




Empowering smart grids: the crucial role of *advanced asset management* in driving the energy transition



In a world demanding ever-increasing amounts of energy, and from a secure, sustainable supply, power grid assets must become more reliable, longer lasting, and cheaper to maintain. Advanced asset management (AAM) can deliver all this while potentially bringing wider benefits for business and society.



Introduction

Globally, power grid operators (network operators) are using transformative technologies to stay competitive and build resilience in an ever-evolving landscape.

Advanced asset management (AAM) is emerging as a cornerstone of this journey. By deploying predictive modelling, risk management and optimized decision-making techniques, it promises a holistic, comprehensive solution to the multifaceted challenges grid companies face. Less well-known is that its benefits extend beyond the operational, such as workforce optimization and predictive maintenance, to business and societal impacts that contribute to a greener future.

For example, imagine a power grid operator has full control and visibility over its assets (and related data) throughout their lifecycle. That includes how each asset was produced, the resources needed to operate it and the emissions it generates. The company could use this information to refurbish, reuse and recycle assets – reducing its overall carbon footprint. It could even develop a Circular Economy Roadmap, using the data to set and track goals and measure overall impact. This would in turn allow the company to be more transparent with stakeholders about its goals and achievements, demonstrating its leadership in sustainability.

Best-in-class AAM is not only a precondition for achieving such far-reaching results. It is also fundamental to the effective implementation of all smart grid activities. If operators fail to manage their assets properly, as part of a smart grid wider transformation, they risk creating islands of modernization that are not connected to the whole. This in turn increases the risk that they will fail to deliver reliable, sustainable, and adaptable services – let alone the wider benefits we described.

However, the level of transformation needed to adopt AAM is very different from what today's grid operators have undertaken so far. It also requires specific skills, systems and processes. In this paper, the third in our series showcasing Capgemini's smart approach to smart grids, we look at the crucial role of AAM and how to approach it in an holistic way.

The challenge/ opportunity

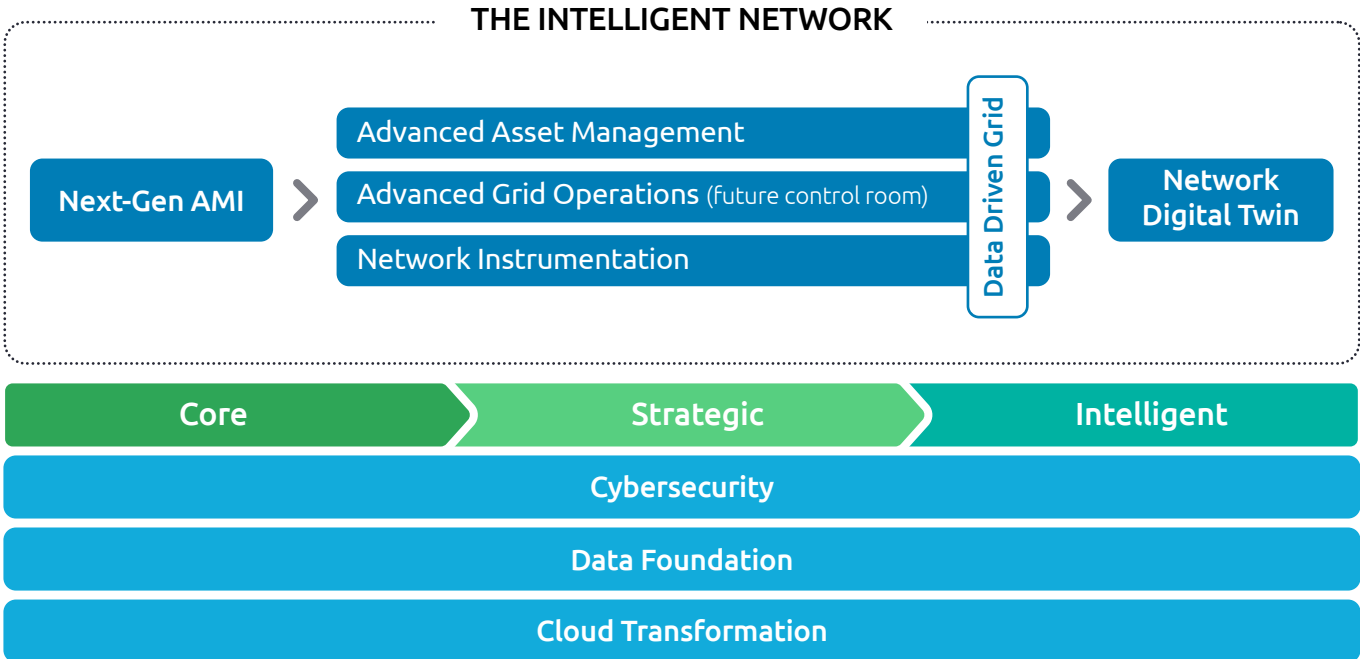
Why does advanced asset management matter?

