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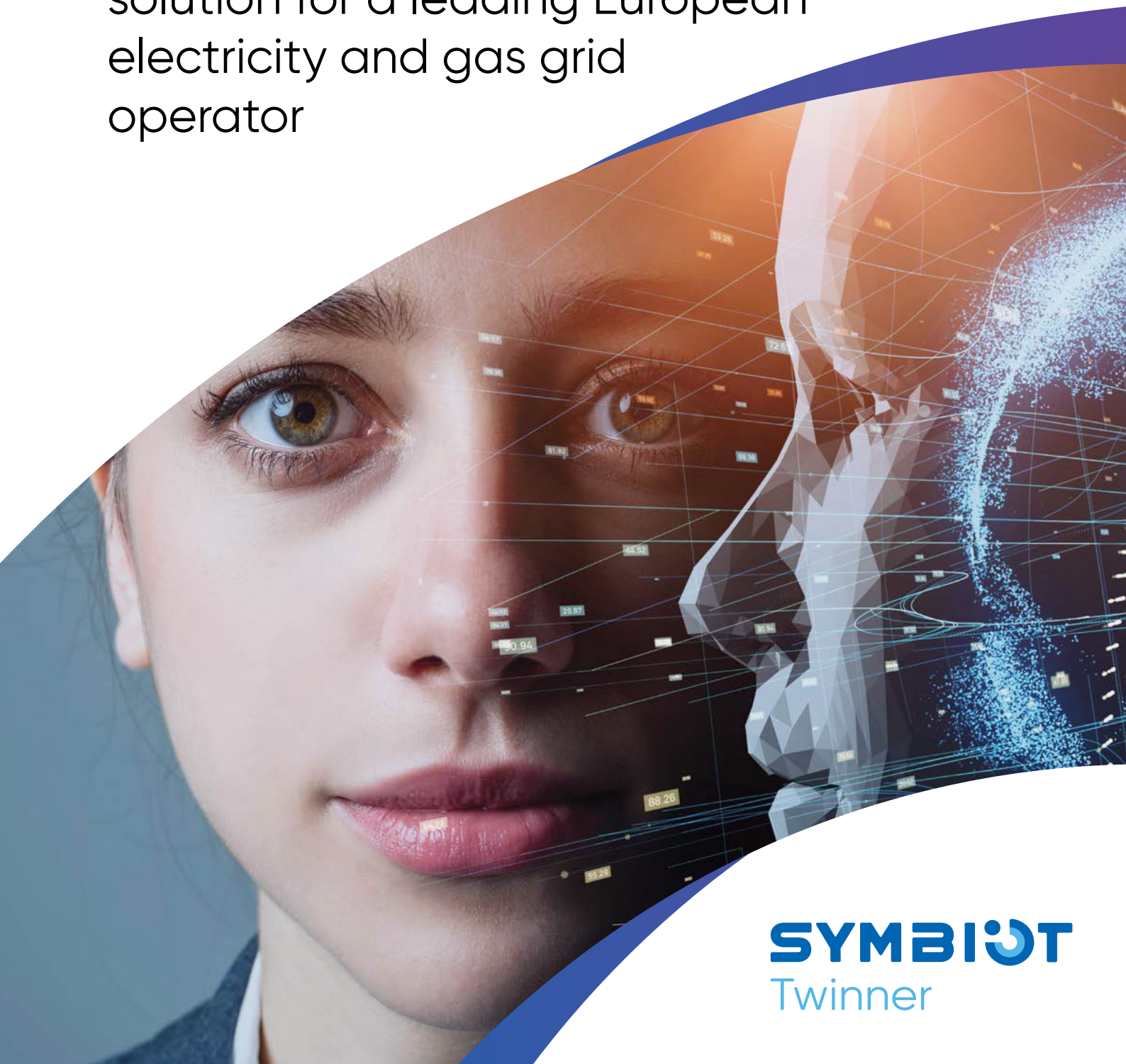
CUSTOMER SUCCESS STORY

Data-driven grid management: Implementing a digital twin solution for a leading European electricity and gas grid operator



SYMBIOT
Twinner

Customer profile and challenges

Distribution System Operators (DSOs) ensure a stable power supply to millions of consumers. They manage complex low-voltage electrical grids, facing increasing challenges due to a growing demand for efficiency and reliability. This success story explores how Symbiot Twinner can help DSOs to overcome these challenges and seize new opportunities.

These operators ensure a stable power supply to millions of consumers, manageing everything from strategic grid design to daily operations focused on efficiency and reliability.

The ongoing energy transition driven by renewable energy sources places additional pressure on electrical grids, thereby increasing the intricacy of energy management. The imperative for smarter, efficient, and reliable grid solutions is clear, with digital integration playing a pivotal role. By integrating modern information technology and operational technology, data takes a central role, enhancing the intelligence of the smart grid.

DSOs and emerging challenges

In a heavily regulated environment, DSOs manage significant data volumes and complex grid planning tasks.

