

Transform your future with digital intelligence

Channeling the power of data for a
stronger, smarter, and greener grid

Executive Summary

Today's dynamic electricity market places real pressure on critical assets across the rapidly evolving grid, with transformers playing a vital role in the safe, reliable, transmission and distribution of electricity. This places new demands on transformer operators to understand and mitigate the impacts on performance, safety and operational life.

Real-time monitoring and diagnostics are recognized as a key requirement in addressing these demands and moving toward a predictive maintenance model - enabling the prioritization and effective targeting of limited maintenance, repair and replacement resources.

At ABB, we have leveraged our global leadership position to truly understand customer needs and priorities and have worked to make it easy for our customers to access and benefit from digital technologies – not least with the launch of fully digitally integrated transformers as standard.

In our digital product strategy, we have embraced an open platform approach to ensure digital solutions are compatible with all transformer types while data can be analyzed through alternative software according to client choice. We emphasize that data can be analyzed locally as well as in the cloud, with Edge computing providing robust on-board intelligence even without connectivity.

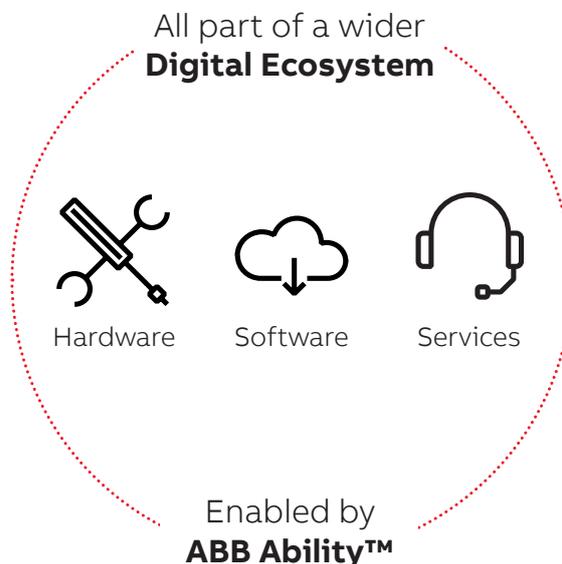
Real-time data driven intelligence is the key to enhanced financial and operating performance and we are excited by the platform this intelligence creates for a new generation of electricity transmission, distribution services and business models.

ABB has developed and continues to grow a digital ecosystem of hardware, software, services and expertise that ensures all customers are fully supported on their digital journey, while benefiting from an unrivalled history and depth of institutional intelligence and expertise. This puts us in a prime position to satisfy current and emerging customer needs.

The digital transformer solutions form an important part of the market leading ABB Ability™ industrial internet platform – the culmination of almost 40 years of digital development at ABB.

Whether you are looking to purchase and install new transformers, retrofit ageing transformers or assess and optimize your existing fleet in the face of new grid dynamics, ABB is the ideal partner.

At ABB we turn the potential inherent in data into market leading operational insight, enabling a stronger, smarter, and greener grid.



Why Digitalization – Transformers and Power Grids

Digitalization has already started to deliver innovative new solutions and business models for electricity transmission and distribution. There is no time to wait before embarking on your digital journey, with today's grid demanding innovation, and existing and new competitors developing new solutions.

Today's electricity market is more complex than ever before. Renewable and distributed energy integration, and the increased adoption of new technologies such as EV charging, present operators with new challenges and place key assets under considerable stress. The objective is 'to do more with less'. For example, by controlling temperatures, you can absorb more load fluctuation.

Transformers are fundamental to the safe transmission and distribution of electricity. They command a high capital cost and require significant lead times for replacement. Unplanned downtime has significant financial impacts. Timely, actionable insight into asset health and performance is therefore becoming a priority over the lifecycle.

Focusing on the impact of real time transformer monitoring, authoritative research from CIGRE¹, found the benefits of transformer monitoring yielded the following results:

75%

reduction in repair costs due to early detection

60%

reduction in revenue loss due to unanticipated problems/outages

50%

reduction in risk of catastrophic failures.

2%

Annual cost savings, equivalent to the replacement cost of a new transformer

These are hugely attractive (and challenging) benchmarks for the positive impact of digitalization, but they do only reflect the optimization of today's operations rather than creating new value for operators. As such you can see monitoring and diagnostics as the foundation for the full value of digitalization.