The last decade has seen demand for energy surge globally, both to meet the needs of a growing population and to fuel the energy transition. At the same time, customer expectations for a sustainable, secure and reliable energy supply have risen. Regulatory demands, particularly around environmental impact, have also increased and evolved.

As we explained in the first paper of this series, grid companies must transform in various areas to meet this demand and achieve the energy transition. Modernizing how they manage their assets is a cornerstone of that approach.

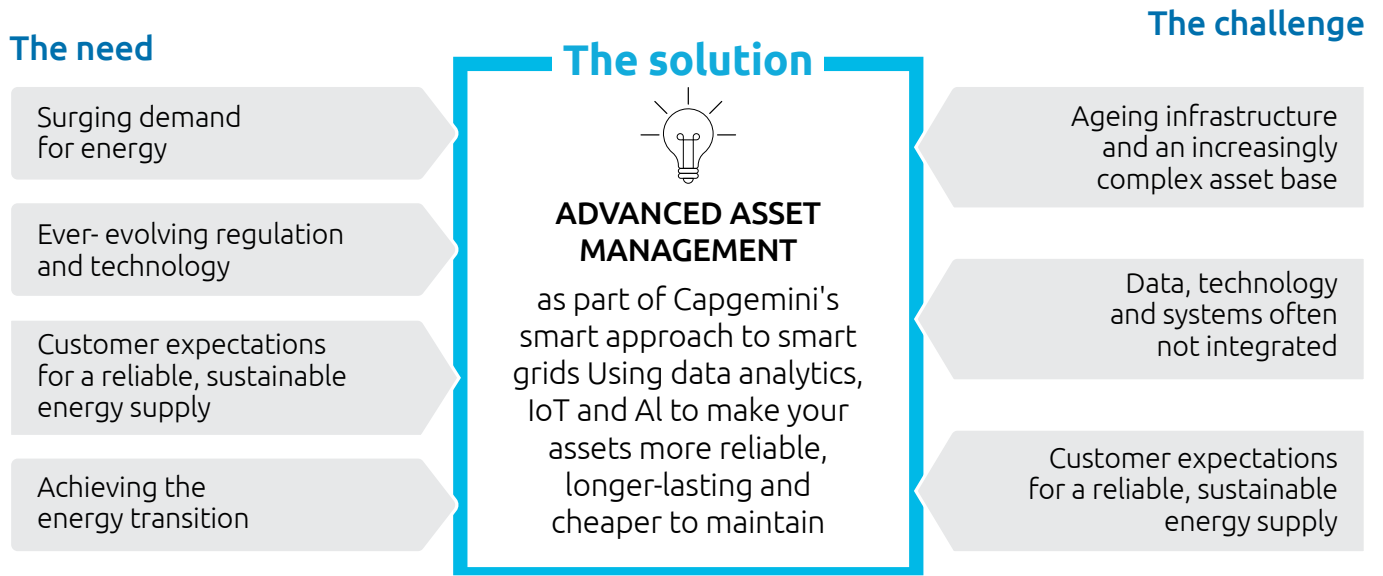
A rapid surge in technological innovations offers exciting opportunities to innovate and adapt in this crucial area. But the aging infrastructure in power grids presents a constant hurdle, requiring meticulous maintenance and potential replacement. Striking a delicate balance between preserving older assets and investing in modernization has become imperative, adding another layer of complexity. And while technological advances open the door to operational improvements, they also bring new challenges. These include the need to seamlessly adopt innovations while making sure they are compatible with existing infrastructure.