The increasing integration of distributed energy resources (DERs)—such as solar panels and small-scale wind turbines—alongside the growing prevalence of electric vehicles and heat pumps introduces new dynamics and challenges. These developments lead to increased loads and potential instabilities, exacerbating the strain on infrastructure, notably on cables and transformers, and leading to overvoltage issues in low-voltage (LV) grids. Moreover, these challenges occur within a broader context of aging infrastructure, heightened cybersecurity threats, evolving customer service demands, and rapid technological changes.

Iskraemeco solution and implementation benefits

To tackle grid management complexities, Iskraemeco has introduced the Symbiot Twinner, powered by DataThings' GreyCat technology. This digital twin solution harnesses smart meter data alongside advanced temporal-graph data architectures to create real-time grid replicas. This innovation supports continuous machine learning and enhances scalability and decision-making across grid management departments.

Symbiot Twinner stands out with its robust data architecture that excellently manages data aggregation, visualization, analysis, and machine learning. By integrating graph and time-series database engines, it adeptly handles millions of grid elements and billions of data points. It transforms raw data into actionable insights considering contextual information like weather, calendar events, and various forecasts.

Utilities equipped with Symbiot Twinner benefit from its comprehensive predictive simulation and analytics capabilities. It identifies true grid congestions, facilitating targeted investments and strategic optimizations. The solution profiles each grid asset to ensure data consistency and enhances investment justification, reduces non-technical losses, and optimizes network capacity.

For each grid asset and consumer, the Symbiot Twinner provides:

- Live monitoring (including High, Medium, and Low Voltage assets)
- Accurate predictions (e.g., consumption of a final client, cable load)
- Agile simulations (taking into account current and forecasted grid status)
- Power flow calculations
- Heatmaps (active power, current, voltage, meter reading, cable load etc...)
- Geo-temporal navigation on all asset data in a map view format with a time-machine slider to navigate anywhere across the grid and visualize its past, present, and forecasted state instantaneously
- Instantaneous visualization of results on portable devices at minimal computational cost (ideally hosted on-prem)
- Data-inconsistency detection and identification (algorithm detects data inconsistencies in core source systems from day one)

Impact of a Symbiot Twinner implementation

(observed after 1 year of utilization)

1. Streamlining operations and cost savings through accurate grid data management

Results achieved:

- Instantaneous data analysis and reconciliation across integrated systems to correct and remove inaccuracies within targeted IT systems.
- Capability to pinpoint and resolve specific grid issues remotely while updating documentation instantaneously.
- Reduction in manual on-site verifications.

Value delivered:

- Update and cleaning cycle for grid documentation down from several years to a few months.
- Manpower requirement reduced from 20 part-time workers to one full-time individual working on updating the documentation two months per year.
- Reduction in operational costs and environmental impact due to decreased need for on-site checks.

2. Elevating maintenance strategies with predictive simulation technology

Results achieved:

- Reduction in simulation time for maintenance activities from several days to just seconds.
- Introduction of tools for regional centers to make informed decisions quickly.
- Successful examples of maintenance operations that were non-disruptive to customers.

Value delivered:

- Enhanced reliability and efficiency in maintenance operations.
- Significant reduction in societal and commercial impacts by avoiding service outages.
- Improved operator confidence and decision-making capabilities.

3. Strategic savings through optimized technical loss management

Results achieved:

- Comprehensive suite for predictive simulation and analytics.

Value delivered:

- Improved operational efficiency by reducing waste associated with over-purchasing of losses: Saving 5% on loss buybacks.
- Enhanced market responsiveness, allowing for purchasing at times of low prices.

4. Predictive analytics: a game changer for grid investment strategy

Results achieved:

- Reduction in the overestimation of network capacity needs by over 50% in some cases.
- Identification of true bottlenecks in the network, allowing for targeted investments based on real network conditions.
- Significant time savings in grid planning processes, reducing certain tasks from several weeks to just seconds.

Value delivered:

- Reduction in unnecessary infrastructure investments, saving on trenching and cabling costs.
- Enhanced ability to support economic growth by efficiently managing network connections for new developments.
- Decreased operational costs by reducing the workforce needed for grid planning.
- Automated simulation process for minor grid capacity increases.

5. Enhancing non-technical loss detection

Results achieved:

- Enhanced detection of non-technical losses leading to more accurate billing and revenue protection.
- Reduced instances of electricity theft through targeted interventions.
- Improved ROI from smart meter deployments due to theft reduction.

Value delivered:

- Financial savings from the recovery of lost revenue due to non-technical losses.
- Increased customer trust and satisfaction due to more accurate billing.
- Positive societal impact by addressing and reducing electricity theft.

6. Pioneering optimal path configuration for enhanced energy distribution

Results achieved:

- Identification of network optimizations leading to reduced ohmic losses.
- Financial savings from decreased energy loss and improved network efficiency.
- Reduction in the environmental impact of energy distribution.

Value delivered:

- Enhanced network performance with lower technical losses.
- Financial benefits from cost savings in energy generation and distribution.
- Positive environmental outcomes due to increased efficiency.

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