¹CIGRE, Technical Brochure 248, Guide on Economics of Transformer Management



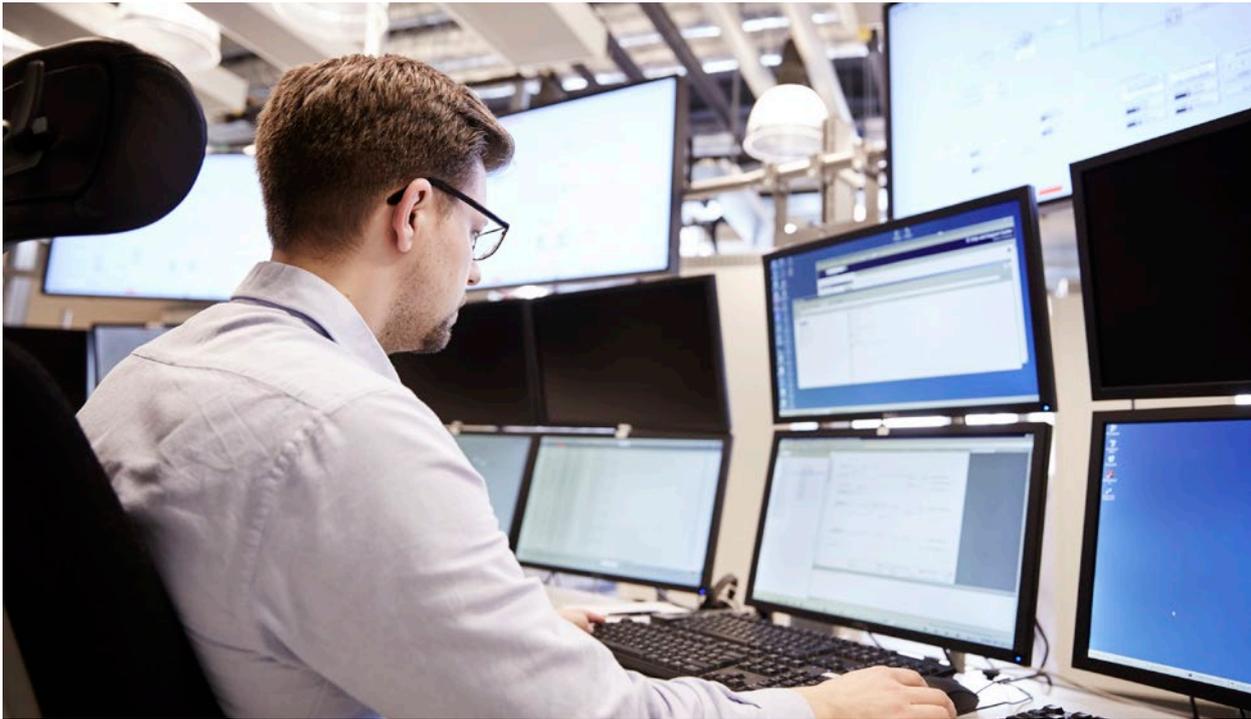
At ABB, there is a real commitment to the long-term potential of digitalization to inform new solutions and electrical transmission and distribution business models.

Digitalization fundamentally changes the market; it demands cross-sector partnerships, for example, between IT and OT specialists, while supporting new relationships and collaboration between operators and vendors, with ABB itself rapidly moving to a service and solution orientation rather than a product proposition.

ABB is investing in new service and collaboration centers across the globe to provide round-the-clock expert support for customers wherever they are.

ABB Client Success Stories

Operators remain skeptical of the benefits of digitalization for their business. Here we present two simple success stories, indicative of the positive commercial impacts being achieved by ABB customers. Each is a discrete application highlighting the potential of digitalization at scale.

