Power the *clean energy* transition

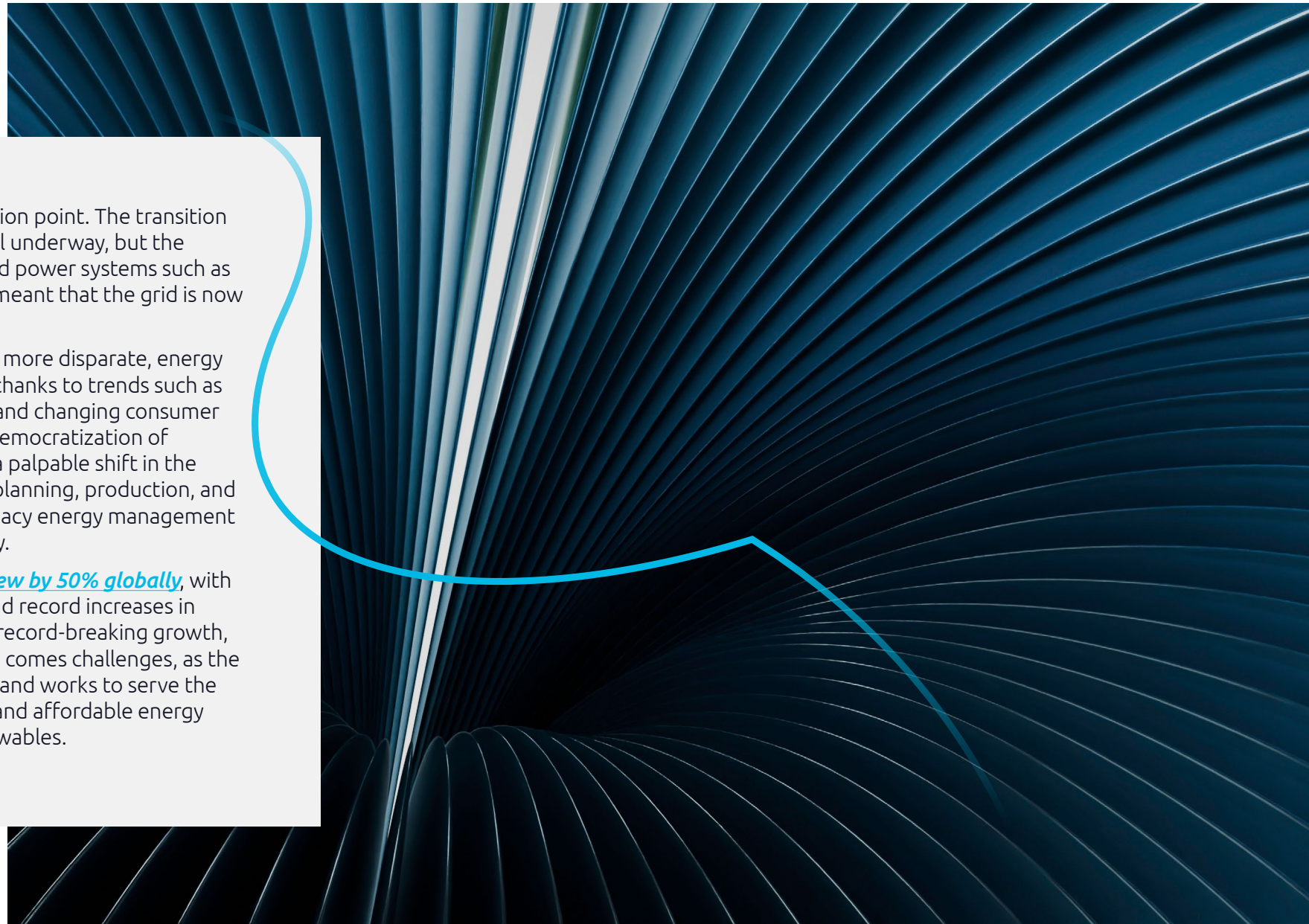
Fuel sustainable, smarter, and more reliable energy systems with AI and Gen AI.

