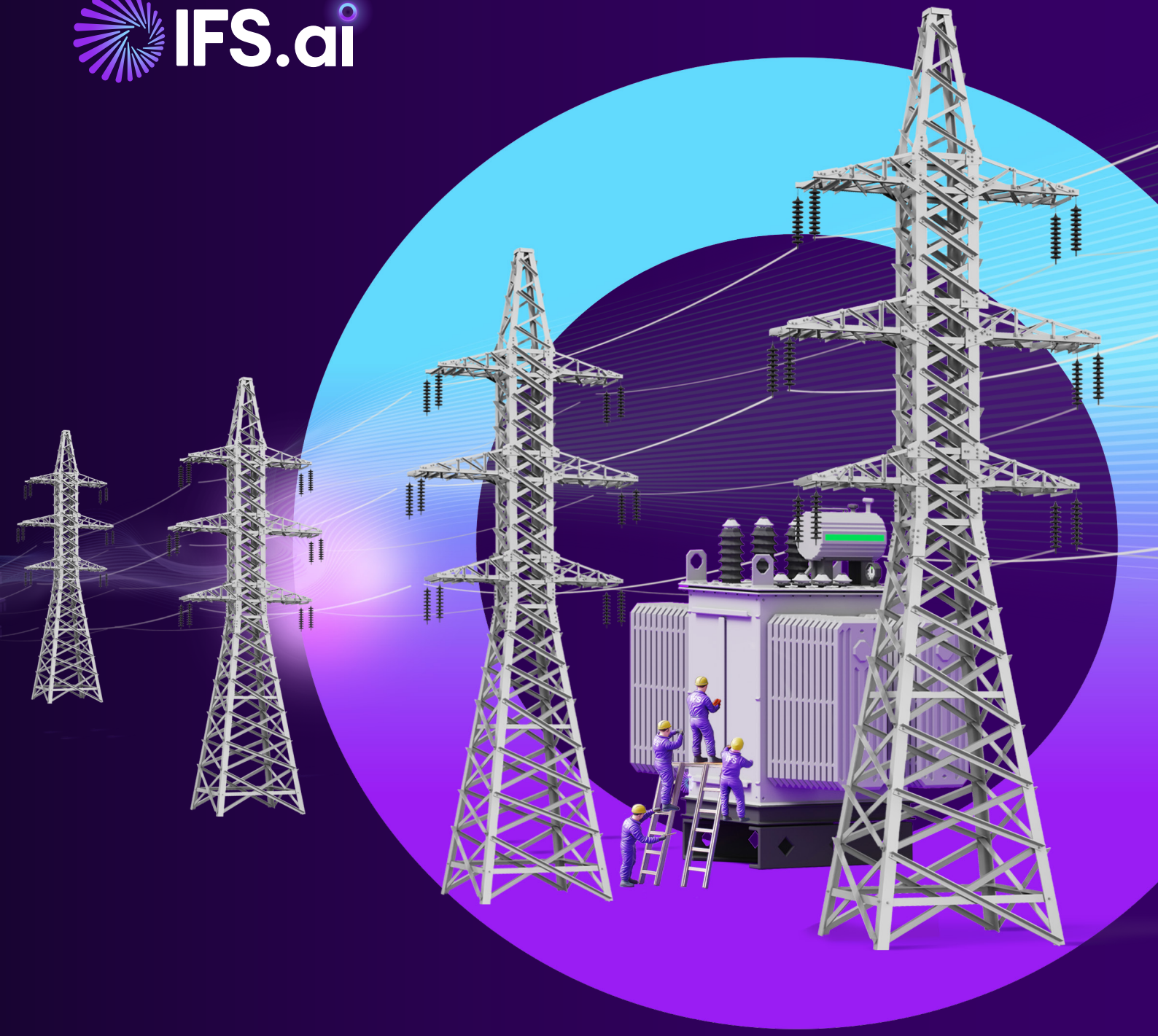
IFS.ai



The Path to Future Utility with AI: Expanding Grids While Sustaining Reliability

Introduction

Faced with an increase in Distributed Energy Resource Management Systems (DERMS) and growing behind-the-meter micro-generation, grid operators must manage and optimize assets throughout the lifecycle to meet increasingly volatile demand, whilst also contending with an aging infrastructure and rising maintenance costs.

This paper examines how both Transmission System and Distribution System Operators can meet pressures to expand and invest whilst maintaining a reliable service by leveraging AI, machine learning, automation and more.

The Big Challenge

Transmission vs. distribution: different assets, similar challenges

Transmission System Operators (serving the national grid via high voltage overhead and underground cables) have a critical portfolio of large, extremely costly assets. In tandem, Distribution System Operators (responsible for regional and municipal delivery of medium and low voltage to premises) maintain a large portfolio of smaller, less costly assets. Despite these key operational differences, both stakeholders in the value chain share very similar business, strategic and technical challenges and pressures.

