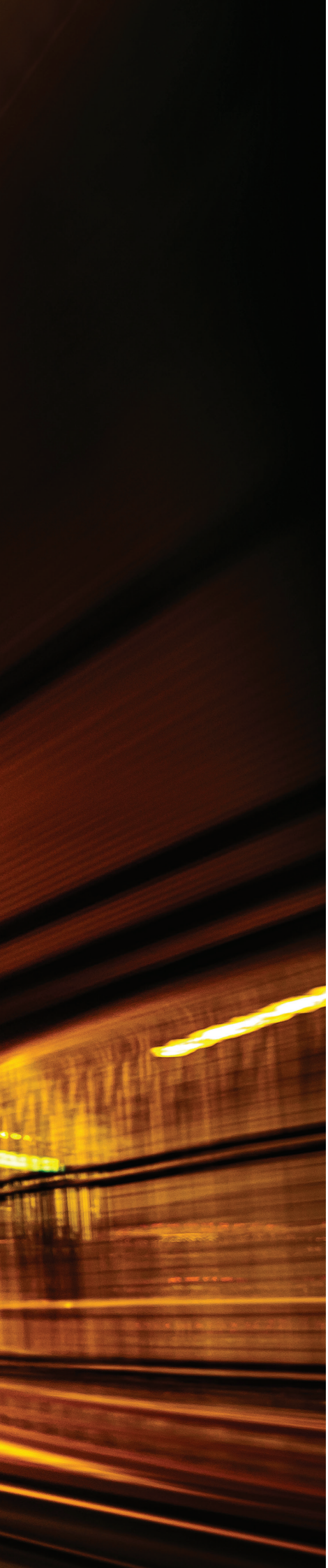
Advanced asset management: Powering sustainable *smart grid technology*

Capgemini



Introduction

Power grid operators are using transformative technologies like advanced asset management (AAM) to stay competitive and build resilience.

Advanced asset management promises a holistic, comprehensive solution to smart grid challenges and increasing energy demand. With predictive modelling, risk management, and workforce optimization, power grid assets can become more reliable, sustainable, and cost effective.

For example, a power grid operator with full control and visibility over its assets and data throughout the entire product lifecycle – including how each asset was produced, the resources needed to operate it, and the emissions it generates – could refurbish, reuse, and recycle assets, reduce its overall carbon footprint, and develop a circular economy plan to track and report on sustainability goals transparently.

Best-in-class AAM is also fundamental to the effective implementation of all smart grid activities. Failure to manage assets properly during a smart grid transformation could result in siloed modernization projects that are not connected, and therefore less effective.

The level of transformation needed to adopt AAM is very different from what today's grid operators have undertaken so far, because it requires specific skills, systems, and processes. The key is to approach implementation in a holistic way.

The challenge

Increased demand and a more complex operating environment require new tools

The last decade has seen an increased demand for energy to meet the needs of growing populations and to fuel the energy transition. Regulatory demands, particularly around environmental impact, have also evolved.

Grid companies must transform in various areas to meet this demand and achieve sustainable energy transition, including modernizing how they manage their assets.

A rapid surge in technological innovation offers an exciting opportunity to adapt in this crucial area. But aging power grid infrastructures present constant hurdles which requi-re meticulous maintenance and potential replacement. Striking a balance between preserving older assets and investing in modernization adds another layer of complexity.

