iskraemeco
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Digital grid - holistic grid management

Empowering the digital grid of the future

Addressing the increasing pressure on the electrical grid

As the electrical grid evolves, there's a rising number of devices ranging from household appliances to renewable energy resources, climate control systems, and electric vehicle infrastructure. This expansion places significant pressure on the grid, intensifying the complexity of maintaining a stable supply and increasing the risk of instability.

In response to these challenges, Iskraemeco has developed a **Digital grid solution** equipped with advanced monitoring systems, real-time data analytics, and efficient energy management to ensure grid stability and optimal resource utilization.

Our solution harnesses **smart meters with edge computing capabilities**, utilizing a variety of **communication protocols** for data transfer. **The Symbiot platform** is at the forefront of our data management strategy, while **the Symbiot Twinner** provides a comprehensive and real-time virtual model of the physical grid.

The core operations focus on monitoring, control, and communication within the energy supply chain, aiming to enhance efficiency, reduce energy losses, optimize energy supply and generation, lower costs, and improve reliability.

Benefits

Iskraemeco's digital grid solution optimizes energy efficiency and fortify the power supply and offer benefits for distribution & grid companies:

- Modernizing MV/LV stations
- Quickly adapting to changes in transmission lines
- Improving power quality management, network balances, and TCO
- Cutting energy losses
- Reducing power downs outage times, and ensuring power supply reliability
- Changing energy flows in the grids, and
- Lowering CO_2 footprints

Solutions Portfolio: Core Applications

1

Grid monitoring

This application focuses on the real-time surveillance of essential grid parameters such as current, voltage, power, and frequency. It's integral to maintaining utility stability, ensuring parameters remain within set safety and performance ranges. The system features smart meter integration, data aggregation, and an alarm system for rapid issue resolution.

2

Grid observability

The application offers detailed, near real-time insight into grid performance. It supports prompt operational adjustments based on continuous data analysis, enhancing grid stability in response to fluctuating consumption patterns and potential disturbances.

3

Grid flexibility

This application ensures a dynamic equilibrium between electricity production and consumption, particularly focusing on the integration of renewable energy sources and transmission capacity. This application strategically manages peak demand scenarios through active load control, aligning energy production with consumption patterns. Additionally, it emphasizes the connection to the energy market, facilitating efficient energy trading and demand forecasting.