Capgemini | databricks

The energy sector has reached an inflection point. The transition to cleaner, greener energy sources is well underway, but the steady growth in the use of decentralized power systems such as solar, wind, and geothermal energy has meant that the grid is now more multi-faceted – and complex.

And just as energy sources have become more disparate, energy demands have become less predictable thanks to trends such as extreme weather events, remote work, and changing consumer behavior. These dynamic demands and democratization of diverse energy sources have resulted in a palpable shift in the energy landscape – one that is bringing planning, production, and delivery systems to a tipping point as legacy energy management platforms struggle to operate effectively.

Last year, renewable energy capacity ***grew by 50% globally***, with China leading the way on solar power, and record increases in Europe, Brazil, and the US. But with this record-breaking growth, shifting economic and trading landscape comes challenges, as the industry straddles new and old systems, and works to serve the continued need for traditional, reliable, and affordable energy alongside this growing demand for renewables.



Traditional energy systems were built on static rules, siloed data, and centralized control structures that can't respond quickly enough or scale effectively to meet today's needs. They simply weren't designed for the level of complexity seen today. And it's not like the old fuel pipes are being turned off as the new ones are powered up – fossil-fuel-based energy systems are far from being retired. Energy companies must account for and accommodate the unique challenges that come with renewables, including their intermittent availability and fluctuating price points, while simultaneously navigating existing energy production and distribution systems.

The pressing need for the energy sector is evident: to define a forward-looking data strategy that can address the challenges in managing this smart and dynamic ecosystem.

This requires a strategy to govern the data from a new generation of smart meters and assets – time series and historical data, consumer data, maintenance and scheduling systems, substation, and grid data, not only at the source level but also on a modern data and AI platform.

This strategy must consider how to maintain just the right amount of historical data needed for future AI use cases while complying with legal and regulatory requirements. And it must incorporate intelligent, data-driven systems that have the ability to leverage real-time data, machine learning, and AI to anticipate fluctuations in supply and demand, optimize the performance of distributed assets, automate trading of energy resources, and provide faster, more accurate decision-making at every level of the ecosystem.

Adopting a future-forward data strategy and intelligent platform is no longer a nice-to-have. It's a critical step to ensure stability, sustainability, and scalability moving forward.

The unpredictability of renewable energies

As renewable power systems ramp up alongside traditional fossil fuel systems, energy companies face a number of risks. These include a lack of continuity and predictability of renewable power generation, as well as resultant price volatility and downtime costs. For energy companies, these risk-related issues can be expensive. And for energy-intensive industries such as manufacturing, metals, and materials, wild swings in energy costs can have a profound impact on profitability.

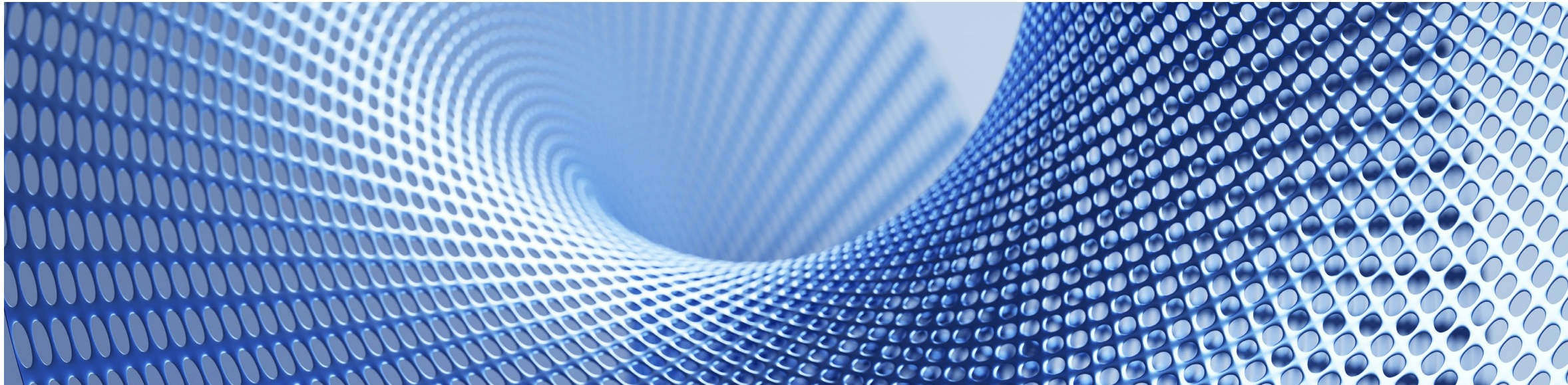
As the energy transition progresses, successful energy companies will set themselves apart by leveraging technology solutions that enable them to undertake in-depth predictive analyses – deploying data, analytics, and Gen AI to simultaneously tap the opportunities of this mid-transition period and mitigate the risks that come with it.