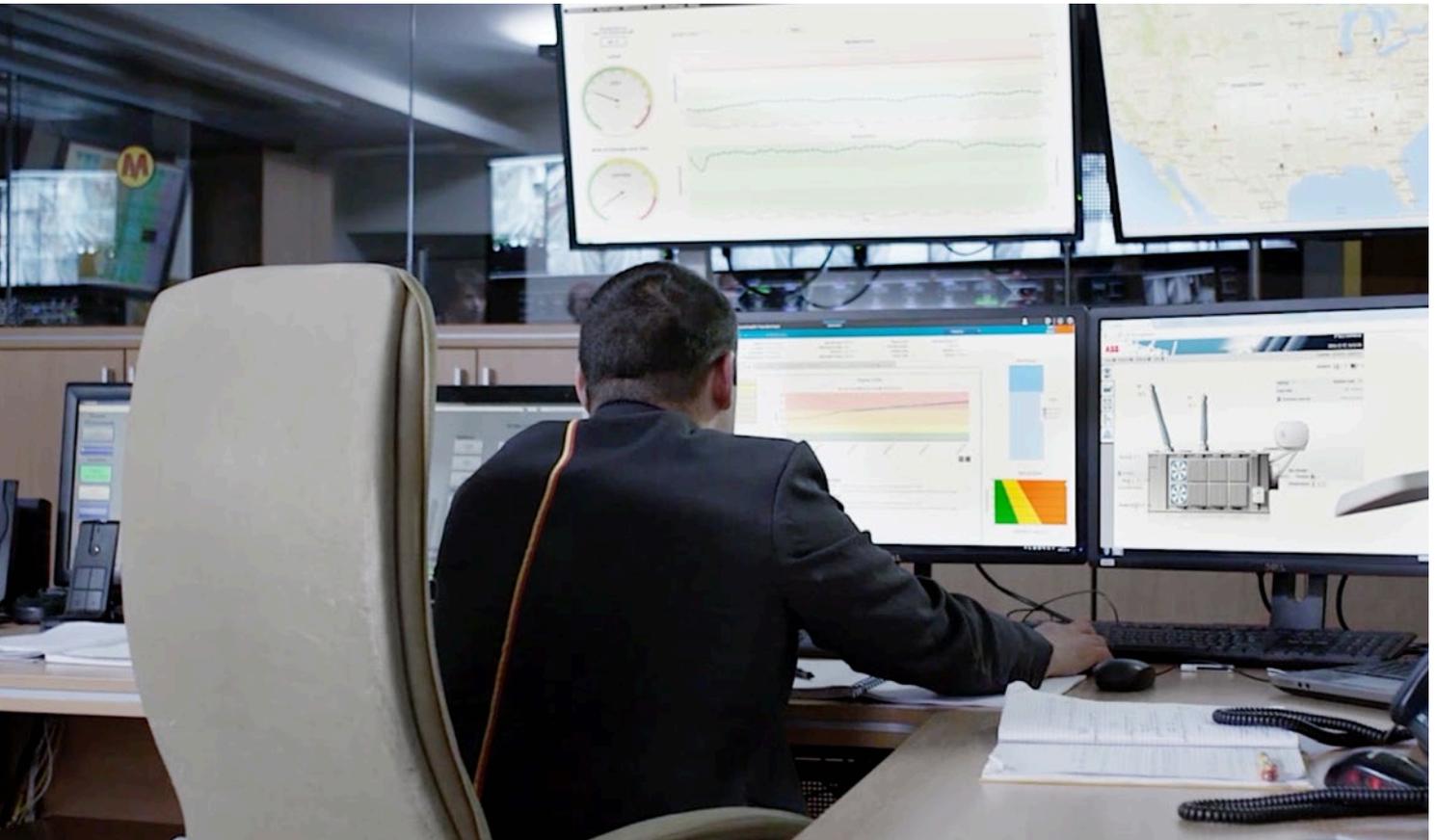


INDUSTRIAL PLANT – ENHANCED PRODUCTION CAPACITY

An industrial customer approached ABB with a business challenge. The company needed to increase the capacity of their transformer installation by up to 15% and, in light of uncertainty as to the future of the plant, to achieve a return on their investment within 3 years.

In response, ABB examined the feasibility of the project, conducting an overall condition study and risk assessment. The ABB team delivered priority on-site repairs and installed remote monitoring hardware across the installation. The data collected was subject to expert ABB analytics with recommended actions delivered on-demand and in a full quarterly report.

The project was a significant success, delivering a cost-effective capacity increase of 18% over 4 years. All customer objectives were achieved by leveraging the ABB digital ecosystem.



POWER PLANT – MAINTAINED SUPPLY DURING PEAK DEMAND

An operator of a small power plant approached ABB with an urgent transformer challenge. With performance deteriorating at a key time it was clear to the operator that the asset needed to be replaced. The challenge was to keep the existing transformer safely operational through the peak season to avoid contractual penalties to the operator.

ABB performed a condition assessment study. The assessment successfully diagnosed the problem with the transformer and the team was able to make intelligent recommendations including implementing immediate repairs, the installation of remote monitoring, and to confirm the need for replacement – which would take 9 months, including installation. Through remote monitoring, expert data analytics and clear recommendations, the ABB team worked collaboratively with the operator to successfully maintain an uninterrupted power supply throughout the peak season and for the full nine months until the new unit was installed.

This is another successful application of the ecosystem approach, with the ABB team not only interpreting the data and making intelligent recommendations, but also implementing actions.

Getting Started with ABB

ABB has developed a leading digital solutions portfolio through interaction with global customers. This focused approach informs a rigorous understanding of needs, priorities and perceived barriers.