4

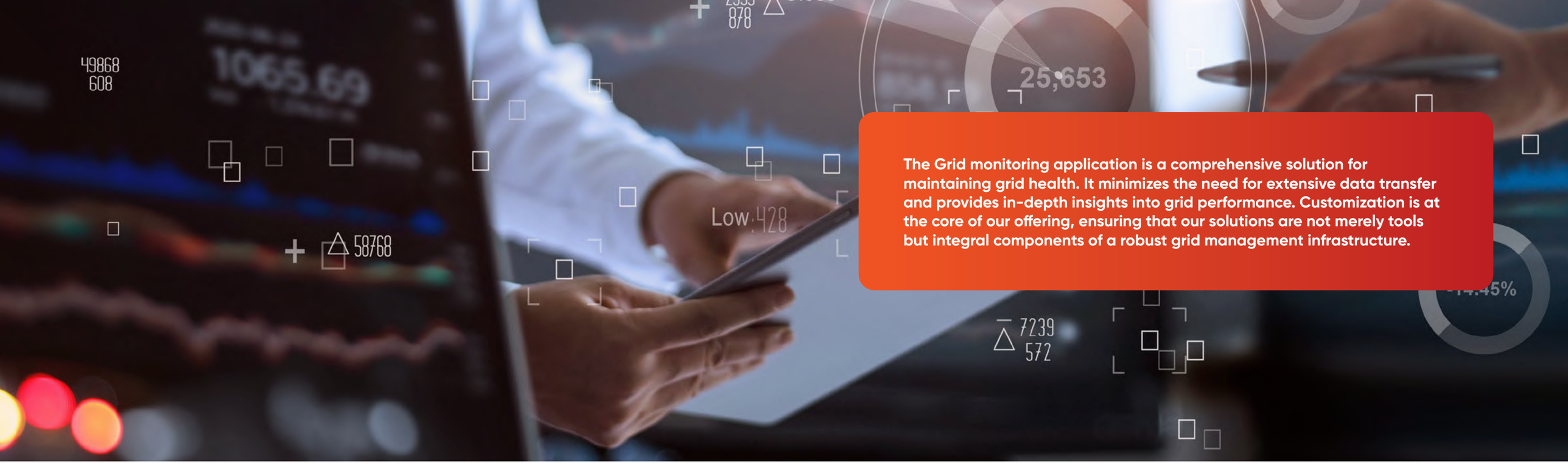
Grid topology

The application serves as a crucial analytical tool, offering a detailed understanding of the electrical grid's structure. It plays a vital role in various applications, such as fault detection, load balancing, and optimization of electricity flow paths. By leveraging real-time meter data, grid topology aids in making informed decisions across diverse grid management areas, including network configuration analysis, efficient integration of distributed resources, and strategic planning for grid enhancements.

5

Digital twin

This application, exemplified by the Symbiot Twinner, creates a virtual model of the physical grid. This model is continuously updated with real-time data, offering advanced analytics for grid performance, predictive maintenance, and strategic planning, thereby enhancing overall grid management.



The Grid monitoring application is a comprehensive solution for maintaining grid health. It minimizes the need for extensive data transfer and provides in-depth insights into grid performance. Customization is at the core of our offering, ensuring that our solutions are not merely tools but integral components of a robust grid management infrastructure.

1

Grid monitoring

Iskraemeco's Grid monitoring (GM) system is designed to monitor critical grid parameters such as current, voltage, power, and frequency. These parameters are central to the stability of utility operations and are monitored to ensure they remain within the set ranges.

Configurability and adaptability

The GM application is designed with a high degree of configurability, allowing for the setting of acceptable ranges for each monitored parameter. This flexibility is crucial for utilities to adapt the system to their unique grid profiles and operational standards. Additionally, GM can store the parameters of the last event in COSEM objects and maintain a proprietary log-book for historical reference.

Data presentation and management

Efficiency in data presentation is a hallmark of the GM system, which is fine-tuned to minimize data transmission to central systems without sacrificing informational value. This efficiency is achieved through a focused data aggregation process that prioritizes critical data points for analysis and transmission.

Alarm systems

An integrated alarm system is at the heart of the GM, activated when parameters deviate from their predefined norms. These alarms prompt immediate communication with our Symbiot HES, which is equipped with protocols designed to rapidly address and rectify such deviations.

Smart meter integration

IE.X smart meters are equipped with advanced processing and storage capabilities, enabling them to record not only the aggregate electricity consumption data but also detailed real-time power usage metrics. This includes the monitoring of individual consumer usage and the identification of system losses, which are critical for effective grid management.

Iskraemeco's grid observability application is the cornerstone of modern power grids, ensuring they are not only more reliable and efficient but also primed for the dynamic demands of the future.

2

Grid observability

Centralized control systems frequently struggle with the required agility to respond to fluctuating consumption patterns across the network. Iskraemeco's grid observability application is engineered to navigate these complexities, employing cutting-edge technologies that enhance responsiveness and reliability.

Near real-time grid monitoring

Continuous data streams are the backbone of our grid control application, enabling minute-by-minute oversight of grid performance and facilitating prompt adjustments to optimize electricity distribution.

Minute-based data reading

Our application's minute-based data reading captures the grid's rhythm in near real-time, providing a detailed perspective that empowers control systems to enact swift, effective measures to uphold grid integrity.

Decentralized control systems

Our decentralized approach allows for localized, informed decision-making, enhancing the grid's adaptability and ensuring a meticulous balance between supply and demand.

3

Grid flexibility

Our grid flexibility solution advocates for a user-centric approach over costly infrastructure overhauls, engaging both residential and public sectors in peak demand management. Smart meters on low-voltage networks are leveraged to mitigate the impacts of PVs, EV-chargers, and heat pumps, benefiting both utility providers and consumers.

Active load control

Central to our grid flexibility application is active load control, ensuring a dynamic balance between electricity production and consumption. Active load control responds to a variety of factors, from ambient temperature fluctuations to the operational status of transformers and network branches, ensuring the grid is neither overburdened during peak times nor underutilized during off-peak periods.