Integrating systems and data

Consider a utilities company facing the challenge of producing and supplementing both traditional and renewable energy by buying from a variety of sources to meet the needs of its customer base. To fulfill the demand effectively, the company requires power producing and power demand forecasts, plus information on peak usage and peak production times, along with an understanding of the variables that can interrupt production and distribution.

This was the case at a major oil and gas company, which was grappling with how to optimize everything from asset performance to energy trading, inventory, and retail operations. As its consumption of real-time data increased, the company needed to better leverage its data at scale, to accelerate its progress on decarbonization and shape a cleaner energy system. Inadequate data management and processing capabilities in the sector mean less asset data is actually used today. But utilities and energy companies need access to real-time data from a broad range of sources to make effective decisions on how best to generate, purchase, and distribute power. To leverage that data, many energy companies are moving toward AI-powered solutions that enable them to integrate disparate data sources for more effective analysis and insights.

At Capgemini, we've built data-driven solutions that advance AI capabilities for every aspect of the energy production and distribution process – from demand forecasting to product optimization and ecosystem integration. We've enabled everything from power plants and refineries to renewable energy producers to more effectively meet today's energy needs.



A sovereign approach to data management

Too often, data and analytics are locked in proprietary software systems that force energy companies into dependency with technology vendors. This can limit their ability to access, manage, and analyze data to meet specific needs.

Energy companies typically have two core sources of data: operational technology (OT) data and information technology (IT) data. OT data is crucial here, as it provides a snapshot of what's going on in real time in the field.

And yet that data is often unstructured and difficult to parse and compare to other sources – especially if it's locked in proprietary software tools. An open data platform with options for interoperability can instead be a bedrock for all of the data an energy company produces through its OT and IT systems. Together with a sovereign approach to managing data, energy organizations are able to create data models that fit their unique business cases.

At Capgemini, we're working with ***Databricks*** to optimize the energy sector by applying AI and Gen AI. To that end, we've developed a variety of data accelerators and solutions that effectively bridge disparate systems and create interoperability with an open foundation.
For example:

01 The time series data processor is a joint solution with Databricks that processes time-series data based on asset hierarchy, and provisions it on Databricks Unity Catalog to ensure it can be effectively used for AI-driven use cases and self-service solutions like Databricks Genie.

02 We leverage our ***Intelligent Inspection Framework*** to inspect assets such as transmission lines, substations, power stations, and oil and gas production equipment. The framework uses Computer Vision AI to ensure defects are detected and mitigated in time to avoid unplanned downtime.

03 We also bring together disparate data systems onto a unified, sustainable data model with ***Sustainability Data Hub***. This framework uses the Databrick Data Intelligence Platform to calculate emissions and savings on offsets.