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

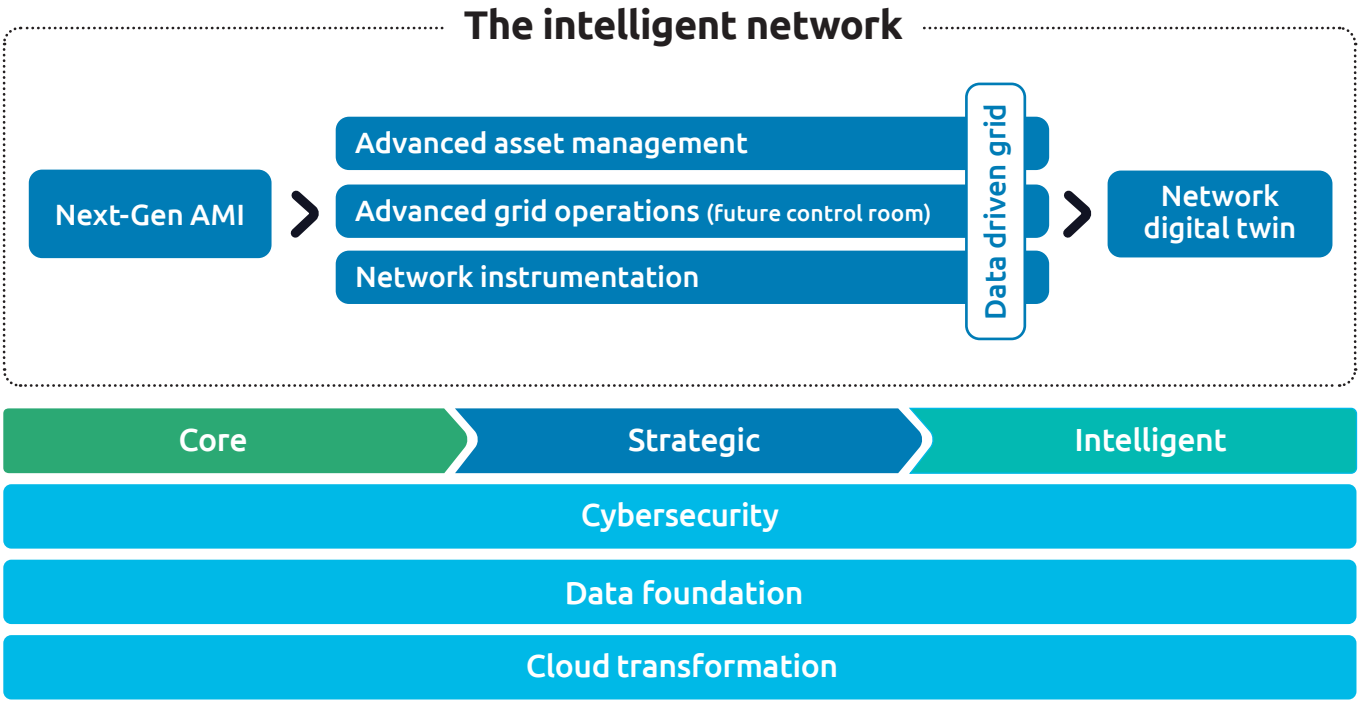
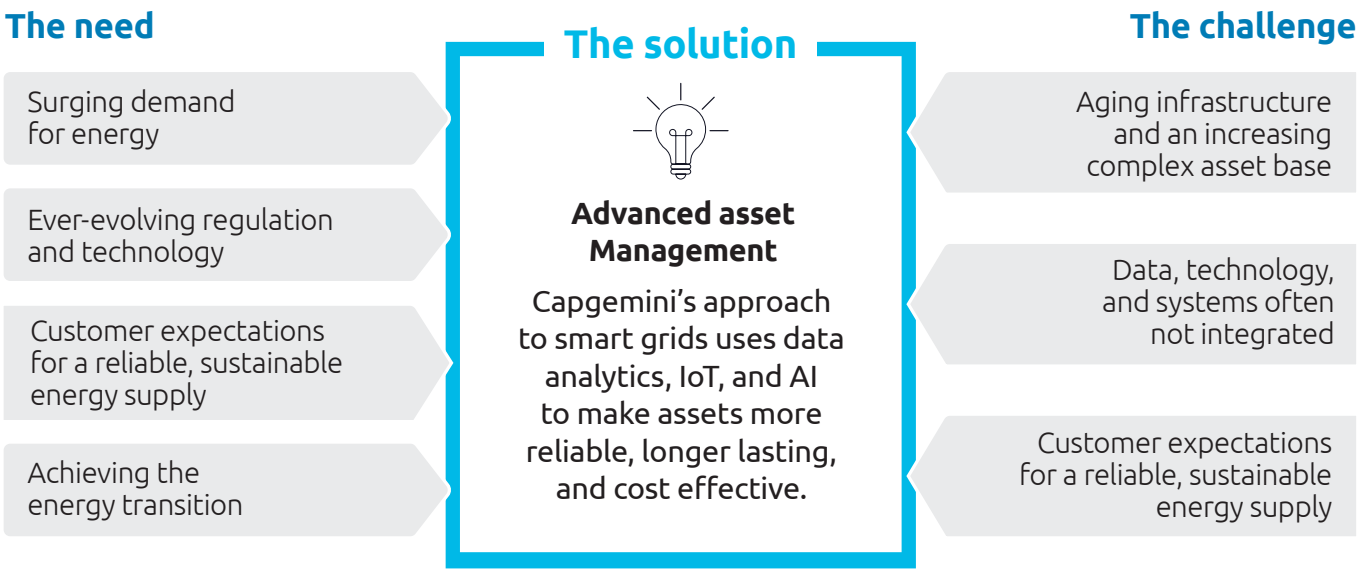


Figure 2: The need, the challenge and the solution



The solution

To benefit from data-driven technologies, power grid operators need robust systems to securely integrate siloed data sources into a single, cohesive asset management system.

Advanced asset management uses 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 to minimize associated costs, improve overall asset performance, and mitigate risk by enabling power grid operators to identify and address potential issues before they escalate.

These technological innovations are already transforming the way power grid operators manage their assets.

Capturing data

IoT sensors and smart devices help operators collect accurate, real-time data on performance metrics, condition assessments, and health indicators. Data gathered on elements like temperature, humidity, voltage, and pressure helps optimize asset performance and workflow across the asset base. It can also provide evidence that assets comply with health, safety, or environmental regulations. Blockchain technology supports compliance further by making sure data is secure in transit, traceable, and verified.

Analyzing data

Various technologies help extract value from the vast amounts of data gathered across the 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 on asset behavior and performance, which can be used to optimize maintenance strategies, reduce cost, and shorten downtime.