Enhancing renewable integration

Active load control not only optimizes the use of current resources but also facilitates the seamless integration of renewable energy sources into the grid. This capability is crucial for supporting the transition towards a more sustainable and resilient energy infrastructure.

Centralized Data and Decentralized Control

The centralized data collection provides a comprehensive overview of the grid's state, while decentralized control ensures swift and effective responses to immediate grid conditions. Centralized Data Collection: At the core of the solution is a centralized data processing. This system aggregates a wide array of data points from across the grid, including electricity generation and consumption metrics, environmental conditions, and network status indicators. It is crucial for comprehensive data analysis, patterns identification and understanding of the grid's operational dynamics. Decentralized Grid Management: This approach allows for localized, autonomous decision-making at various points within the grid, enhancing the system's responsiveness to real-time changes. Decentralized control units, equipped with simplified yet effective algorithms, regulate actions such as the activation or deactivation of transformers, grid branches, smart appliances or power generators. This decentralized model reduces the complexity of individual algorithms, leading to increased efficiency and reliability of the grid.

Real-time grid monitoring

The grid monitoring application captures grid performance in near real-time with minute-based data reading. It monitors critical grid parameters - current, voltage, power, and frequency - in real-time, ensuring these remain within predefined safety and performance norms. The data management strategy focuses on efficient aggregation, prioritizing critical data for analysis and transmission, crucial for minimizing data transmission loads while preserving informational integrity. An integrated alarm system triggers when parameters deviate from set ranges.

Connection to energy market

The integration of Grid flexibility with the energy market is essential for effective management of predicted consumption. This functionality enables traders to align their energy sales with day-ahead consumption forecasts. Accurate forecasting is critical in this context, as it can lead to substantial cost reductions. Deviation from these forecasts, whether as an excess or shortfall in consumption, carries significant financial consequences. Overconsumption requires the activation of additional power plants, while underconsumption leads to an energy surplus, challenging in terms of both management and incurred financial penalties. Thus, this integration is not just about efficient energy distribution, but also about crucial financial optimization for energy traders.

4

Grid topology

The solution leverages real-time smart meter data for in-depth analysis and optimization of the electrical grid's structure. It enables utility companies to effectively manage the grid by detecting and isolating faults, balancing loads, and optimizing electricity flow. This solution is crucial for integrating distributed energy resources and ensuring stable, efficient energy distribution across diverse grid sections.

Grid topology is based by real-time data from meters, extends beyond mapping to become a vital component in grid management, supporting a variety of end applications:

- **Network configuration analysis:** Topology, enriched with real-time meter data, enables an understanding of the grid's dynamic configuration, important for adapting to changes due to operational switches and the integration or removal of distributed resources.
- **Fault detection and isolation:** Continuous meter data integrated into topological analysis allows for the immediate detection and isolation of faults, reducing consumer impact and ensuring grid reliability.
- **Load balancing:** Utilizing real-time data, topology assists in redistributing power across the network to avoid overloads and maintain energy balance.
- **Path calculation for electricity flow:** Topology aids in determining efficient electricity flow paths, informed by real-time data, to improve grid efficiency and minimize transmission losses.
- **Management of independent grid sections (islanding):** For parts of the grid operating independently, real-time topology data is used to confirm operational stability and functionality.
- **Integration with phasor measurement units (PMUs):** Real-time data from PMUs, combined with topology, is essential for real-time grid stability monitoring.

Applications relying on grid topology:

- **Symbiot Twinner:** This application, a digital twin of the physical grid powered by smart meter data, relies on real-time topology for accurate grid performance analysis and decision support. When paired with topological data, Symbiot Twinner not only enhances operational awareness and response coordination but also supports the simulation of energy market dynamics, optimizing resource management.
- **Energy market analysis:** Topology data is used for simulating energy market dynamics, aiding in resource management and strategic decision-making.
- **Distributed resource management:** Applications managing distributed energy resources utilize topology data for efficient resource placement and grid integration.
- **Maintenance and strategic planning:** Predictive maintenance and grid planning applications employ topology data to identify potential issues and plan grid enhancements.