Figure 1: An end-to-end approach to smart grid transformation



To benefit from data-driven technologies, power grid operators also need robust systems to securely integrate diverse technologies data sources into a single, cohesive asset management system. In this dynamic and evolving landscape, expertise and collaboration in strategic planning and technology adoption emerge as the linchpins not only of survival, but of success.

Figure 2: The need, the challenge and the solution



The solution

Why advanced asset management is the answer

AAM can help overcome these challenges as part of a wider smart approach to smart grids. This approach deploys data analytics, the Internet of Things (IoT) and artificial intelligence (AI) to optimize maintenance and replacement cycles – maximizing the value of assets while extending their life and reducing replacement costs.

AAM also streamlines operations, minimizing associated costs and improving overall asset performance. What is more, it serves as a proactive risk mitigation strategy, enabling power grid operators to identify and address potential issues before they escalate.

These ground-breaking technological innovations are already transforming the way power grid operators manage their assets. We see companies use them to:

1. Capture data

By embedding IoT sensors and smart devices, operators can collect accurate, real-time data on performance metrics, condition assessments and health indicators. The data gathered – on everything from temperature and humidity to voltage and pressure – equips them to optimize the performance of individual assets as well as workflow across the asset base. It can also provide evidence that assets comply with regulations around health and safety or environmental impact. Blockchain technology supports compliance further by making sure data is secure in transit, traceable, and verified.

2. Analyze data

Various technologies and tools are helping to extract value from the vast amounts of data gathered across an increasingly complex asset base. Cloud platforms allow power grid operators to store and analyze large datasets in a scalable, flexible way, while making sure they are accessible from any location. Big data analytics transform those datasets into actionable insights into asset behaviour and performance trends that

allow companies to optimize maintenance strategies, reducing costs and downtime.

AI, machine learning and predictive analytics take these abilities to another level. By scrutinizing historical data and sensor readings, they can predict failures, detect anomalies and unveil patterns in asset performance data. Predictive planning and budgeting, along with improved energy efficiency, also lead to reduced environmental impact, aligning with sustainability principles.