The energy transition is in progress and there are several challenges it presents. For example, to support increasing investment in generation from offshore wind farms, Transmission System Operators must rapidly expand the capacity and reach of the grid, transferring power from the point of generation to regional areas of consumption. At the same time Distribution System Operators are having to pivot from a network that was built to provide a predictable, unidirectional flow of power, from substation to consumer, to one that is bi-directional: catering for customers both using power, and generating it behind-the-meter, using on-premises solar PV panels and wind turbines.

The power these ‘prosumers’ might generate is very hard to predict and, obviously, variable dependent on weather conditions. In both transmission and distribution scenarios, the capacity of the grid and local networks must be increased to prevent failure due to overloading. At the same time, as existing assets are aging, maintenance costs are escalating to ensure a reliable operation. Both transmission and distribution businesses now face the same business conflict: namely how to build new capacity whilst also maintaining existing infrastructure with an increasingly limited budget.

Asset Management: a fundamental concept

The concept of Asset Management emerged following early privatization of national network operators in the UK, Australia and New Zealand in the 1980s. It began with a British standard called PAS (Publicly Available Standard) 55, which has now evolved into ISO 55,000. Both these standards define asset management as ‘generating value from an asset over the complete life cycle by balancing cost, risk and performance’.

These three objectives – cost, risk and performance – are entirely interlinked. For example, eliminating risk from an asset will significantly increase cost. Put simply, Asset management is the way in which organizations make decisions to balance these variables to generate value and meet corporate objectives.

Strategic goals for the future roadmap: two sides of the same coin

Understanding the asset lifecycle

ENTSO-E, the European Association of Transmission System Operators, has recently published a future roadmap for Transmission System Operators Europe-wide[1].

In this roadmap, they identify two key pillars/ goals:

One calls for a secure and efficient power system, a solution enabling allowing operators to ensure efficient, secure and resilient system operation through Operational Excellence.

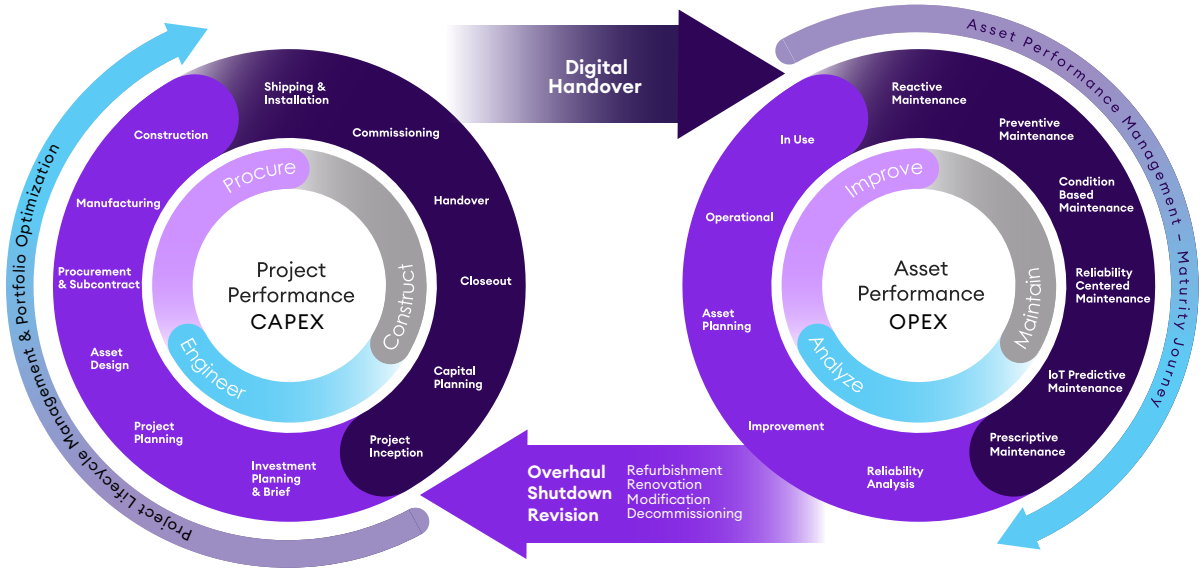
The other focuses on infrastructure & investments to accelerate the development and delivery of the grids, creating a power system fit for a carbon-neutral Europe.

Assets are planned, designed, built and commissioned; operated and maintained; and ultimately approach their predicted end-of-life life where they may be refurbished/rebuilt to extend life, replaced with new equipment, or decommissioned.

These two pillars map directly to the lifecycle paths of assets as described by IFS: the Infrastructure and Investment cycle on the left, and the operational excellence cycle on the right.

1. https://eepublicdownloads.blob.core.windows.net/public-cdn-container/clean-documents/Publications/ENTSO-E%20general%20publications/entso-e_strategic_roadmap_WEB_240215.pdf

Generating value over the lifecycle of Assets



Harnessing AI to Meet Strategic Goals

Goal 1: Achieving operational excellence using IFS.ai

i) From reactive to predictive maintenance: AI-enabled Asset Performance Management

Asset Performance Management (APM) starts with collecting data from equipment, transferring it into a database, and analyzing it to inform decision-making.

Over the last decades the growing availability of asset operating data has transformed maintenance. We have moved from the most basic reactive (break/fix) model to interval-based planned schedules, to condition-based interventions using sensors and real time alerts to maintain an asset before it fails.

