

Mastering modern grid challenges

8 key challenges DSOs face – and solutions that can help overcome them



Key challenges facing DSOs in a changing energy landscape

In an increasingly complex energy landscape, distribution system operators (DSOs) are under immense pressure to keep their grids stable, efficient, and adaptable.

The rapid integration of distributed energy resources (DERs), combined with rising consumer expectations for transparency and control, and the strain of aging infrastructure, make grid management more challenging than ever before. Additionally, the growing need for cybersecurity and regulatory compliance adds another layer of complexity, forcing DSOs to rethink traditional approaches.

Based on valuable feedback from our customers and industry professionals, we have identified six key challenges that DSOs must address to navigate these evolving demands and ensure resilient arid operations.

These challenges include changing the role of DSOs: from being just an energy link to becoming a flexibility provider, digitalization of the electricity grid, management of demand and generation flexibility, cybersecurity threats to the grid, meeting consumer expectations, upgrading infrastructure, choosing the right tools to support ongoing operations and modernization.

In this eBook, we delve into each of these critical areas and demonstrate how the Symbiot software suite provides the necessary tools and solutions to empower DSOs.

Energy transition, grid safety and resilience

Digitalization of the grid

Demand and generation flexibility

Cybersecurity



Challenge 1 Energy transition, grid safety and resilience

The EU's ambitious energy and climate targets require a large-scale deployment of renewable-based generation, much of which will be decentralised and connected to the distribution grid.

Beyond being decentralised, the output profile of much of this generation will be variable, unpredictable, and unreliable, requiring a more flexible energy system to accommodate it.

The increasing integration of DERs introduces new loads and system instabilities. These challenges occur within a broader context of aging infrastructure, heightened cybersecurity threats, evolving customer service demands, and rapid technological changes. Traditional grid management methods are no longer sufficient.

The traditional role of the distribution systems and their operators - to deliver to connected consumers the electricity produced by large generating units connected at transmission level – is being complemented by a new task - of managing the flexibility provided and required by resources connected at distribution level.*

Aging and Need for advanced Increased DER inadequate integration grid management infrastructure

Symbiot Twinner supports a resilient, safe, and efficient power distribution system through the following capabilities:

Source: https://fsr.eui.eu/event/the-new-role-of-distribution-system-operators/

Integration of renewables with predictive impact analysis

Grid status assessment, overload prevention and safety

- load.

Optimal path calculation

Voltage problem detection

Symbiot Twinner equips DSOs with tools for simulating and predicting grid performance, enabling precise grid reconfigurations and accurate impact forecasting. The platform supports agile simulations, power flow calculations, heatmaps, and instant visualization, empowering DSOs to make data-driven decisions.

• Symbiot Twinner evaluates how new renewable connections affect grid stability. By modeling the grid in real time, it identifies the most effective integration methods, mitigating potential destabilization.

• Anomaly detection: Continuously monitors safety indicators, detecting issues Provides real-time insights into cable utilization, voltage levels, and overall grid

• Overload detection: Built-in power flow calculations forecast overload risks. • Power flow calculation & forecasting: Uses meter data and forecast models to perform rapid power flow calculations, assessing grid health.

• Automatic warnings: Machine learning algorithms generate automatic alerts, enabling operators to respond promptly to potential risks.

• Analyses of network structure to recommend optimal paths and division points, reducing technical losses and improving network performance.

• Identification of consumers causing voltage irregularities (e.g., incorrect inverter settings) and provides targeted recommendations for resolution.

Challenge 2 Digitalization of the grid

In a heavily regulated environment, DSOs must handle vast amounts of data. The need for smarter, more efficient, and reliable grid solutions is evident, with digital integration playing a key role. Data-driven planning allows utilities to anticipate future demands, integrating renewable energy sources and emerging technologies. Effective digitalization relies on leveraging big data and automating grid operations, all with a strong focus on sustainability.

"We need to introduce greater digitalization across all aspects, enabling more data to be generated, transferred, and utilized by various stakeholders at multiple levels. This will provide deeper insights into the current grid conditions and allow us to respond more effectively to changes."

