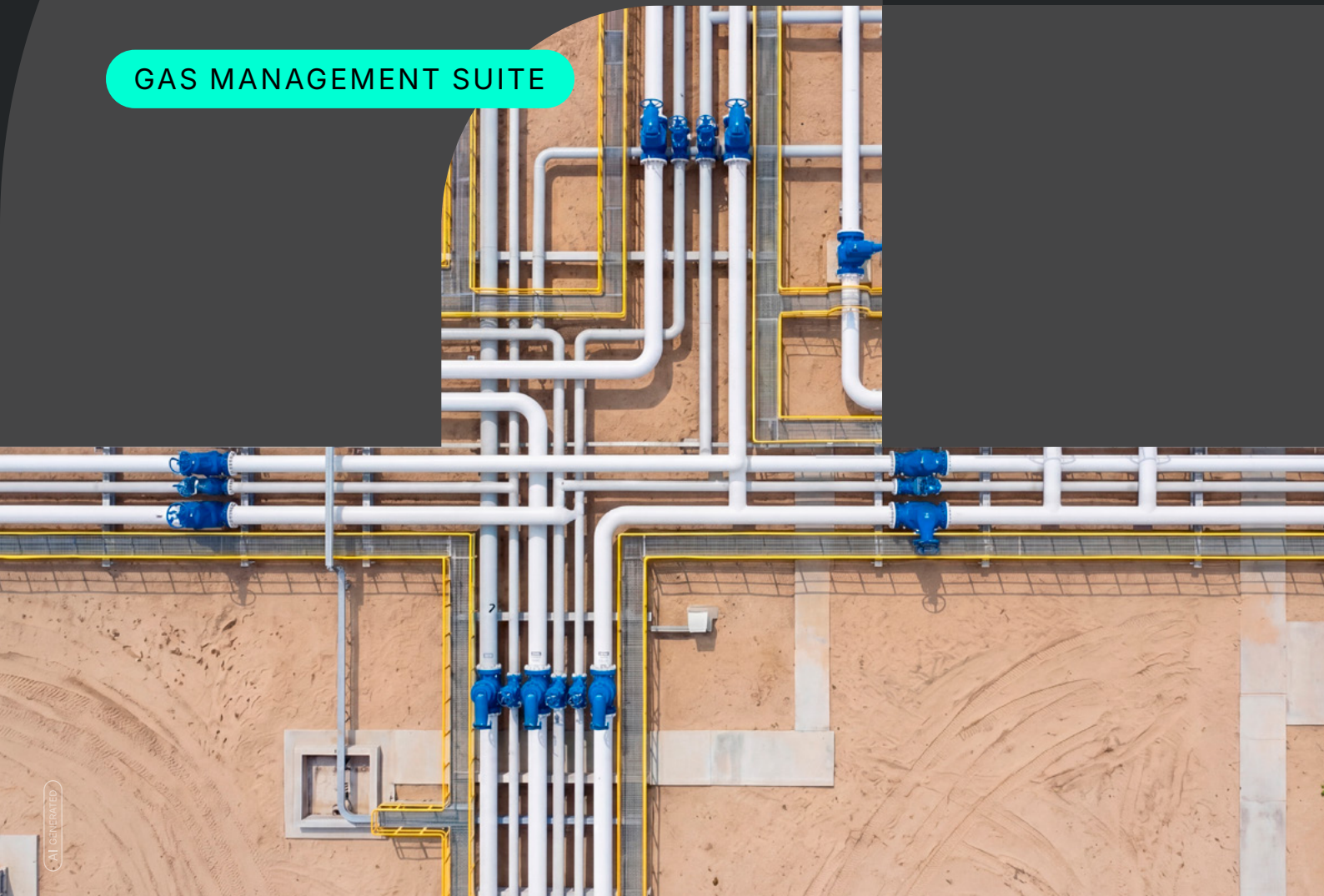


Smart Operation and Management of Gas Grids and Storage

GAS MANAGEMENT SUITE



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Introduction

The PSI Gas Management Suite (PSI GMS) is a field-proven application suite for operating gas networks and storage facilities, as well as for managing commercial business processes. PSI GMS combines applications for monitoring technical facilities with real-time simulation, forecasting, and commercial operational planning.