Asset data has been available for many years, but now AI is enabling defined use cases and market-ready software solutions. For example, IFS Cloud asset performance management can analyze equipment data with AI to support data-driven maintenance on high value assets.

With the availability of Big Data, AI-driven predictive maintenance algorithms and machine learning are informing decisions, sometimes autonomously, that effect true improvement to asset performance.

IFS AI-enabled asset performance modeling and APM dashboards integrate with OEM (Original Equipment Manufacturer) asset insight solutions to support operational decision making for individual assets, but also provide a strategic view of performance right across the entire portfolio. Asset Health Insights that allow prioritizing maintenance, considering the criticality of assets for (say) a £7m transformer, do not rely on the utility sharing data with the asset OEM for maintenance support.

ii) Managing maintenance resources: AI-based scheduling and dispatch

Prioritizing maintenance work orders and orchestrating field service resources such as technicians, parts and equipment are highly complex, posing several difficult questions. Which job is the most critical? Are the parts available? Which engineer is nearest and has the necessary equipment and skills? Despite these multiple complex variables, in most cases, Utilities decisioning is still made by human schedulers, not by software analysis. As a result, choices may be subjective, and often sub-optimal.

IFS Planning and Scheduling Optimization tool uses AI to plot and analyze failure and intervention data in real time, planning and prioritizing resources to attend mobile work orders. The system factors in location, skills, parts, equipment and equipment criticality to dynamically manage the optimum schedule. The interface even allows ‘what if’ simulations to be visualized and explored – for example, a reduction in staff or the impact of a proposed grid expansion project.

Goal 2: Optimizing investment using IFS.ai

Much of Europe's transmission and distribution infrastructure was built between 1960 and 1980. These assets have a life expectancy of 50 - 70 years. As a result, most utilities are now facing complex, difficult, very high value business decisions around investment. Deciding where to focus to add the most value over time is especially challenging – particularly when potential outcomes might span regulatory fiscal, performance, efficiency, environmental, and reputational gains. Decision making must foster resilience and embed agility to react to changing market conditions.

End-to-end asset lifecycle management means companies must take decisions considering various aspects of an asset's lifecycle. It requires companies not only monitor and manage their assets, but also have the ability to identify where, when and why to invest.

The only way to make an informed judgement is to somehow establish a value framework that forms the basis to compare the significance and importance of each of the outcomes based on the underlying corporate strategy and goals.

Moreover, when there are tens, or hundreds of such scenarios to resolve across an asset portfolio and shifting public sentiment due to economic volatility or geopolitical conflict, the cumulative danger (and risk) associated with subjective human decision making is very real.

By using AI, the IFS solution provides a way to develop a value framework. It allows utilities to set desired strategic objectives and map activities to values in projects. The framework also allows different projects to be directly compared, and for changes to be emulated, supporting business resilience through informed, unbiased decisioning.

Explore IFS Copperleaf® Integrated Grid Planning (IGP) enables utilities to meet these challenges head-on with a modern, data-driven approach that connects strategy, operations, and investment decisions across the entire grid.

Learn More

exelon[SM]

Hear from Exelon about leveraging AI and technology to unify utility operations and navigate through the evolving landscape. In this exclusive video, Exelon's VP of Enterprise Asset Management, Rob Biagiotti, shares how Exelon is leveraging IFS software to streamline asset management, increase operational agility, and meet today's most pressing industry challenges from customer affordability to supply chain resilience.

Watch Now

Conclusion

Electric utilities, both Transmission System Operators and Distribution System Operators, face numerous challenges and partially competing objectives. Both face the need for grid and network extensions; and both have aging assets and infrastructure, threatening future capacity for supply.

Operational Excellence and Infrastructure and Investment are both fundamental to enable grid expansion.

Integrated solutions that support these pillars, a robust Asset Lifecycle Management solution embracing AI capabilities will significantly help Transmission and Distribution System Operators to respond to these challenges and generate value from their assets.

Powering the Future: Strategies for Grid Flexibility and Resiliency. Download IFS Spotlight for Utilities, developed in collaboration with Accenture

Download Spotlight Paper

How to Enhance Grid Resilience: A Path to Reliable and Sustainable Energy

Read the Blog

Learn more

To find out more about the ways end-to-end asset lifecycle management with AI-enabled IFS software empowers utility companies to stay ahead of the competition, visit us on **ifs.com.**

About IFS

IFS develops and delivers cloud enterprise software for companies around the world who manufacture and distribute goods, build and maintain assets, and manage service-focused operations. Within our single platform, our industry specific products are innately connected to a single data model and use embedded digital innovation so that our customers can be their best when it really matters to their customers – at the Moment of Service™.

The industry expertise of our people and of our growing ecosystem, together with a commitment to deliver value at every single step, has made IFS a recognized leader and the most recommended supplier in our sector. Our global team of over 7,000 employees every day live our values of agility, trustworthiness and collaboration in how we support thousands of customers.

Learn more about how our enterprise software solutions can help your business today at ifs.com.

#MomentOfService

Production: IFS, August 2025.