Dr. Simon Oblak, Global solution management director at Iskraemeco

"We are very active, particularly in the modernization and digitalization of the grid. We know that data is now extremely valuable, and data-driven planning is crucial. The more data we have, the better we can anticipate future challenges. There's a lot of work being done on big data systems and network automation, all of which will support the integration of new energy sources and electric charging stations. This green approach is currently very relevant in all Europe."

Matjaž Keršnik, Head of Metering services at Elektro Ljubljana

Data overload vs. Proactive grid Data integration actionable insights management

To fully leverage the potential of digitalization, DSOs require a unified platform capable of managing and synthesizing diverse data streams, transforming raw data into actionable insights. Symbiot Twinner addresses this by integrating data from smart meters, IoT devices, and various systems, providing DSOs with a centralized platform for efficient grid management and planning. Key functionalities include:

Instant data analysis

Enhanced maintenance strategies with predictive simulation

- data-driven decisions.
- Non-disruptive maintenance.

Symbiot consolidates data from diverse sources into a unified platform, enabling real-time monitoring, predictive maintenance, and consumption forecasting. It provides DSOs with full grid visibility, streamlines large data management, and reduces processing errors, improving data accuracy. By integrating systems and enhancing collaboration across departments, Symbiot optimizes grid performance, detects potential issues and supports long-term infrastructure planning with actionable insights.

• Symbiot Twinner provides real-time data analysis across integrated systems, swiftly identifying and correcting inaccuracies.

• Documentation update cycles are shortened from years to just two months, significantly reducing manpower requirements.

• Symbiot Twinner's predictive simulation technology reduces maintenance planning time from days to minutes, enabling regional centers to make quick,

Challenge 3 Management of demand and generation flexibility

Flexibility is crucial for achieving green transition goals as the grid faces challenges such as overvoltages, undervoltages, overloads, and overheating of grid elements.

To avoid disruptions, a more responsive system that allows for predictive and realtime management is essential. This includes enhancing system resilience and establishing a future-proof regulatory framework that supports dynamic regulation.

As the role of Distribution System Operators (DSOs) evolves from being merely energy links to becoming flexibility providers, they must adapt to the changing demands of prosumers and network users. The ability to manage, predict, simulate, and dynamically adapt the grid is now essential for successful operations.

Iskraemeco offers the solution for managing flexibility in the electricity distribution system implementing the following features:

"Flexibility is now required at every level of the grid. Different prosumers and network users must become more adaptable. DSOs themselves need to be more flexible, and that's where our current focus lies."

> Igor Podbelšek, Head of electric power systems control and operation department at Elektroinštitut Milan Vidmar



Prediction of individual consumer consumption behavior

Load scenario simulation

Network impact analysis

ensuring stability in the grid.

Voltage regulation assessment

Symbiot Twinner empowers DSOs to transform from traditional energy distributors to flexible grid managers. By leveraging unique machine learning insights and predictive power flow management, Symbiot enables DSOs to anticipate and dynamically respond to consumption fluctuations, integrating new generation sources without destabilizing the grid.

• A unique innovative feature. This predictive ability allows for dynamic management of power flow, enabling the grid to respond flexibly to varying demand levels while maintaining stability.

• By simulating different load scenarios, including the integration of renewable energy sources, Symbiot Twinner helps mitigate potential issues from fluctuating power inputs and demands, thereby enhancing overall grid flexibility.

• Evaluates the effect of connecting new customers on grid parameters, identifying potential risks such as transformer overloads, over-voltage, and network quality issues. Assesses the impact of new generation sources on voltage parameters,

• Analyzes the effects of tap changer regulation and Automatic Regulation of Voltage (ARN) on voltage levels in medium and low-voltage networks.

Challenge 4 Cybersecurity threats to the grid

As grid systems digitalize, the risk of cyberattacks increases. Attacks on metering devices, communication infrastructure, software, and central systems can lead to data manipulation or disabling critical parts of the grid. Strong access control policies are essential to prevent unauthorized access, while protecting customer privacy is crucial due to the handling of sensitive data. Robust cybersecurity is the key to maintaining grid stability and safeguarding information.

Compliance with global security standards is essential for DSOs to safeguard their operations. These standards ensure data protection, cloud security, and rigorous quality control over software, giving DSOs a framework to protect both operational systems and customer information.