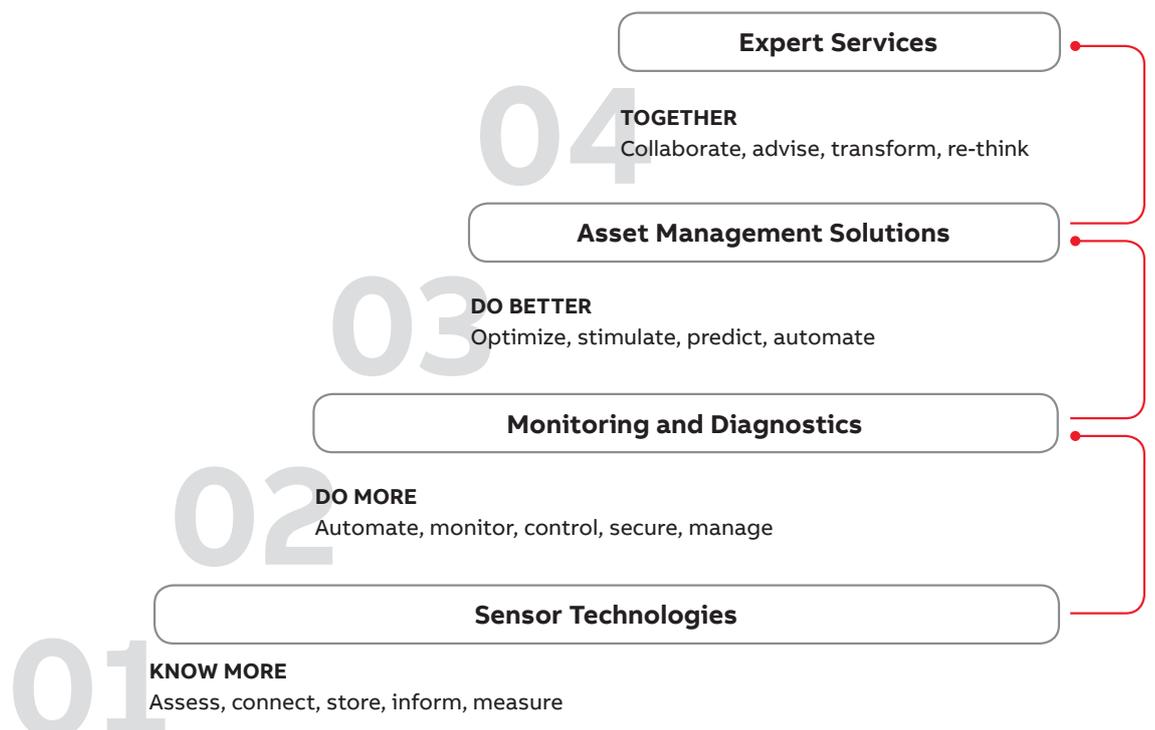
The ABB digital vision is, in the first instance, focused on simplicity and easing the transition to a digital operating model. The ABB digital ecosystem includes an extensive, modular, range of devices, software, service packages and expert support that can be deployed as digitalization scales up.

Customer dialogue ensures the ABB vision is pragmatically grounded. For example, ABB recognizes the vital importance of an open operating model to operators. ABB digital solutions are compatible with assets from other manufacturers, while alternative software can be used to analyze ABB data.

ABB has responded to other concerns raised, including for example, hardware costs and installation disruption, data access and ownership, cloud analytics and security, and data skills and expertise.

The latest additions to the ABB portfolio not only include built-in monitoring hardware (at no cost to the customer), and so are digitally enabled out of the box, they also incorporate on-board intelligence ensuring that they can be 'smart without being connected'. Edge Computing adds a new dimension to data management and security, offering an alternative to cloud dependence and is a key part of the focus on flexibility and security built into the ABB digital philosophy.

Sophisticated ABB software, developed from years of manufacturing, repair, and consultancy engagements, carries the weight of analytical expectations on your behalf. This powerful interpretative software enables client managers to build confidence and skills with the full support of the ABB team.





Optimization of operations is provided through modelling, simulation and bespoke algorithms which enable the management of predictive maintenance and repairs, while dynamic fleet and active network management supports renewable integration and intelligently manages the grid under fluctuating load conditions.

Completing the picture is a holistic approach to data. This can be understood as a layered framework where (real time) sensor data is interpreted in relation to the latest operator data (from oil samples for example), along with data from the ABB global installed base, and with reference to the ABB transformer design database. This design database includes the original specifications from over 30 legacy brands, providing a crucial level of analytical detail.

The depth of contextual data is vital to ensuring that the correct inferences are drawn from operational data and that the best recommendations are made. Without this depth, and expert analytics, it is always possible that data will be misinterpreted – creating avoidable disruption and loss.