PSI GMS
includes functionality for

- ✓ SCADA
- ✓ Gas Transport
- ✓ Gas Storage
- ✓ Forecasting
- ✓ Simulation
- ✓ Historian
- ✓ Reporting
- ✓ Training



Integrated Solution made in Germany

The GMS uniquely integrates all applications for cost-effective implementation, high system performance, high reliability, outstanding quality, efficient engineering, safe operation and reduced costs for service and training.

The GMS combines SCADA with gas network simulation and commercial dispatching applications. User access control, communication, and reporting complement the solution. The GMS is based on more than 40 years of experience implementing standard and bespoke solutions in numerous gas industry projects. The software is continuously developed using the latest technology for modern, efficient, and cost-effective management of gas networks and storage facilities.

The system meets operational safety and reliability requirements. GMS offers consistently high performance and fault tolerance. Its modern and user-friendly human-machine interface ensures a uniform appearance across all applications. The modular design of the GMS allows for easy adaptation to a wide variety of tasks. GMS's unique, scalable architecture supports integration with various third-party applications.



The system's inherent flexibility allows an existing solution to be extended to very large, multi-level transport and distribution networks without project-specific code changes.

The GMS provides all the engineering tools for master data configuration, the graphical user interface, user management, and other configuration functions to support maximum flexibility, scalability, and efficient project execution.

By leveraging its modular platform and expertise in engineering, development, and service, PSI is a strategic partner for customers implementing standard or customized solutions.

Scalability and Flexibility

The GMS is a highly scalable solution that provides all applications for gas network operations. Each application utilizes a common set of subsystems, including a real-time database, data historian, event and alarm system, communication and data exchange protocols, redundancy management with automatic failover, role-based user access, a modern human-machine interface, and multilingual support.



SCADA

PSIcontrol enables efficient monitoring and control of gas flow and pipeline assets. It supports the operation of gas supply, transport, storage, and delivery in large pipeline systems.

Operators can manage these processes safely, continuously, economically, and in compliance with contracts.



[SCADA]

Data Acquisition

PSIcontrol supports standard protocols such as IEC 104, Modbus TCP, and OPC UA for acquiring real-time data from RTUs and PLCs.

Data Validation

The acquired data from all tags is validated in real time. Validation can be individually configured for each tag and includes plausibility, origin, status, and processing checks.

Data Processing

All acquired and validated data is further processed according to predefined rules. Processing functions include analog and Boolean monitoring, calculations, data compression, and control.

Data Storage

Current field data and derived data represent the current process status. This data is stored in the real-time database.

Data Historian

The integrated data historian is a long-term storage system for time series data. It stores all data collected by the GMS applications and provides complete datasets for the operation of gas networks and gas storage facilities. The data historian also includes various tools for data analysis and optimization.

Visualization

Visualization is the central human-machine interface. Process and system states are displayed cyclically or event-driven in process diagrams, alarm lists, and trend curves. Commands are transmitted and setpoints are defined by using dialog boxes.

Workflows

In addition to functions performed by operators, control tasks can be fully automated and executed continuously using workflows

Alarm Management

The alarm log displays important events that prompt the operator to take appropriate action, especially in critical situations.

The event log is a highly efficient tool that provides a quick and comprehensive overview of the entire process. It stores all important events as well as all relevant operator actions.

Authorization Management

Access rights are role- and function-based. Individual user permissions can be granted for accessing process elements, displays, and application functions.

System Configuration

PSIcontrol offers a comprehensive set of configuration and engineering tools, including those for master data, process displays, user-defined scripts, and pipeline simulations.