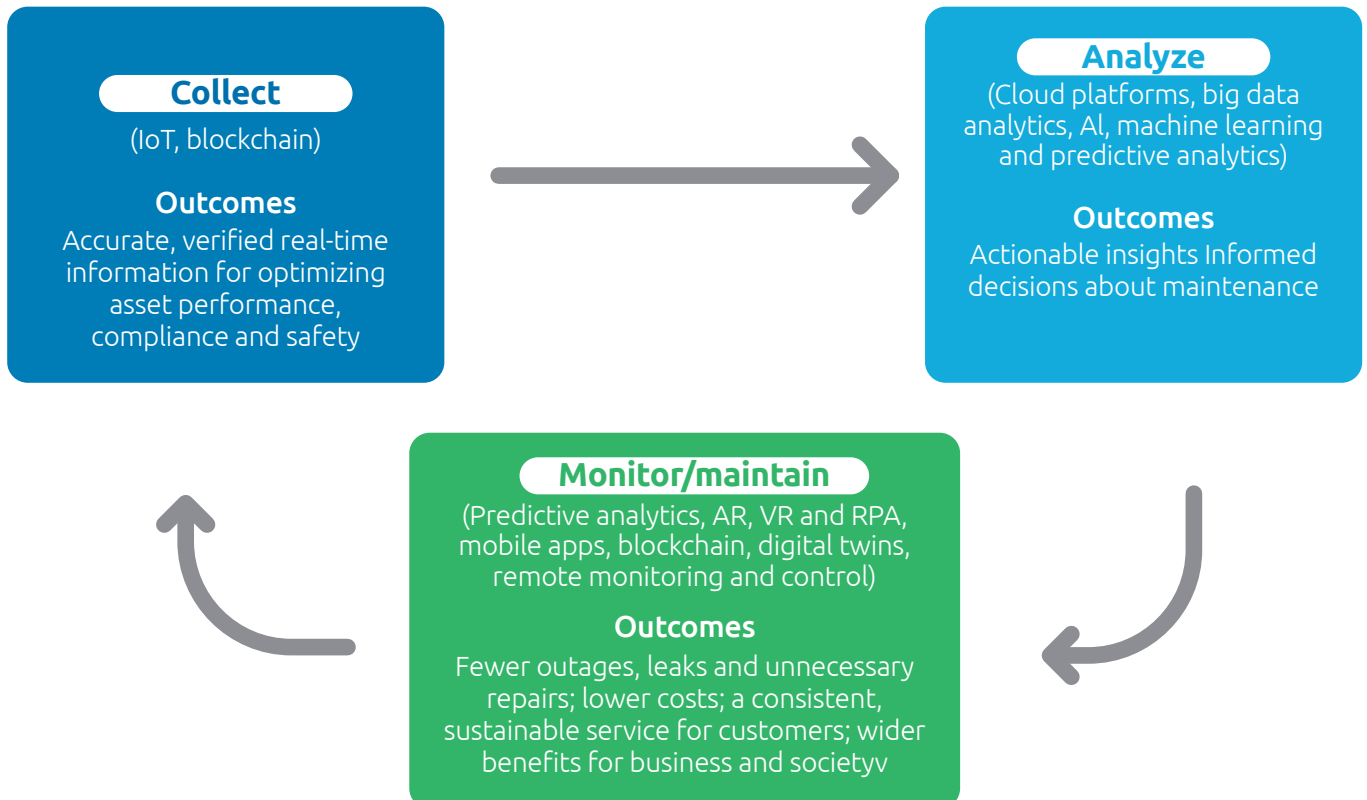
3. Monitor and maintain assets

The data-driven insights generated throughout this process provide visibility of which assets might fail, when, and the proactive steps that will prevent it. Technicians then use augmented reality (AR) and virtual reality (VR) technologies to guide predictive maintenance or repair work, and log the data in a mobile app. The grid operator may also automate some tasks through robotic process automation (RPA) and use blockchain technologies to keep an immutable record of all activities.

Two other solutions are helping power grid operators to refine how they monitor and maintain assets. The first is digital twin technology – a virtual replica of physical assets that allows operators to simulate and monitor asset behaviour in real time. The second is remote monitoring and control, which allows them to supervise assets centrally. This minimizes the need for physical inspections and speeds up response times when there is a potential issue.

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Figure 3: Data + analysis + application = a consistent, sustainable service for customers



It is clear that the amalgamation of technology, data and asset management heralds a new era of efficiency and reliability for power grid operators. By creating a continuous flow of valuable information, this combination can help them to:

- minimize outages, leaks and unnecessary repairs or inspections, so reducing costs and environmental impact
- boost the performance, efficiency and life span of assets
- deliver a consistent, sustainable and adaptable service for customers while meeting regulatory requirements
- deliver broader transformational benefits for the business and society – for example, by helping to facilitate a shift to a circular economy.

To achieve these transformational results, though, power grid operators need to approach asset management in a holistic way. That means integrating the technology and data involved at every step – from procuring an asset to managing it to the end of its lifecycle. And while different companies are at different levels of transformation, few have the people and expertise needed to integrate the many disparate elements.

How Capgemini can help

At Capgemini, we have huge experience in shaping and delivering digital asset transformation with our clients.

Our consultants have helped power grid operators globally to move to AAM as part of an end-to-end process of smart grid transformation. (You can read more about the framework we use in our paper, Smart Grid – Technologies for the Future.)

