IFS

Optimizing power generation assets

A strategic, tactical, and operational guide

The power generation sector is preparing for a **30% increase in global demand by 2040...**

...including a **potential tripling in U.S. electricity demand** driven by rising adoption of electric vehicles (EVs), electrification in transportation, and energy-intensive applications like AI. At the same time, climate-related risks, carbon reduction targets, regulatory affairs, managing the variability of renewables within the grid, and optimizing capital spend with the right projects are just some of the other challenges and opportunities power generation companies may encounter as they position themselves for growth.

With 70 to 90% of power generation capital invested in physical assets, the optimization of this infrastructure, equipment, and land is a significant component in ensuring success over the long term. Effectively managing the asset lifecycle is critical to reliably meeting demand while balancing cost and risk.

Replace, repair, or build back better?

Power generation companies are focused on, among other things, having available resources to meet current and future demand. Given a diminishing skilled workforce and finite capital, organizations are increasingly looking to asset lifecycle management to optimize asset longevity. Research suggests most assets now in the field are operating beyond their original intended lifetime.

In the US, over 70% of energy assets are over 25 years old. **Any forward-looking asset management, maintenance and investment strategy must be able to recognize where it makes sense to extend existing asset lifetimes, or where replacement or redesign is the most viable route.**

Capture now, benefit tomorrow

Capturing current performance and condition data of assets can provide valuable indicators to inform future investment. Today's data, when correctly filtered and interpreted, can expose trends such as performance degradation, highlighting the viability (or otherwise) of future asset management and maintenance options.

Climate change and aging assets: **The perfect storm**

Climate change poses significant challenges for power generation companies, particularly in ensuring operational resiliency and managing risks associated with extreme weather events.

1. **Operational disruptions**

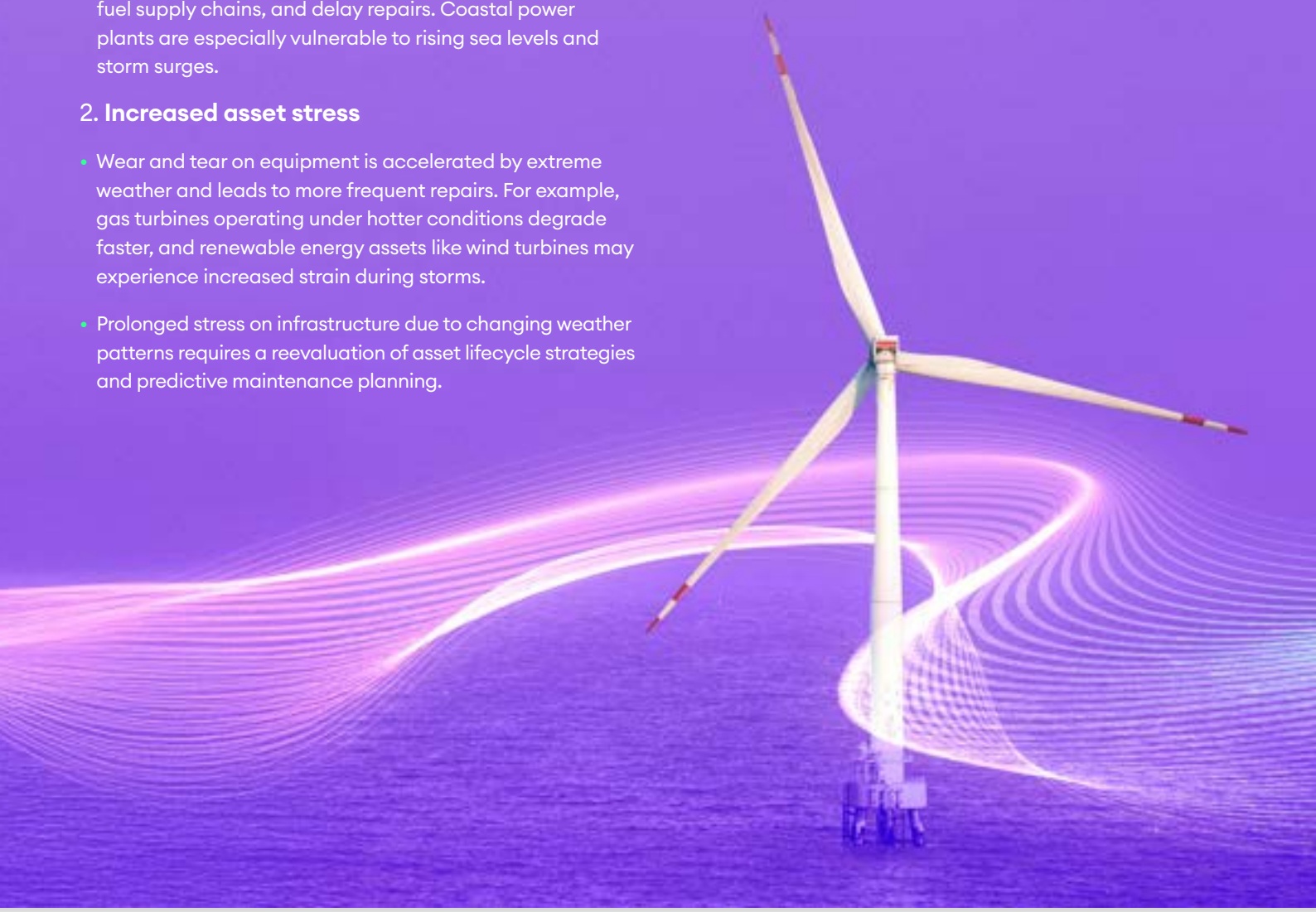
- Higher temperatures can reduce the efficiency of thermal power plants (coal, gas, and nuclear), as they rely on water for cooling. Droughts can limit water availability, leading to reduced power output or shutdowns.
- Storms and flooding can damage power plants, disrupt fuel supply chains, and delay repairs. Coastal power plants are especially vulnerable to rising sea levels and storm surges.