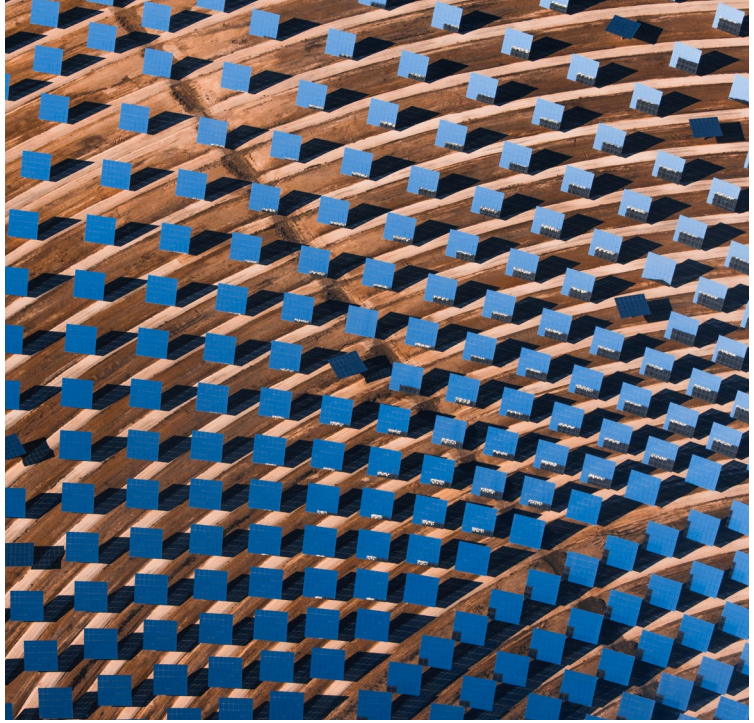
04 Our SAP data processing accelerator is another ***joint solution*** that takes advantage of SAP Databricks, a product offered natively in SAP Business Data Cloud, that combines enriched SAP data with enterprise data on Databricks via a Delta Sharing Connector for everything from data warehousing to AI.

05 Capgemini's Gen AI Strategic Intelligence System (GSIS) supercharges decision-making in the energy and utilities sector by orchestrating AI agents across enterprise systems. Built on Databricks, GSIS leverages real-time insights, predicted KPI trends and generates prescriptive actions across operations helping companies unlock measurable value and resilience at scale.

06 Finally, ***Capgemini RAISE*** is a Gen AI solution built on Databricks that uses the Mosaic AI platform including Vector Search, AI Gateway, MLflow, mode training and serving, agent framework, AI/BI, and more to support end-to-end AI use case development, from agent development to deployment and monitoring. RAISE takes predictive models or outputs to a prescriptive level, crafting unique strategies and plans that address individual use cases at scale with proper guardrails.

Taken together, these solutions have already produced positive outcomes for our clients. In the case of the large oil and gas player, for example, the Industrial Time Series Data Modeling solution enabled hundreds of technologists working on more than 100 use cases to leverage data at scale. This was done via an open-source, cloud-native framework that extends the company's data lakehouse to accommodate the global footprint of its industrial time-series data sources across its entire ecosystem.

While reducing the overall cost of analytics infrastructure, organizations gain the capability to proactively inform customers of potential performance issues, enabling timely intervention and reduced risks.