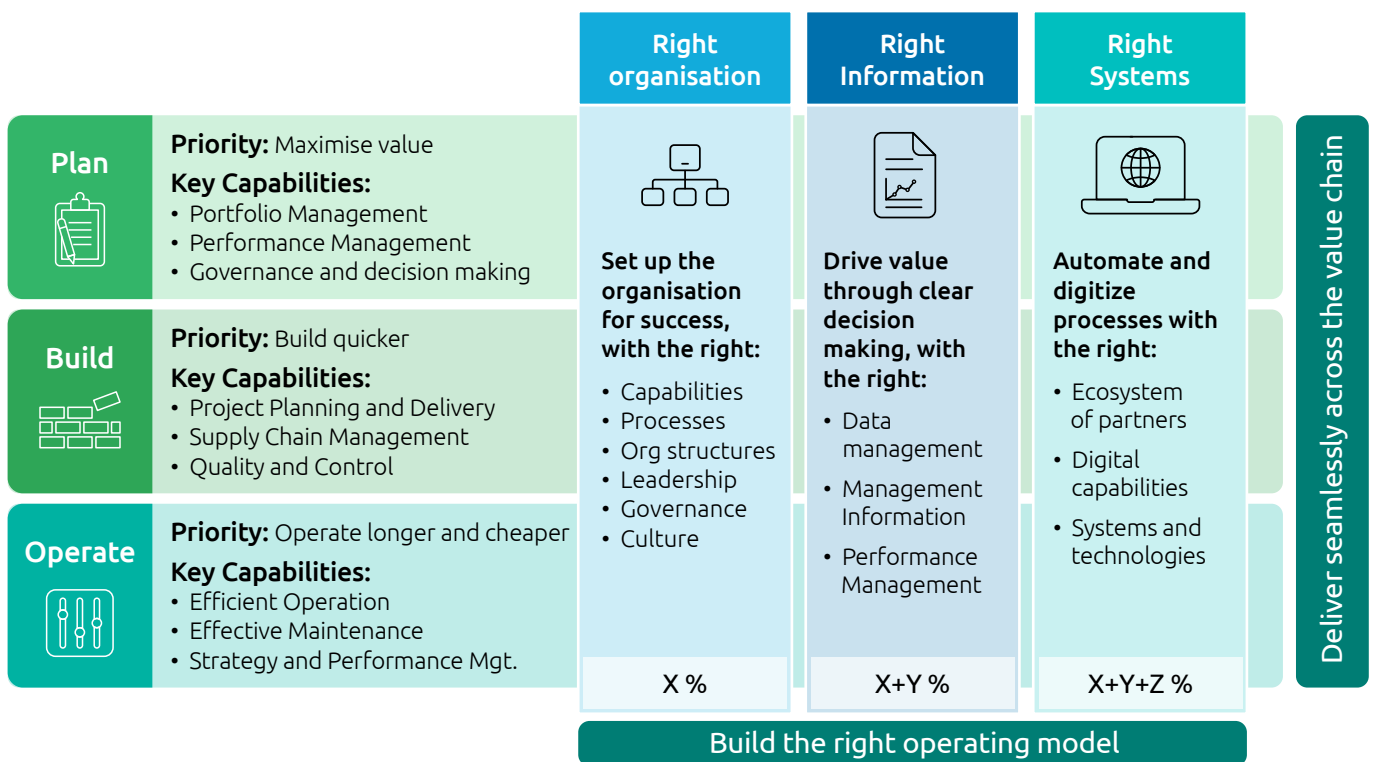
This proven track record means we understand the complexity and unique challenges power grid operators face. And we can apply best practice from our engagements across many markets to help overcome them.

Our approach uses a tried-and-tested framework (Figure 3), which reflects our understanding that people and processes are as important as systems in moving successfully to AAM.

We start by assessing how far grid companies have come on their transformation journey, then help to plan, build, and operate a fully integrated AAM solution. This includes making sure the commitment for change is in place, along with the capabilities, systems and business functions needed to make it happen.

Selecting the right partners for this task can be complex, not least because there are more than 100 core enterprise asset management (EAM) solutions on the market. At Capgemini, we are vendor- and platform-agnostic, which means we help grid companies to choose, configure and implement the best mix of technologies to meet their specific needs. Whether that is advanced asset tracking, comprehensive reporting for compliance or measuring the impact of circular economy initiatives.

Figure 3: Capgemini’s framework for implementing an integrated AAM solution



Want to find out more?

Read the other papers in our series on smart grid transformation.



[Smart Grid –
Technologies for the Future](#)



[Unleashing the Potential of Next-Gen
Advanced Metering Infrastructure](#)

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Capgemini is a global business and technology transformation partner, helping organizations to accelerate their dual transition to a digital and sustainable world, while creating tangible impact for enterprises and society. It is a responsible and diverse group of 340,000 team members in more than 50 countries. With its strong over 55-year heritage, Capgemini is trusted by its clients to unlock the value of technology to address the entire breadth of their business needs. It delivers end-to-end services and solutions leveraging strengths from strategy and design to engineering, all fueled by its market leading capabilities in AI, cloud and data, combined with its deep industry expertise and partner ecosystem. The Group reported 2023 global revenues of €22.5 billion.

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