2. **Increased asset stress**

- Wear and tear on equipment is accelerated by extreme weather and leads to more frequent repairs. For example, gas turbines operating under hotter conditions degrade faster, and renewable energy assets like wind turbines may experience increased strain during storms.
- Prolonged stress on infrastructure due to changing weather patterns requires a reevaluation of asset lifecycle strategies and predictive maintenance planning.

3. **Need for operational resiliency**

- Fleets must be resilient enough to meet fluctuating demand during extreme weather. For instance, during heatwaves, energy demand spikes due to air conditioning, stressing the supply system.
- Diverse generation sites will present unique challenges, such as the vulnerability of fossil fuel plants to supply chain disruptions and renewables to resource variability (reduced wind speeds or solar irradiance).



4. Compliance with emission and environmental goals

- Climate policies are driving a shift to lower-carbon generation methods. While this aligns with long-term goals, it requires upfront investments in retrofitting existing plants or building new renewable energy projects, which can strain budgets if not planned strategically.
- There is growing scrutiny around emissions during extreme weather events (for example, blackouts caused by heavy reliance on fossil fuels), underscoring the need for sustainable solutions.

5. Fuel supply chain challenges

- Thermal power plants reliant on coal, gas, or oil face disruptions from climate-induced transportation challenges, such as blocked railroads due to flooding or supply delays during extreme weather.
- Renewable sources also experience constraints, such as the intermittent nature of wind or solar during adverse weather, which impacts their reliability.

6. Insurance and financial risks

- Increased exposure to natural disasters raises insurance premiums for power generation companies.
- Potential damage to infrastructure or lost generation capacity during extreme weather events can lead to financial instability.

To address these challenges, power generation companies are adopting advanced technologies.

- Risk modeling software, which predicts weather impacts and helps plan contingencies.
- Resilient design investments of infrastructure, such as elevated plant designs or improved cooling systems.
- Asset Lifecycle Management (ALM) software, which provides a comprehensive view of asset health, operational risks, and performance under extreme conditions, enabling proactive measures across fleets.

