IFS Spotlight for Utilities

Powering the Future:

Strategies for Grid Flexibility and Resiliency

IFS | accenture

Contents

Introduction

Overburdened by the planet's ever-increasing demand for electricity and incapable of keeping up, the grid's capacity will quickly become inadequate. It already is. If everyone in the world turned on everything all at once, the grid would collapse.

The transition to net-zero across all industries combined with the rising electricity demand, and increase in renewable energy integration, is presenting new complexities for Transmission & Distribution (T&D) networks.

Demand only continues to grow. According tothe International Energy Agency,electricityconsumption is forecasted to increase at close to 4% annually through 2027, driven by industrial use,growing demand for air conditioning, acceleratedelectrification (led by the transport sector), and the rapid expansion of data centers.

In parallel, the current and future state of the world's electricity supply is under deep transformation; at the same time, the energy systems are at risk from increasingly extreme climate events.

A warming planet and related weather events have accelerated the urgent need for a more resilient, flexible, and net zero grid to accommodate the new order.

The high cost of net zero

Overhauling the world's power grid is challenging and expensive. At a global level, according to a survey from **Accenture**, USD 115T must be invested for a successful transition. Here's how the investment breaks down:

$53T clean power generation

$42T transmission and distribution

$20T interim fossil fuels & alternative tech

$115T investment to hit net zero by 2050

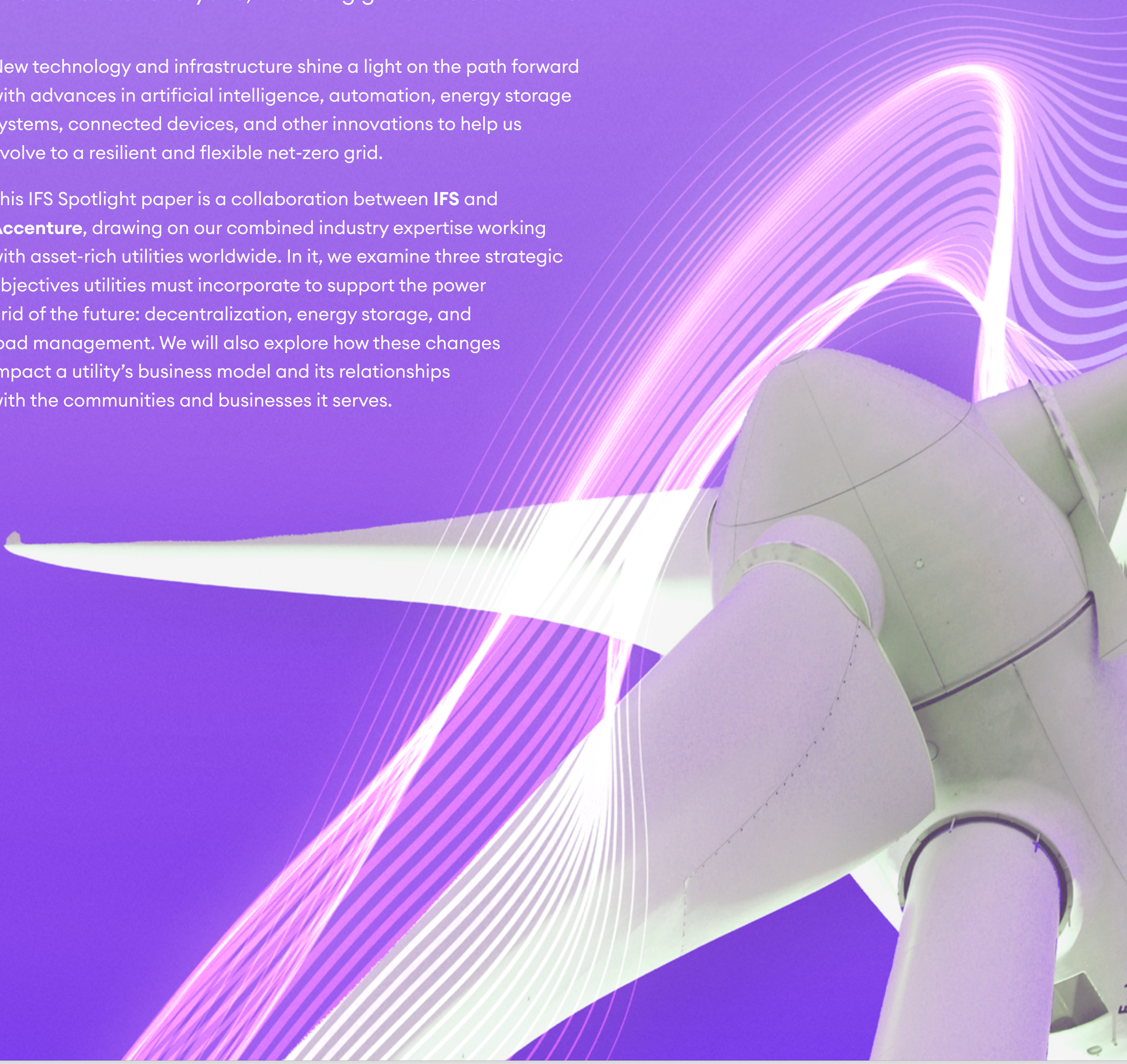
So far, investment by countries has fallen short. China, where electricity demand has grown **faster than the overall economy since 2020**, spends the most at **USD 1.2T**. However, this still represents less than 1% of the country's GDP. To keep up, annual grid investment **must increase by 58% by 2030**, well above the average yearly investment we've seen over the first four years of this decade.