Scalability and security must go hand in hand. As DSOs expand grid capacity to accommodate growing demand and new technologies, such as electric vehicles and heat pumps, security measures must adapt automatically to cover new endpoints without compromising performance.

Protecting critical infrastructure requires high-level security measures, including encryption, secure storage of cryptographic materials, and strict access controls. Additionally, regular testing and certification of security mechanisms are essential to ensuring ongoing system integrity.

Cybersecurity is critical for grid reliability

Compliance with global standards

Evolving security with grid expansion

Symbiot's security architecture plays a vital role in helping DSOs protect their infrastructure. Software suite complies with industry standards, including ISO 27001, ISO 27017, ISO 27018, and ISO 33061, ensuring data protection, cloud security, and rigorous control over software lifecycles. Symbiot undergoes regular security testing by CCLab Metas and has passed the Swiss Metas Data Security Examination, further validating its commitment to data integrity. By adhering to Cenelec 2016 AMI security standards, Symbiot ensures top-level security, with end-to-end encryption protecting data from smart meters to central systems against unauthorized access.



Symbiot delivers robust cybersecurity by adhering to critical industry standards, ensuring the protection of sensitive grid data. Utilizing end-toend encryption, Symbiot secures data transmission from smart meters to central systems, mitigating risks of unauthorized access. The platform undergoes regular, rigorous security testing to validate its defense mechanisms. In addition, Symbiot provides consistent security updates and patches to address potential vulnerabilities, ensuring continuous system integrity. Its scalable architecture supports the expansion of grid capacity without compromising security.

Challenge 5 **Development and investment** planning

As Distribution System Operators (DSOs) work within a heavily regulated environment, they face the increasing need for efficient, data-driven network development and investment planning.

The rapid integration of Distributed Energy Resources (DERs) such as solar panels and small-scale wind turbines, combined with the rising prevalence of electric vehicles (EVs) and heat pumps, has introduced new complexities into grid planning. These changes lead to increased loads and heightened risks of overvoltage, particularly within low-voltage (LV) grids, placing further strain on existing infrastructure.

Aging infrastructure, cybersecurity concerns and evolving customer demands add to these challenges, demanding more from DSOs in terms of operational efficiency and arid stability.

The need for accurate forecasting and targeted investments has never been more urgent, yet traditional approaches often rely on worst-case scenario assumptions, leading to overestimations that inflate costs and resource requirements.

Symbiot Twinner provides DSOs with advanced geo-temporal navigation and simulation tools to effectively plan for future scenarios, including network expansion, DER integration, and load growth.

Increased complexity in grid planning

Aging infrastructure and emerging demands

Need for accurate forecasting and targeted investments



This solution enables DSOs to prioritize investments based on accurate forecasts of capacity, reliability, and sustainability, enhancing both short-term adaptability and long-term planning.

Data-driven grid planning and scenario simulation

Optimized investment strategy with predictive analytics

Automated and efficient planning processes

- planning.
- hours.

Symbiot Twinner offers DSOs a comprehensive platform for optimized grid planning and investment, shifting from generalized capacity assumptions to precise, data-driven forecasts. By identifying true network bottlenecks, it enables targeted investments and reduces unnecessary infrastructure costs.

• Simulates various network conditions (e.g., faults, maintenance, and grid extensions) using real-time data, moving beyond worst-case assumptions. • Predicts the impact of load growth and consumption changes, helping DSOs target infrastructure investments where needed.

• Reduces capacity overestimations by over 50% by identifying true bottlenecks. • Facilitates targeted investments to allocate resources effectively.

• Automates simulations for minor capacity increases, minimizing extensive manual

• Streamlines grid planning, cutting down task completion times from weeks to

Challenge 6 Managing technical and non-technical losses

Distribution System Operators (DSOs) face significant financial and operational challenges from both technical and non-technical losses.

Technical losses, related to energy dissipation in system components, can lead to high expenses due to loss buybacks, especially when misaligned with favorable market conditions.

Non-technical losses, often caused by electricity theft or inaccurate billing, directly impact revenue and can erode customer trust.

Together, these losses represent a substantial financial burden, reduce operational efficiency, and negatively impact societal and customer perceptions.

Symbiot Twinner offers a comprehensive approach to minimizing both technical and non-technical losses through data-driven strategies that improve accuracy, efficiency, and market alignment.