Big data, little insight

While power generation companies potentially have vast data volumes available, most have no automated filtering to extract meaningful insights. Integrating data from AI-powered analytics, plant historians, operator rounds, and IoT devices generates a wealth of actionable business intelligence. Yet currently, most data collection efforts don't extend beyond reactive maintenance and time-intensive manual trending of data. Using data effectively underpins strategic asset investment and a predictive maintenance program.

The average life expectancy of solar panels is around 30 years. After 25 years use, latest analysis suggests **panels will remain between 80 and 94 per cent efficient**. When correctly decommissioned, 96 per cent of solar panel materials can be recycled to produce further units.

Without automated monitoring and reporting, smaller frequent micro-events, which could be early warning signals, are often hidden and ignored – despite the fact that they may cumulatively erode margins more – perhaps even by up to 10%. Data visibility and insights highlight trends. They support informed decision-making to reduce spending and increase network reliability and safety.

The next level of asset management

While all power generation entities have some kind of asset management system in place, those that rely on spreadsheets and historical data don't have a complete picture as a basis for effective decision making. Some companies outsource data analysis to third parties. Others focus on the operation and maintenance of assets but have no integrated system to support the complete lifecycle, starting with capital investment decisions.

At this inflection point in the industry, with burgeoning demand accompanied by unprecedented challenges, industry analysts emphasize the importance of shifting from traditional asset management to comprehensive asset lifecycle management (ALM) as a way to maximize efficiency, reduce costs, and extend asset life. Power generation executives agree. The **IFS Global Utility Survey 2024** polled 863 C-level executives and VPs from utility companies around the world. Predictive maintenance and improved asset lifecycle management were noted by 36% of respondents as essential drivers for adopting enterprise software in the sector.

Asset lifecycle management software provides a holistic view of asset performance that includes the entire lifecycle–from planning and acquisition to operation, maintenance, and disposal. Instead of relying on only historical or even current data, companies can also use simulated data to develop "what if" scenarios and model various outcomes. By adopting full ALM approach, companies can align asset strategies with long-term business goals, allowing for a more complete, proactive, and data-driven approach to decision making.

Integrated projects and assets for full visibility

Asset lifecycle management software supports data collection from IoT-enabled sensors and leverages AI to perform predictive and prescriptive maintenance, which improves both the accuracy and timing of maintenance tasks.

These capabilities help power generation companies move beyond reactive repairs and towards strategies that extend asset longevity, improve uptime, and reduce downtime costs. Integrating predictive insights directly into operational workflows, ALM reduces emergency maintenance and enhances decision-making across the organization. As assets become increasingly complex, ALM's role in facilitating real-time asset monitoring and condition tracking becomes essential, aligning maintenance practices with evolving compliance, safety, and sustainability standards.

An important part of the asset lifecycle often missing from many so-called ALM systems is the first stage: investment planning, acquisition, and the design/build phase. Having projects and assets integrated in one platform creates a true end-to-end ALM solution. This integration ensures that capital investments are not only strategically aligned with business objectives but also optimized for cost, compliance, and performance across the entire asset lifecycle.

Enhanced strategic alignment

Asset lifecycle management systems with capital planning capabilities allow organizations to align asset investments with business objectives, such as improving reliability, increasing efficiency, and meeting sustainability goals. This strategic alignment enables companies to make informed decisions about which assets to acquire or replace, based on data about asset performance, future needs, and cost-benefit analysis. Power companies can move beyond short-term planning and ensure that capital expenditures contribute to long-term profitability.

Optimized budgeting and resource allocation

Capital planning within an ALM system enables companies to budget accurately for future asset acquisitions, replacements, and major upgrades. By considering the entire lifecycle cost of each asset, regulated utilities can prioritize spending on assets that offer the best return on investment (ROI), while independent power producers (IPPs) can minimize or optimize capital spend, depending on their strategy. Companies can also better anticipate and manage expenses, avoiding unplanned costs and improving financial outcomes.