Where we are today

The scope and costs are intimidating. But there is light at the end of the tunnel. Literally. Work is underway to shift from fossil to renewable energy, with **renewables reaching almost 30%** of the electricity generated globally. This evolution depends upon the coordination and actions of everyone, including grids and customers.

New technology and infrastructure shine a light on the path forward with advances in artificial intelligence, automation, energy storage systems, connected devices, and other innovations to help us evolve to a resilient and flexible net-zero grid.

This IFS Spotlight paper is a collaboration between **IFS** and **Accenture**, drawing on our combined industry expertise working with asset-rich utilities worldwide. In it, we examine three strategic objectives utilities must incorporate to support the power grid of the future: decentralization, energy storage, and load management. We will also explore how these changes impact a utility's business model and its relationships with the communities and businesses it serves.



Decentralization

A resilient and flexible grid starts with decentralization. Unlike conventional grids, where power is generated from a single, often remote source and transmitted to end users, a decentralized grid consists of distributed energy resources (DERs).

DERs are smaller-scale energy assets owned by the end user with an array of functions, including energy generation (solar panels, wind, etc.), storage (batteries), and consumption (electric vehicles, heat pumps, etc.). These assets are broadly dispersed, with production and consumption occurring proximally.

In recent years, energy consumption by DERs has grown significantly, with residential energy demand predicted to increase up to **38% by 2035**, driven mainly by EV ownership. In contrast, the annual increase over the previous decade was just 5%, underlining the urgency to transition to renewable energy sources.

DERs interact with each other and the central grid via a two-way energy flow, a model that supports scenarios where the utility buys and feeds excess energy from DERs back to the grid.

Microgrids for better supply and demand

To help balance supply and demand, utilities may organize DERs into **microgrids**, small networks of electricity users with a local source of supply that attaches to the central grid.

Microgrids allow the utility to throttle energy distribution precisely, ensuring outages are contained at a smaller scale and–in the event of a blackout–restoring power thoughtfully and safely without triggering a power surge or subsequent outage.

The adoption and integration of renewable energy sources supports a decentralized grid, providing utilities with the resilience and flexibility required to stabilize electricity supply in an increasingly unstable environment.

What needs to change

Infrastructure & technology

By its very nature, a decentralized system defers a portion of infrastructure costs and management to the end-user, either a prosumer or commercial/industrial (C&I) entity, who will acquire, assemble, and operate the DERs on their property.