Strategic technical loss management

- market prices.

Non-technical loss detection and mitigation

Symbiot Twinner delivers value to Distribution System Operators (DSOs) by optimizing technical and non-technical loss management. The platform enables potential cost savings of 5-10% on loss buybacks, translating into millions in annual expenditures. Enhanced operational efficiency reduces waste associated with over-purchasing, while improved market responsiveness allows for strategic purchasing at low prices.

Moreover, the solution enhances revenue recovery by accurately detecting and mitigating non-technical losses, leading to improved billing accuracy and increased customer trust. By addressing electricity theft and ensuring fair energy distribution, Symbiot Twinner not only strengthens financial performance but also fosters positive societal impacts.

• Forecasting models: Utilizes enhanced data to refine loss forecasting, reducing the need for unnecessary buybacks and aligning purchases with favorable

• Optimized market responsiveness: Symbiot Twinner's data-driven model enables timely market purchases, lowering costs associated with over-purchasing.

• Better detection of non-technical losses: Identifies electricity theft and inaccuracies in billing, allowing DSOs to address revenue losses effectively. • Targeted interventions: Symbiot Twinner improves ROI from smart meter

deployments by pinpointing and mitigating non-technical losses.

Challenge 7 Meeting consumer expectations

Today's consumers are more informed, empowered, and demanding regarding energy services. They expect greater transparency, control, and real-time insights into their energy usage. As energy prices fluctuate and renewable energy sources become more prevalent, consumers seek accurate billing, dynamic pricing, and detailed information on their consumption patterns.

Customers want real-time data to ensure they are charged fairly based on actual usage, rather than relying on outdated estimates or traditional meter readings. Inaccuracies can lead to dissatisfaction and disputes. To prevent these issues, DSOs must deploy systems that capture and process real-time consumption data, ensuring billing precision while reducing errors.

DSOs are shifting towards a consumer-centric approach by integrating flexible consumption models that allow customers to adjust their energy usage based on grid conditions. Engaging consumers is crucial, as without clear benefits, such as cost savings or environmental insights, these initiatives may fail to gain traction.

Demand for transparency and control

Accurate, real-time billing

Flexible consumption models



Consumer flexibility is key, enabling customers to optimize their usage and actively participate in energy management.

Meeting the demand for transparency requires DSOs to provide consumers with real-time access to their usage data through easy-to-use platforms, mobile apps and dashboards. These tools must offer clear insights, enabling customers to make informed decisions about their energy consumption.

However, delivering these consumer-focused services comes with challenges for DSOs. Advanced billing systems, dynamic pricing models, and customer platforms require significant investment.

Many DSOs are working with systems that lack the flexibility to meet modern demands, making upgrades costly and time-consuming. Furthermore, ensuring data security and compliance with regulatory standards adds complexity and cost.

By delivering real-time data insights, seamless integration, and automated processes, Symbiot helps DSOs to provide accurate billing, dynamic pricing, and the transparency that today's consumers demand—all while reducing operational costs and complexity. Through a unified platform, DSOs can improve the consumer experience, minimize errors in data processing, and significantly reduce data inaccuracies and inconsistencies.

Challenge 8 Choosing the optimal tools

A significant challenge for DSOs is choosing and implementing the right technological tools while ensuring adequate funding for these investments. Building an efficient data management system is essential, requiring careful selection of the appropriate tools.

DSOs rely on a range of software solutions, including HES, MDM, EMS, OMS, GIS. customer portals and other tools to manage grid operations, billing, customer engagement, and regulatory compliance. These systems help optimize performance. However, the challenge lies in selecting software that aligns with current needs.

First and foremost, DSOs need to clearly define their objectives. Whether focused on meter data management, billing accuracy, or demand response capabilities, a clear vision helps narrow down the software features that matter most. Data security is another critical concern. With large volumes of sensitive data flowing through the grid, robust security measures must be in place. DSOs need software that offers encryption, access control, and compliance with industry standards to ensure data privacy and protection from potential cyber threats.

The reputation of the vendor and the level of support they offer should not be overlooked. Reliable support, regular updates, and consistent maintenance are essential for ensuring smooth operations in the long term.

Ultimately, selecting the right software is about ensuring that it provides clear cost savings and long-term value. It should help DSOs meet current grid demands while preparing them for future challenges.