Increased predictive and preventive maintenance planning

Integrating acquisition data with maintenance history allows for better predictive and preventive maintenance. By analyzing patterns of wear and performance, ALM software can suggest the optimal timing for replacements or refurbishments, which helps to avoid costly emergency repairs and extend the useful life of assets. This predictive insight also optimizes operations and maintenance, ensuring more consistent power generation.

Improved compliance and risk management

Power generation companies face strict regulatory requirements, and capital investments often need to consider compliance with environmental, safety, and operational standards. ALM systems with capital planning functions enable companies to track and document compliance, incorporating this data into acquisition decisions. This risk-aware approach helps avoid potential regulatory fines and ensures that all new acquisitions align with current and future compliance standards.

Streamlined decision-making and lifecycle tracking

Having capital planning integrated into ALM creates a centralized source of information for all asset data, from acquisition through to end-of-life. This comprehensive visibility supports faster, more coordinated decision-making across departments, allowing teams to track each asset's lifecycle effectively. ALM provides a single source of truth for asset performance, costs, and compliance data, which is essential for efficient lifecycle tracking.

When the planning, investment, and design stages are included, ALM software can offer power generation companies a comprehensive, data-rich approach that not only safeguards assets but also optimizes their financial and operational value throughout their lifecycle. Leveling up to this type of system is essential for organizations that aim to increase ROI, achieve regulatory compliance, and align asset management with sustainability goals and increased demand in a cost-effective way.