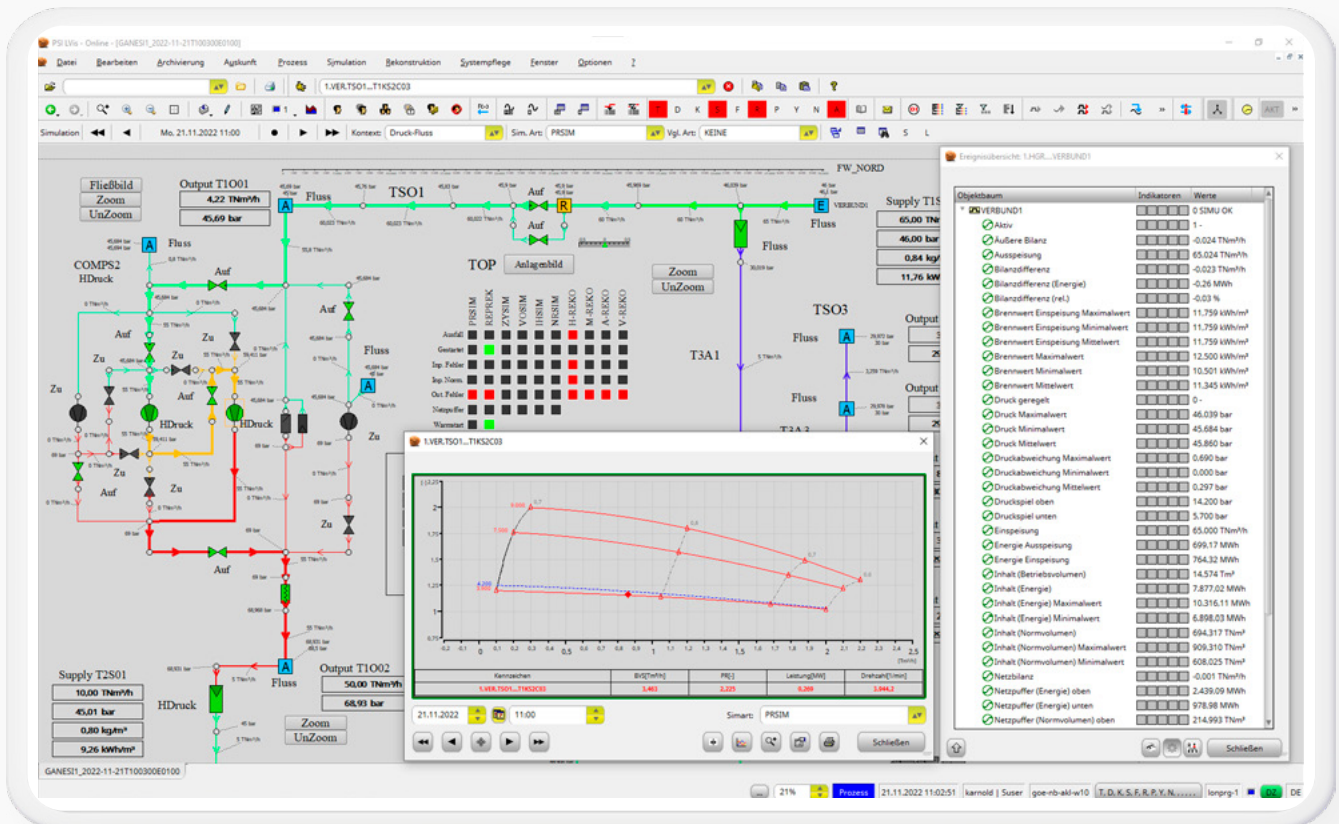
Simulation

GMS has advanced analysis tools for gas networks. Various simulation and forecasting functions help operators to ensure uninterrupted, safe, and cost-effective gas transport from all inlets to all outlets.

PSI-ganesi is a simulation system that provides comprehensive insights into the invisible flow dynamics of gas networks, especially in areas without instrumentation.

The system includes the following simulations:

- ✓ Online
- ✓ Look-ahead
- ✓ What-if



[Simulation]

Online Simulation

PSIgesani Online cyclically determines the current process status of an entire gas network based on sensor readings for pressure and temperature, measured flow rates, and the respective gas composition. The simulation results are continuously monitored. All information, including alarms and warnings, is logged and displayed.