The solution offers real-time, data-driven insights for electrical grid management. It facilitates precise fault detection, load balancing, and efficient electricity flow management. The solution integrates seamlessly with distributed energy resources and ensures stable operation of independent grid sections. Its primary benefits include improved operational efficiency, enhanced grid reliability, and strategic support for future grid development.

5

Digital twin

Incorporated within Iskraemeco's Digital grid solution, the Symbiot Twinner is not just an application; it is a leap towards a more sustainable and efficient energy future. It empowers DSOs to operate, maintain, and plan their grids with unprecedented efficacy.

Symbiot Twinner creates a digital twin of the entire grid, driven by smart metering data, which is continuously updated in near real-time. This digital twin serves as a crucial decision-support tool for various DSO departments, enabling the following key functionalities:

- **Individualized consumer insights:** Utilizes machine learning to predict and understand the consumption behavior of each consumer.
- **Proactive grid management:** Features built-in power flow calculations to predict and alert grid operators about potential overloads and other critical grid issues.
- **Advanced grid simulation:** Employs simulation methods for evaluating grid reconfigurations, aiding in maintenance planning and impact anticipation.
- **Custom load simulation:** Supports grid planning by enabling the simulation of custom loads like heat pumps and electric cars.
- **Smart decision-making:** Suggests countermeasures to address grid issues, recommending optimal timings for grid capacity adjustments.

The Symbiot Twinner is built upon a unique combination of graph and time-series database engine, scaling effortlessly to manage millions of grid elements and billions of metering point measurements annually.

Symbiot Twinner transforms grid management by offering:

- **Data cleaning and consistency:** Creating a single source of truth from various data sources for cohesive network operation.
- **Strategic investment arbitration:** Assisting in the reallocation of funds for investments, streamlining the decision-making process.
- **Reduction of non-technical losses:** Employing algorithms to detect non-metered energy, addressing electricity theft and metering inaccuracies.
- **Optimization of network capacity:** Facilitating calculations for power flow and voltage profiles, crucial for integrating EVs and renewable sources.
- **Streamlined planning process:** Accelerating connection approvals and enabling future-proof grid planning.
- **Enhanced grid observability:** Providing a holistic view of the network for proactive issue resolution and stability maintenance.

The Symbiot Twinner enhances operational efficiency and planning, offering improved grid resilience and reduced non-technical losses. This solution enables data-driven decisions, crucial for maintaining a sustainable energy infrastructure.

Our Digital grid

Grid management solution is designed for automatic and dynamic control of the electrical grid. Specializing in harmonizing electricity generation with consumption, we manage the delicate balance required for efficient grid operation. Our advanced systems are engineered to prevent grid overload and seamlessly meet peak power demands, ensuring a reliable and uninterrupted energy supply, and paving the way for a sustainable energy future.

Innovative technology for enhanced efficiency

Leveraging sophisticated yet streamlined algorithms, our solutions demand minimal processing power, making them highly efficient and straightforward to implement. This allows for effective integration at various levels of grid operation, from local networks to broader infrastructures. Our algorithms contribute to significant improvements in grid reliability, adaptability, and efficiency, addressing today's energy challenges and preparing for tomorrow's demands.

Why choose Iskraemeco?

Partnering with Iskraemeco means engaging with committed professionals dedicated to excellence in grid management solutions. We pride ourselves on creating solutions that are powerful in performance and sustainable in practice, setting new benchmarks in grid management technologies.

At the core of Digital grid: grid management solution lies our commitment to sustainability.

Our solution is designed not only to enhance grid efficiency and reliability but also to significantly reduce the environmental footprint of grid operations. By integrating renewable energy sources more effectively and optimizing energy use, we contribute to a greener, more sustainable future.

Our innovative approach incorporates advanced algorithms and smart technologies that minimize energy losses and maximize the use of clean energy.

By enabling smarter energy management at both the provider and consumer levels, we're paving the way for more environmentally conscious communities, committed to reducing their ecological impact.

Through continuous innovation Digital grid: grid management solution is setting new standards in sustainable grid control, today and for future generations.

Shape the future of energy with Iskraemeco

Together, let's drive innovation and sustainability in your grid operations for a smarter, more resilient energy future. Discover how our solution can transform your network.

Digital grid – Holistic grid management

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DP EN/2311/173/1

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