However, utilities must still invest in supporting infrastructure such as high-voltage transmission lines to move large-scale DER electricity from generation points to demand centers, smaller distribution lines and transformers for last-mile electricity delivery, and inverters to feed excess energy acquired from prosumers and other producers back into the grid.

Utilities will leverage technology to help manage the transformation and ongoing operations. Examples include systems for energy management, data acquisition, geographic information, asset management, resource planning, grid monitoring, control and balancing, DER management, field service systems, and customer service and support technologies, among others. Many utilities already utilize some or even all of these applications.

Data is another consideration. Data generation–and access–will increase substantially, given the high volume of distributed assets within a decentralized grid, accelerating the digitalization of the industry. Utilities must examine and strengthen their data models, leveraging **Industrial AI** for enhanced analytics.

Within a decentralized grid, end users will buy and manage their energy equipment from behind the meter. However, utilities and regulators must maintain oversight and control of the infrastructure to manage how energy is generated, stored, and secured, ensuring the safety of utility workers and the public.

What needs to change

Business models

With people producing their power, the entire energy paradigm shifts. While the central grid remains the system's backbone, it also serves in a more transactional capacity, where the utility negotiates with energy producers to purchase excess energy.

No longer the arbiter of the power supply, the utility must leverage its expertise and existing relationships to provide a more service-oriented business model. The future utility will offer expanded services such as installation, maintenance, and consulting services for DER and other components.

Proactive utilities are already setting up new lines of business and revenue streams, for example the marketing of home services to their established customer base. **New Jersey Resources**, an IFS customer, recently launched an entire services division for appliances, smart home technology, generators, and solar.

Public Power Corporation (PPC) is an Accenture client and the biggest electricity provider in Greece. The utility engaged with Accenture to support its successful diversification into non-commodity industries such as EV infrastructure, fiber and telecom, and electronics retail. **Learn more about PPC's transition.**

Workforce

Utility workers must be reskilled to learn how to manage new technologies and interact within an evolved customer dynamic. As you'll see throughout this paper, the changes wrought by a decentralized grid require an entirely new host of customer service skills and experience to complement the deep technical domain knowledge of the existing workforce.

Some utilities that lack in-house expertise engage with **professional service organizations** that have the industry experience to help expedite the utility's decentralization initiatives.

Workforce efficiencies become even more critical with a much higher volume of assets distributed across a broader network of sites. **Field service** and **mobile workforce management** systems help the utility to do much more with existing resources.

Energy storage

Energy storage is critical to grid resilience and flexibility, especially within a decentralized model where production is widely distributed and variable due to renewable energy sources such as solar and wind. By capturing and storing surplus energy during peak production, it is possible to better manage supply and demand.

> "Achieving global net-zero emissions hinges on the rapid expansion of energy storage, a priority highlighted by COP29 leaders who recognized its critical role in advancing a clean energy future."

What does the future hold for energy storage and decentralized networks?
Polytechnique Insights, 2024

As a result, the global energy storage market is booming, attributed to mandates and targeted subsidies within the renewable energy sector. According to **BloombergNEF**, the global energy storage market almost tripled in 2023, the most significant year-on-year gain on record.

Energy storage increases grid resilience while reducing dependencies upon long-distance transmission, energy losses, fire hazards, and reliance on central infrastructure.

Land management

While it's common to see utility-scale storage installed at solar and wind farms, decentralization and proliferation of DERs introduces a new opportunity for utilities: the installation of utility-owned storage infrastructure within high-producing microgrids.

37%

Households that experience challenges paying energy bills

(Accenture, 2024)

Since few utilities have the land or the means to purchase it, the industry must consider options such as negotiating with energy producers, leveraging demand/response programs, and/or offering preferential electricity rates for permission to place utility-owned storage assets on private property.

For many energy producers, especially consumers who struggle to pay their utility bills each month and C&I entities who have just invested heavily in renewable energy infrastructure, lower rates and the transfer of maintenance and service commitments to the utility are strong incentives to work together.