Tangible value from technology investments

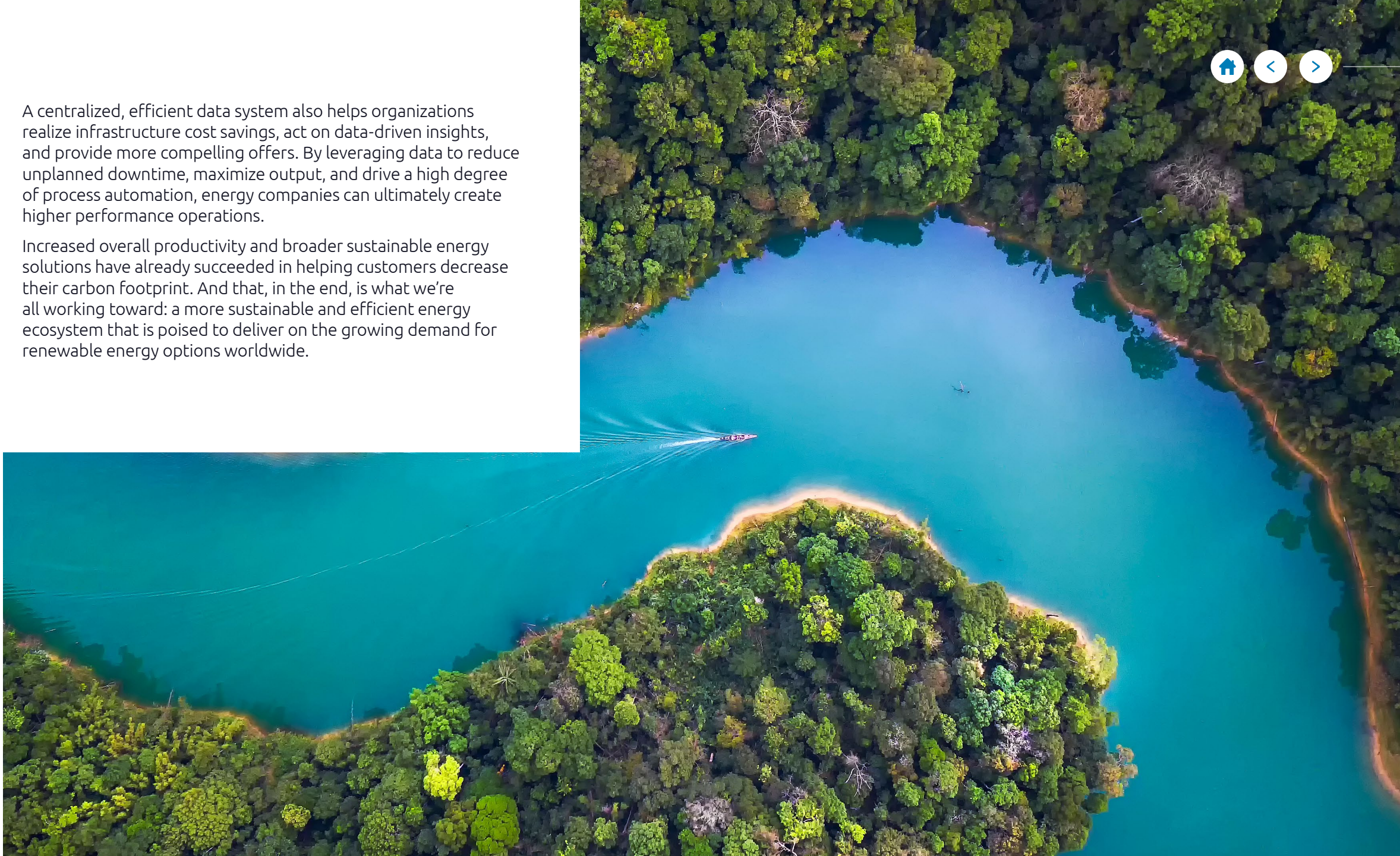
In the industrial sector, there's a big difference between the top decile and other performers. Top decile performers integrate OT and IT data into decision-making frameworks that focus on end-customer outcomes by matching assets inside their plants with activities in the market. This is only achievable with robust data management tools and practices focused on asset performance management, renewable energy forecasting, grid optimization, energy trading, decarbonization, and personalization.