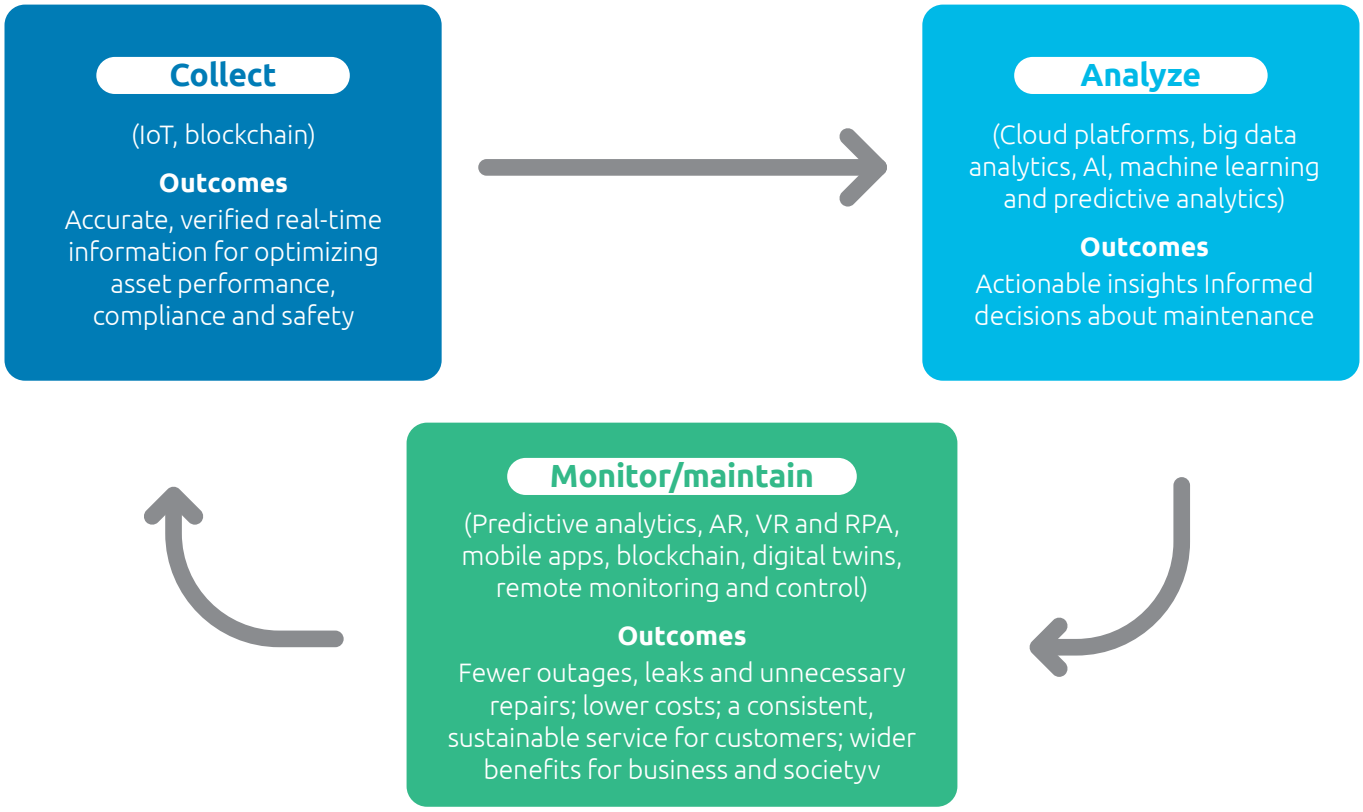
AI, machine learning, and predictive analytics take these abilities to another level by scrutinizing historical data and sensor readings to predict failures, detect anomalies, and unveil patterns in asset performance data. Predictive planning and budgeting, along with improved energy efficiency, also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

Monitoring and maintaining assets

Data-driven insights provide visibility into asset health and proactive maintenance. Augmented reality (AR) and virtual reality (VR) technologies can guide predictive maintenance or repair work, with data logged in a mobile app. Grid operators may also automate some tasks through robotic process automation (RPA) and use blockchain technologies to keep an immutable record of all activities.

Digital twin technology, a virtual replica of physical assets, allows operators to simulate and monitor asset behavior in real time. Remote monitoring and control allows operators to supervise assets centrally, minimizing the need for physical inspections and speeding up response times when there is a potential issue.

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



A new era of efficient smart grid systems

Technology, data, and advanced asset management creates a continuous flow of valuable information which helps power grid operators:

- Minimize outages, leaks, and unnecessary repairs or inspections, 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 by helping to facilitate a shift to a circular economy.

How Capgemini can help

Power grid operators need to approach asset management in a holistic way to achieve transformational results. That means integrating technology and data across the entire product or asset lifecycle.

Capgemini helps power grid operators move to AAM as part of an end-to-end smart grid transformation. We understand the complexity and unique challenges operators face and apply best practices to help overcome them.

Our approach uses a tried-and-tested framework that starts by assessing how far grid companies have come on their transformation journey. Then, we 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. At Capgemini, we are vendor and platform agnostic, which means we help grid companies 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.

About Capgemini

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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