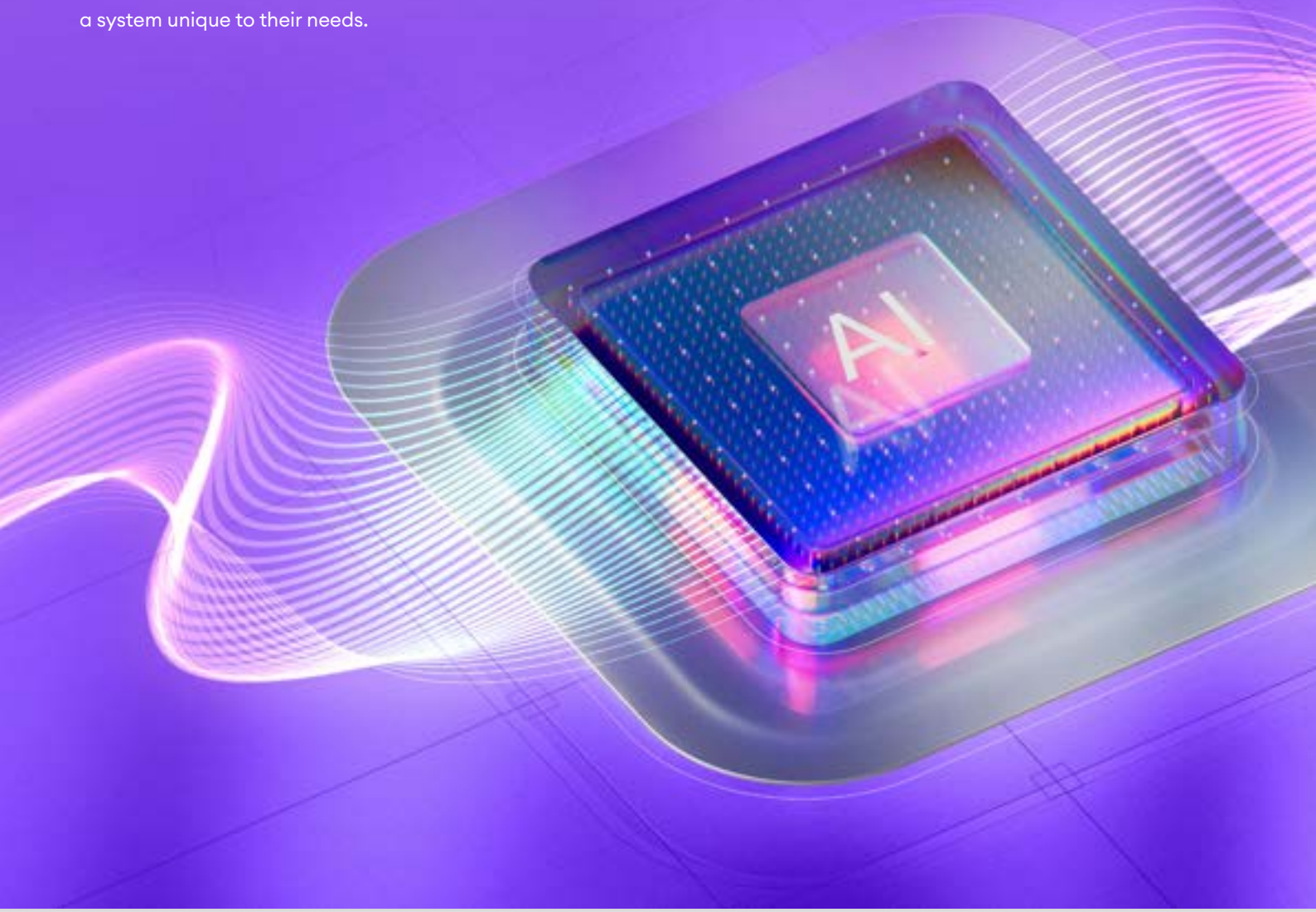
Composability and AI

In the IFS Utility Survey, almost 40% of respondents ranked the search for a composable enterprise platform as the primary approach their utility organization is using to optimize its digital transformation journey, making it the most favored approach overall. But what is composability?

This approach, built around a flexible and modular technology infrastructure, enables businesses to adapt quickly to changing requirements and integrate various applications, services, and functionalities seamlessly as they need them. With priorities ranging from customer experience to worker safety to asset reliability, power generation companies are finding that composable platforms give them the flexibility they need to design a system unique to their needs.

The vast majority of IFS survey respondents also said that data analytics (84%) and AI (82%) are key to digital transformation strategy. AI helps makes better use of the available data by detecting patterns and filling in "data holes." In addition to bolstering visibility into asset resiliency and reliability, utility companies expect to employ AI to support initiatives around customer experience, worker safety, sustainability, and employee training and retention.

Download Report:
IFS Global Utility Survey 2024



Aligning Strategic Decisions

A complete asset lifecycle management system supports decision-making across the spectrum from long-term imperatives to more immediate day-to-day considerations. These activities can be categorized into strategic, tactical, and operational levels based on their scope, time horizon, and impact on the organization.

Strategic

Strategic activities involve long-term planning (1-25 years) and decision-making that align asset maintenance with the overall business objectives and future growth of the organization. These activities set the direction and policies for maintenance practices.

- **Asset lifecycle planning.** Developing comprehensive plans that outline the stages of asset acquisition, operation, maintenance, and decommissioning to ensure optimal asset performance and return on investment.
- **Capital investment decisions.** Making long-term investment choices regarding the acquisition of new assets, upgrades, and major overhauls based on projected needs and technological advancements.
- **Maintenance strategy development.** Creating overarching maintenance strategies such as reliability-centered maintenance that guide how maintenance activities are prioritized and executed.
- **Risk management and compliance strategy.** Establishing frameworks to identify, assess, and mitigate risks related to asset failure, safety, and regulatory compliance.
- **Sustainability and environmental planning.** Integrating sustainability goals into maintenance practices, such as reducing carbon footprint, optimizing energy usage, and ensuring environmentally friendly disposal of assets.
- **Technology and innovation integration.** Planning for the adoption of advanced technologies such as IoT, AI, and digital twins to enhance asset management.
- **Workforce development and training programs.** Strategizing long-term training initiatives to develop a skilled maintenance workforce aligned with future technological and operational needs.

Aligning Tactical and Operational Decisions

Tactical

Tactical activities are planned on a month-to-year basis and encompass the day-to-day tasks and processes involved in maintaining asset reliability. These activities are routine and focus on executing the maintenance strategies set at the strategic level.