What needs to change

Infrastructure & technology

Galvanic cells or batteries are the most common systems used to store electricity generated by end users. Utilities typically install and manage these systems, providing maintenance and service for components such as battery cells, system management, and power conversion capabilities.

Regardless of ownership, the utility must retain visibility and control over these and other grid-connected assets to manage supply and demand while ensuring the safety and security of the operation.

As with DERs, energy storage assets must be modeled into the utility's existing IT system to support grid connectivity and maintenance. Applications such as enterprise asset management (EAM), enterprise resource planning (ERP), and enterprise service management (ESM) support real-time insights, analyses, and planning for the utility.

What needs to change

Business models

Energy storage systems allow utilities to enter into demand response agreements with energy producers, granting the utility access to some of the producer's stored power to support the grid.

These programs help reduce load, particularly during peak usage periods or if the grid is under strain. Along with reducing consumption, demand response programs deliver additional energy when needed, with participants providing a set amount of megawatts to help prevent or alleviate supply constraints.

At present, energy storage is more common for large commercial and industrial operations. However, with the expansion of renewable energy production and a decentralized grid, storage by prosumers–though small in scale–will quickly achieve a network effect with sufficient supply for the utility to access.

Demand response programs require that the utility negotiate with energy producers to agree on how much energy it may access and how much it will pay.

Xcel Energy, an IFS client and a leading US-based energy provider, offers its customers a **Renewable Battery Connect** program, providing users with upfront incentives for permission to automatically manage end-user storage batteries during peak demand on the grid. The utility uses **IFS Mobile Workforce Management** and **IFS Planning and Scheduling Optimization** to schedule its gas and electric distribution. **Learn more.**

Workforce

Most utilities already manage some form of energy storage; however, technicians may need additional training in battery storage infrastructure, including installation, monitoring, charge balancing, system protection, and data management.

Additionally, employee upskilling and training in contract negotiations and customer-centric skills are required to grow and support demand response programs.

Load Management and Flexibility

With the grid decentralized and excess energy safely stored and available, the next step in the evolution of the grid is load management.

Load management allows utilities to control and orchestrate electricity demand and distribution precisely. If a grid failure occurs, whether a blackout or a brownout, the utility restores the system intentionally. For example, trickling electricity back into the grid so that lights come on in a dimmed or staggered fashion to avoid crashing the system again.

Greater control over the load also allows utilities to shut the system down completely. For instance, when extreme weather events threaten to spark a wildfire.

Doing more with existing infrastructure

Load management enables existing C&I and prosumer systems to carry a larger load by distributing energy use more evenly, stabilizing the grid while increasing resilience.

One prosumer example is EV charging, an option that is out of reach for many end users due to inadequate load panels within the residence. But rather than rewire the entire home–an expensive undertaking–the user implements a smart load management panel to supply the necessary power.

The panel determines how much power is available to the residence, checking all points of energy consumption as well as energy not being used at any given time. Then, it subtly orchestrates power consumption, for example, turning the thermostat down by a degree, drip-feeding energy to appliances, and charging the EV in the middle of the night, leveraging available grid capacity with no need to upgrade the entire electrical system.

The same is true and at a larger scale for C&I organizations. Trillions of dollars in infrastructure upgrades are avoided by optimizing available grid capacity.

Load management also supports demand response scenarios. If the grid needs energy for day-to-day operations, the panel identifies excess supply that the utility redirects to the grid. When the grid is under pressure, load management technology allows the utility to limit energy consumption to lower demand.

Load management enables the precise control of energy consumption at the user level, equipping existing infrastructure with intelligent monitoring and control technologies to ensure energy distribution is maintained within system limits.

What needs to change

Infrastructure & technology

Although smart load management panels sit just behind the meter, they serve as a shared utility asset, enabling utility oversight and interaction with the system.

The utility manages the entire lifecycle of a smart electrical panel and coordinates personnel and equipment to install, maintain, and service it. Each panel and the data it generates integrates seamlessly with existing **EAM**, ERP, CRM, and other technologies, providing the utility with real-time insights to help inform operational and business decisions. For example, a utility will use its EAM system to create a heat map of high-load customers to identify where new load management panels are needed.

