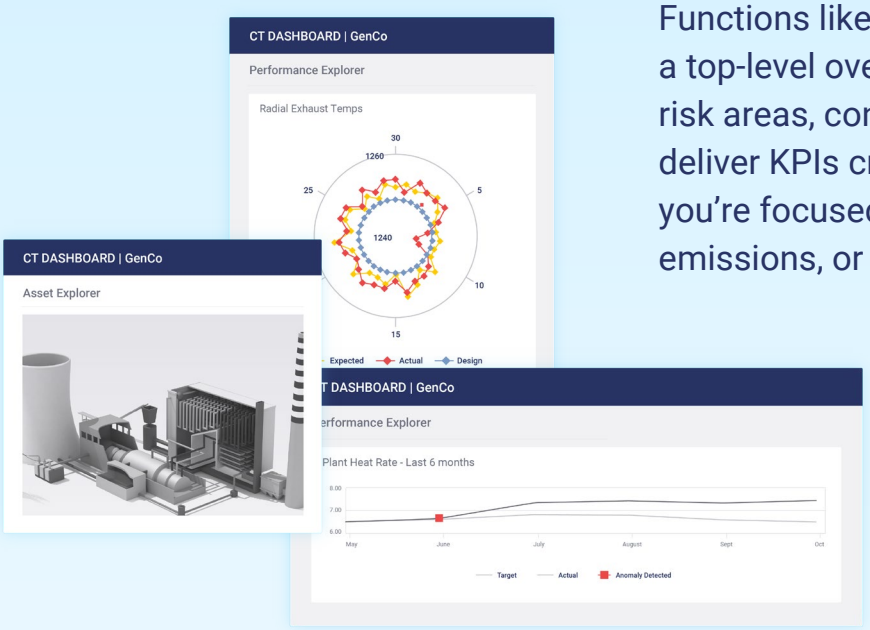
Combustion turbine use case

Challenge

Decentralized data and subject matter experts who focus on different KPIs can make prioritizing solutions challenging.

Solution

Engineer-friendly dashboards translate data in real time, visually identifying where assets have strayed from their baselines. These don't just identify that there is a problem, but visually represent exactly where degradation or failure has occurred, so you can resolve it immediately.



Functions like visual explorers provide a top-level overview of each of your risk areas, constantly updating to deliver KPIs critical to you, whether you're focused on performance, emissions, or reliability.

Combining historical performance data with energy prices and weather forecasts, the Twinify solution also offers powerful predictive capabilities. By accurately anticipating generating capability it can help predict financial margin, allowing energy generators to stay one step ahead of the market.

The Twinify **difference**

Tailored to your needs

Twinify's solution is your solution. We use our extensive knowledge and experience in the power generation space to tailor a digital twin solution backed by ASME for your specific assets, systems, and KPIs. Our technology is scalable, with the ability to start small and grow with you as your needs and portfolio expand. And by applying our technical know-how, we can get your digital twin operation up, running, and providing value in months instead of years.

Actionable insights

We deliver forward-looking digital twins that provide continuous information about how assets and systems are performing relative to plans and expectations. These ongoing projections predict how they will perform under an array of future conditions, and provide forensics to vet, verify, and improve outcomes. This gives unprecedented insights into your assets' past, present, and simulated future performance to optimize near-term actions and achieve long-term goals.

The complete package

Twinify brings the software and domain expertise to implement and support your new digital twin solution, helping you make the most of your data. Our OEM agnosticism means we're ideally positioned to work with your assets. We're built to serve both diverse operators and those looking to diversify their portfolios in the future. We're also designed to integrate with your existing systems and software, providing a smooth transition to improved processes and results.

TWINIFY
TECHNOLOGIES
AN ASME COMPANY

Reach out today to see why the future of power generation runs through Twinify.