Whether you are looking to purchase new (future proof) transformers, retrofit ageing transformers or optimize existing assets in the face of new grid dynamics, ABB is the ideal transformer partner.

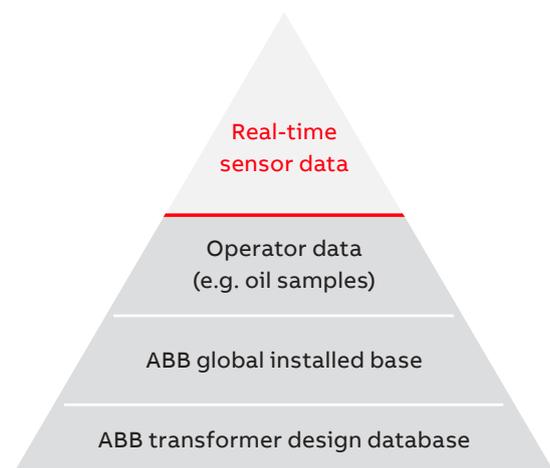


ABB Digital Transformer Solutions

ABB has been involved with transformer manufacturing, installation and operation since the very beginning and have pioneered transformer monitoring (initially fiber optic temperature monitoring) and digital solutions for almost 40 years. ABB has strong, established, partnerships across IT with companies including HP, Huawei, IBM and Microsoft, whilst local support is provided utilizing our industry leading global service network.

A feature of ABB's unique transformer history is the number of companies now merged and aligned, to the extent that ABB can talk of a combined 700 years of transformer experience from companies including ASEA, BBC, GE and Westinghouse.

Therefore, ABB brings an unrivalled body of experience and expertise to the digital transformer market. This institutional knowledge is available to ABB customers and partners through the ABB digital ecosystem – hardware, software, services, and expertise.

ABB continues to grow its digital transformer ecosystem in dialogue and partnership with customers across the globe. This concluding section provides a brief introduction to some of the most recent ABB launches including the ABB Ability Power Transformer, the TXpert and the TXplore.

Our history of digital innovation



1980

Fiber optic temperature monitoring pioneered by ABB



2001

Transformer Electronic Control (TEC) introduced to enable condition monitoring



2010

Self Dehydrating Breather eSDB with digital tracking is launched



2015

CoreSense™ DGA sensors provide continuous monitoring for transformer faults



2017

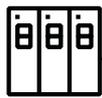
ABB launches TXpert™ the world's first digital distribution transformer and CoreSense™ M10 multi-gas DGA



The future

Artificial intelligence and machine learning will maximize transformer performance

A truly interconnected smart grid emerges



1990s

First digital control introduced for transformers



2005

Remote monitoring introduced with TEC version 2



2013

Asset Health Center enterprise asset management solution is introduced, today known as ABB Ability™ Ellipse®



2016

ABB continues to innovate in digitalization, launching ABB Ability™

ABB AssetShield™ ballistic detection and response solutions



2018

Launch of the ABB Ability™ Power Transformer sets the digitalization benchmark for all power transformers, enabled by CoreTec™ 4

Safe, fast and efficient internal robotic inspection with TXplore™

ABB ABILITY™ POWER TRANSFORMER

Officially launched at the Hannover Messe 2018, the ABB Ability™ Power Transformer sets a new industry standard with built-in monitoring hardware and full digital integration as standard. Benefiting from the highest levels of cyber-security together with sophisticated on-board intelligence, the ABB Ability™ Power Transformer accelerates your digital ambitions and provides a critical foundation for future development including digital substations.

**TXPERT**

Launched in 2017, the TXpert was the world's first digitally integrated distribution transformer. Ideally suited to the grid dynamics facing electricity distributors, the TXpert includes built-in monitoring hardware and full digital integration as standard. Built from the ground up in collaboration with customers and prospects it seeks to address the particular needs of different industrial sectors.

TXPLORE

The TXplore submersible robot addresses a key issue for the transformer market by enabling internal visual inspection of the transformer tank without requiring significant downtime, exposing the tank to the risk of external contamination or risking the safety of a human operative. Thus, data signals can be easily qualified by internal inspection before critical operating decisions are confirmed.



These examples sit within a far broader, and constantly developing, ABB ecosystem of digital devices, software and services forming part of the ABB Ability industrial internet platform. ABB is a global leader in leveraging data for industrial applications with 70 million connected devices installed, 70,000 digital control systems in place and 6,000 enterprise level software solutions operational.

At ABB we can help you realize the potential of digital technologies and turn data into market leading operational insight. Together we can enable a stronger, smarter, and greener grid.

Discover more at www.abb.com/transformers



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