Once again, data management is critical. Since demand response occurs in real-time, data transfer and communication between enterprise software applications and the load management panel must be adequately supported.

What needs to change

Business models

The business relationship between the utility and the end user becomes more balanced and contractual. The utility negotiates with the energy producer to meter energy consumption, including accessing extra energy and lowering consumption as needed. Compensation may include a rebate program (federally or via the utility) or a discounted electricity rate.

Similar to DERs, the utility is presented with a new line of business where it sells, maintains, and services smart load management panels.

This new business model also impacts the back office with additional workflows to support field service, contract terms and management, and new billing arrangements.

Demand response programs require that the utility negotiate with energy producers to agree on how much energy it may access and how much it will pay.

Workforce

The same protocols for new infrastructure apply to load management panels, including training technicians on the hardware and management of these assets.

Many utilities will run organized campaigns to solicit interest from end users, leveraging field service management and mobile workforce management to efficiently implement these devices across the grid.

Next steps

The march to decentralization and a net zero future is already underway. While much greater investment is required to achieve global objectives, utilities have established a strong technological foundation to build upon leveraging advances in artificial intelligence, machine learning, automation, connected devices, and many others.

It certainly helps that the industry is one of the world's most asset-intensive, where installing and managing new components such as load management panels and storage batteries is simply business as usual–integrating new assets with old.

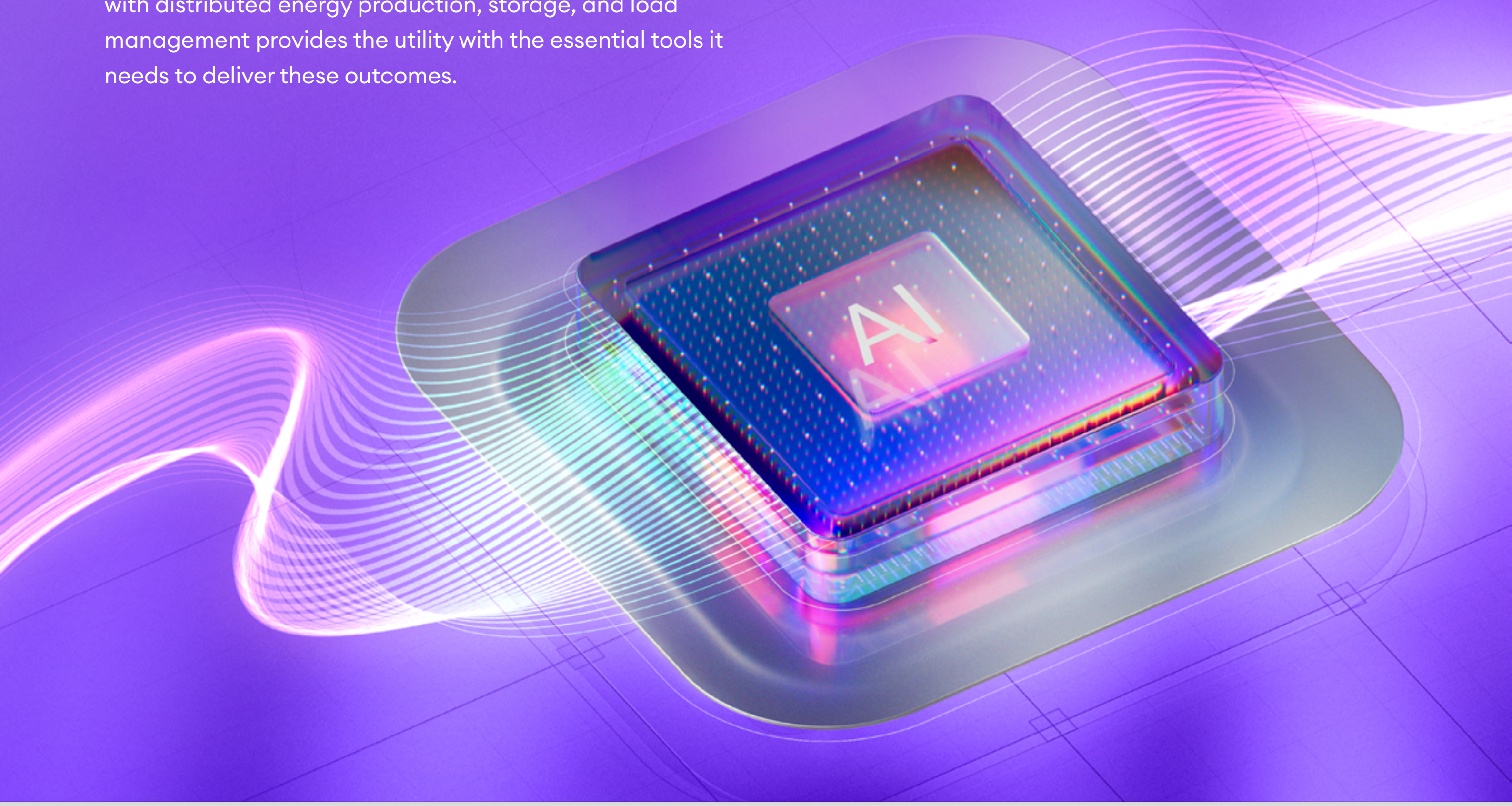
Decentralization extends beyond the grid, with end users assuming a more active role in energy production and supply. For example, the cost, assembly, and operation of renewable energy infrastructure is shared with prosumers and C&I organizations generating energy independently from the utility.