- **Preventive maintenance scheduling.** Planning and executing regular maintenance tasks such as inspections, lubrication, and adjustments to prevent unexpected equipment failures.
- **Corrective maintenance execution.** Performing repairs and fixes in response to equipment malfunctions or failures to restore assets to their operational state.
- **Condition monitoring and inspections.** Continuously monitoring asset health using tools like vibration analysis, thermography, and oil analysis to detect early signs of wear or degradation.
- **Asset performance tracking.** Utilizing maintenance management systems to track key performance indicators (KPIs) such as Mean Time Between Failures (MTBF) and Mean Time to Repair (MTTR).
- **Data collection and reporting.** Gathering data from various maintenance activities and generating reports to inform operational decisions and improve maintenance practices.
- **Routine compliance checks.** Ensuring that daily operations adhere to safety standards, regulatory requirements, and internal policies.
- **Inventory management for spare parts.** Maintaining adequate stock levels of essential spare parts to facilitate timely maintenance and minimize downtime.

Operational

Operational activities involve short-term actions and decisions that address immediate maintenance needs and challenges. These activities are often reactive and focus on optimizing resources and responding to unforeseen issues.

- **Resource allocation for maintenance tasks.** Assigning technicians, tools, and materials to specific maintenance activities based on priority and urgency.
- **Scheduling specific maintenance activities.** Coordinating the timing of maintenance tasks to minimize disruption to power generation operations and ensure optimal use of resources.
- **Implementing short-term fixes or solutions.** Applying temporary solutions to address equipment issues while planning for permanent repairs or replacements.
- **Responding to unexpected equipment failures.** Quickly mobilizing maintenance teams to address sudden asset breakdowns to restore operations as swiftly as possible.
- **Managing spare parts inventory.** Handling the procurement, storage, and distribution of spare parts needed for immediate maintenance tasks.
- **Short-term workforce management.** Adjusting staffing levels and schedules to meet fluctuating maintenance demands, such as during peak operation periods or after equipment failures.
- **Emergency preparedness and response.** Developing and executing plans for unforeseen events such as natural disasters or major equipment failures to ensure rapid recovery and continuity of power generation.
- **Cost control measures.** Implementing cost-saving initiatives for immediate maintenance activities without compromising quality and safety.

IFS: A true end-to-end asset lifecycle management solution

IFS supports greater efficiency and accuracy in decision-making throughout every stage of the asset lifecycle. Trusted by many of the most innovative global power generation companies, IFS helps to manage diversified assets and projects within renewable, nuclear, and conventional energy sources.

IFS Cloud provides a holistic approach, that starts with comprehensive project management, which supports the digital asset handover to ongoing maintenance and future upgrades, ensuring long-term functionality and compliance. This strategy enhances asset performance across its lifecycle, maximizing return on investment and maintaining high environmental and safety standards.

Unifying Engineering and Design, Project Management, Maintenance, and Asset Performance Management establishes the core of the solution. And due to the unique breadth of IFS Cloud, organizations can easily take advantage of an entire suite of integrated capabilities from Finance to Supply Chain Management.

By integrating these processes, businesses achieve predictable project outcomes: reduced operational costs, enhanced asset reliability, availability and lifespan, and streamlined compliance with regulatory and environmental standards.

Power generators must excel as both construction and asset maintenance businesses--amidst a backdrop of sustainability and carbon reduction targets and other challenges. Learn why innovative, global power generation companies trust IFS to help manage diversified assets and projects within renewable nuclear, and conventional energy sources.

Want to learn more?
Explore how Power Generation companies globally are leveraging IFS software for a holistic approach to project and asset lifecycle management

Watch the Video

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™.

IFS was founded in 1983 by five university friends who pitched a tent outside our first customer's site to ensure they would be available 24/7 and the needs of the customer would come first. Since then, IFS has grown into a global leader with over 7,000 employees in 80 countries. Driven by those foundational values of agility, customer-centricity, and trust, IFS is recognized worldwide for delivering value and supporting strategic transformations. We are the most recommended supplier in our sector.