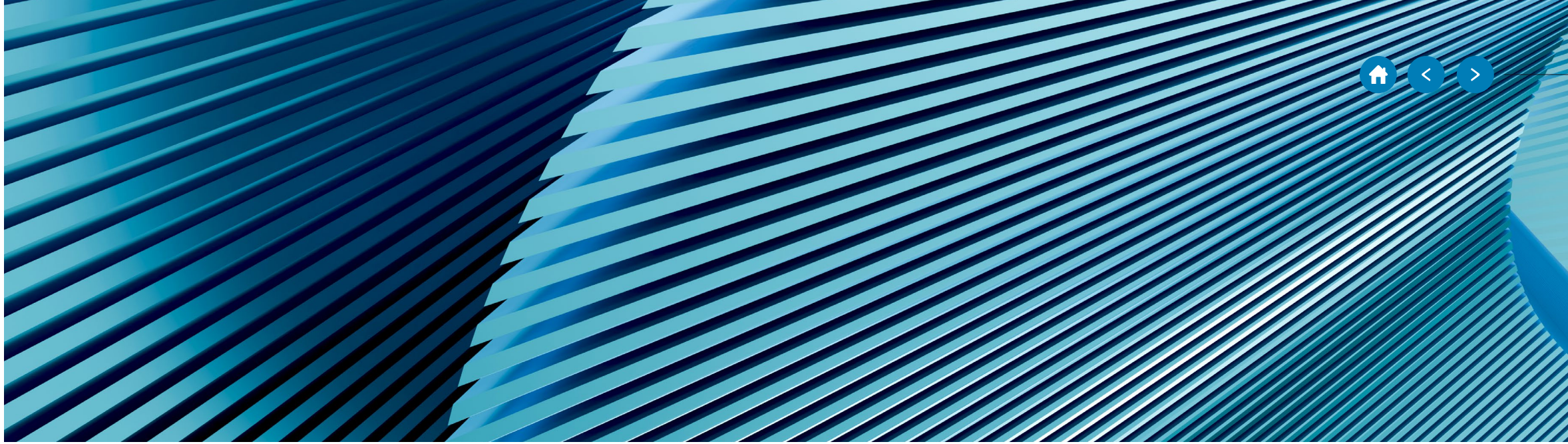
Capgemini energy industry analysts estimate the tangible benefits of this approach include:

- Better grid insights, pattern identification, prediction of risk containment measures, and AMI/AMR rationale, providing a 10 to 15 percent reduction in manual efforts in distribution planning studies with more accurate detection of loads and load types like EV and DER, and a five to 10 per cent improvement in detection of unapproved loads and revenue recovery
- More effective outage prediction and load balancing, with a five to 10 per cent reduction in damage thanks to the ability to pre-emptively identify critical and vulnerable network sections and implement targeted hardening measures
- Higher customer ratings due to more connected customer communication resulting in a 15 to 20 per cent improvement in customer satisfaction through timely and contextual communication
- Higher productivity levels with data-assisted regulatory compliance, automation of monitoring reports, faster retrieval of customer information for technicians, and faster response times to tech problems and customers, providing a 35 to 40 per cent reduction in regulatory reporting efforts and a 20 to 25 per cent increase in call containment/diversion to low-cost channels along with satisfaction improvements.

A centralized, efficient data system also helps organizations realize infrastructure cost savings, act on data-driven insights, and provide more compelling offers. By leveraging data to reduce unplanned downtime, maximize output, and drive a high degree of process automation, energy companies can ultimately create higher performance operations.

Increased overall productivity and broader sustainable energy solutions have already succeeded in helping customers decrease their carbon footprint. And that, in the end, is what we're all working toward: a more sustainable and efficient energy ecosystem that is poised to deliver on the growing demand for renewable energy options worldwide.





Contact us

Please reach out with questions or to schedule a conversation about our capabilities to assist your organization.

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About Databricks

Databricks is the Data and AI company. More than 10,000 organizations worldwide — including Block, Comcast, Condé Nast, Rivian, Shell and over 60 per cent of the Fortune 500 — rely on the Databricks Data Intelligence Platform to take control of their data and put it to work with AI. Databricks is headquartered in San Francisco, with offices around the globe, and was founded by the original creators of Lakehouse, Apache Spark™, Delta Lake and MLflow. To learn more, follow Databricks on LinkedIn, X, and Facebook.

About Capgemini

Capgemini is a global leader in partnering with companies to transform and manage their business by harnessing the power of technology. The Group is guided every day by its purpose of unleashing human energy through technology for an inclusive and sustainable future. It is a responsible and diverse organization of nearly 350,000 team members in more than 50 countries. With its strong 55-year heritage and deep industry expertise, Capgemini is trusted by its clients to address the entire breadth of their business needs, from strategy and design to operations, fueled by the fast evolving and innovative world of cloud, data, AI, connectivity, software, digital engineering, and platforms. The Group reported in 2022 global revenues of €22 billion.

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