Looking ahead, system failures will continue to increase in volume and impact, accelerating the need for utilities to innovate and adapt, focusing on rapid recovery to limit the impact of these events. A decentralized, net zero grid with distributed energy production, storage, and load management provides the utility with the essential tools it needs to deliver these outcomes.

IFS began working with utilities the year the company was founded in 1983. Since then, we've established active partnerships with utilities globally, working closely with our clients to deliver innovative technology optimized for asset-intensive industries.

To support such fundamental change, some utilities leverage the skills and experience of professional services from **Accenture Strategy and Consulting**. IFS and Accenture help the utility strengthen its team strategically and technically.

For more information, **visit our website**, explore the success stories of **IFS utility customers**, or **contact us** for more information.



About IFS

IFS is the world's leading provider of Industrial AI and enterprise software for hardcore businesses that service, power and protect our planet. Our technology enables businesses which manufacture goods, maintain complex assets, and manage service-focused operations to unlock the transformative power of Industrial AI™ to enhance productivity, efficiency, and sustainability.

IFS Cloud is a fully composable AI-powered platform, designed for ultimate flexibility and adaptability to our customers' specific requirements and business evolution. It spans the needs of Enterprise Resource Planning (ERP), Enterprise Asset Management (EAM), Supply Chain Management (SCM), and Field Service Management (FSM). IFS technology leverages AI, machine learning, real-time data and analytics to empower our customers to make informed strategic decisions and excel at their Moment of Service™.

About accenture

Accenture is a leading global professional services company that helps the world's leading businesses, governments and other organizations build their digital core, optimize their operations, accelerate revenue growth and enhance citizen services-creating tangible value at speed and scale.

We are a talent- and innovation-led company with approximately 799.000 people serving clients in more than 120 countries. Technology is at the core of change today, and we are one of the world's leaders in helping drive that change, with strong ecosystem relationships. We combine our strength in technology and leadership in cloud, data and AI with unmatched industry experience, Asset Lifecycle Management for Utilities 15 functional expertise and global delivery capability.

Our broad range of services, solutions and assets across Strategy & Consulting, Technology, Operations, Industry X and Song, together with our culture of shared success and commitment to creating 360° value, enable us to help our clients reinvent and build trusted, lasting relationships. We measure our success by the 360° value we create for our clients, each other, our shareholders, partners and communities.