Scalability and flexibility are also essential considerations. As the grid evolves with the integration of distributed energy resources, the chosen software must be able to grow with these changes. Systems that allow seamless updates, feature expansion, and integration ensure that DSOs can adapt without frequent overhauls.

Integration is also a crucial consideration. The ability to operate within a complex ecosystem and ensure interoperability between systems is vital for efficient grid management.

Symbiot is an all-in-o challenges of DSOs. It p management, predictive The platform seamlessly adaptable architecture changing requirements. Going beyond traditio platform for grid digit visibility, and strengthen

Symbiot is an all-in-one platform designed to address the operational challenges of DSOs. It provides a comprehensive solution for real-time data management, predictive analytics, and grid flexibility.

The platform seamlessly integrates with third-party devices and systems. Its adaptable architecture supports easy upgrades, allowing it to evolve with changing requirements.

Going beyond traditional meter management, Symbiot offers a robust platform for grid digitization, simplifying data management, enhancing visibility, and strengthening network control.

Data-driven efficiency with the Symbiot software suite

Faced with rising pressure for operational efficiency, grid complexity, and service excellence, utilities struggle to extract value from AMI components and all collected data.

Using Symbiot, utilities will be able to make informed, datadriven decisions, hence optimizing their efficiency, performance, and sustainability across diverse applications.

Symbiot is more than just an advanced meter management software; it's a universal digitalisation platform, offering track records of large-scale deployments, ease of commission, and widespread applicability across electricity, water, and gas services.







Packages

To fully tailor our solution to your needs, we offer a modular package of Symbiot apps.



Symbiot HES

Head-end system for collecting data from multiple sources.



Symbiot MDM

Meter data management system and analytics software.



Symbiot Twinner

Digital twin of the electricity grid.



Symbiot Elumia

Smart lighting monitoring system.



Symbiot FieldAssist

Platform for organized and efficient field work.



Symbiot Energy360

Customer application.



Symbiot Water

Digital water management.



Symbiot Neboola

loT device management platform.



Features

Reliability

The platform's successful track record underscores its reliability, providing utilities with a trusted solution for critical operations.

Easy integration and interoperability

Using open standards and technologies ensures effortless integration with existing legacy systems and minimizes your custom development costs. Third-party devices can be integrated with ease.

Scalability

Symbiot grows with your needs, with a scalable architecture allowing for easy expansion to accommodate evolving requirements and changes in legislation.

Modularity

Symbiot offers seamless customization by utilizing only the modules our partners truly need, thereby minimizing system costs through a flexible licensing model.

High security End-to-end security is provided through the use of advanced, standard-based security methods.

Multi-utility

Managed services Supports on-premise HW, virtualized HW, cloud deployment, or SaaS and DaaS modes of operation.

solution.

Open platform The Symbiot software suite is an open platform, where third-party applications can be integrated.



A generic platform for electricity, water, heat and gas.

Flexibility and customization

Adopts new functionalities very quickly to suit your project needs. A future-ready



It unifies critical systems (HES, MDM, FieldAssist, Twinner) into a single platform, reducing operational complexity and maintenance costs by eliminating the need for multiple disconnected solutions.

It allows DSOs to quickly scale by adding metering points or integrating new technologies without major infrastructure changes.



Why to switch to Symbiot?

Ready to take your grid management to the next level?

Book a personalized demo of Symbiot and see how the solution can help you optimize operations and enhance grid flexibility.

Sign up today on our website to get started. Discover the tools that will future-proof your grid!

Book a call with our experts

Symbiot demo

About Iskraemeco

Iskraemeco is a globally recognized brand whose solutions can be found in over 80 countries worldwide. For more than seven decades, Iskraemeco has been delivering quality products, solutions, and services that make efficient energy use a reality. Since 2007 we are part of Elsewedy Electric Group with whom we share a common vision of smart, digital, and green future.

We develop intelligent digital solutions and services for the energy and water sector by combining our extensive experience and industry expertise with cutting-edge eloT and Al technologies. By understanding the power of data, we help our customers embrace their digital transformation, the grid management and optimization opportunities it presents.

Together with utilities and cities we create sustainable networks that are a key enabler of the green transition.

Innovating for Life.