Look-Ahead Simulation

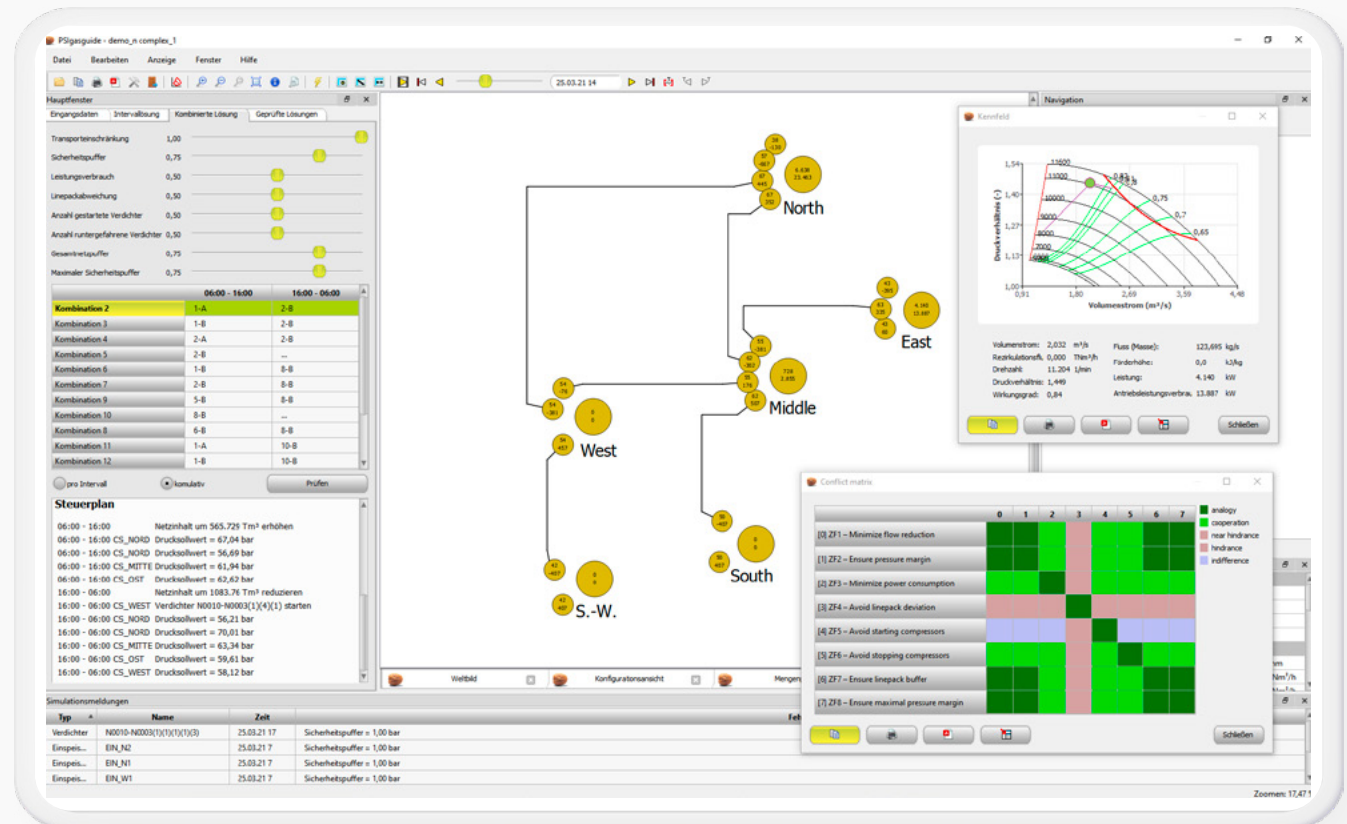
A preset operating mode can prove unsuitable. PSIgesani Look-ahead detects potential deviations and undesirable states. The system determines the process element that will reach a specific threshold and calculates the time of the predicted event. The operator can adjust all relevant process parameters and proactively initiate the necessary steps to avoid critical situations.

What-If Simulation

PSIgesani What-if is used to predict the consequences of operator actions. Based on real-time simulations, valve settings, changed setpoints, and other information, the system calculates the corresponding future process values. Multiple scenarios can be created and evaluated.

Forecasting

Gas network operators need to estimate gas consumption as accurately as possible. The software uses weather forecasts and periodic fluctuations. Models are initialized with historical data and utilize calendars, different temperature zones, and contract terms for forecast calculations. The system incorporates techniques such as Kalman filtering, exponential smoothing, and trend correction. The forecaster can use all data objects from GMS applications or third-party systems.



Commercial Dispatching

Commercial Dispatching includes all applications necessary to perform logistical and organizational tasks, both technical and commercial. Gas volumes and gas qualities at entry and exit points are planned in accordance with commercial conditions.

Transport and Storage

PSItransport is an application for gas transport and storage management that provides the necessary functions for business processing for transmission system operators (TSOs) and storage system operators (SSOs). The system serves as a central platform for gas logistics, contract management, capacity management, inventory management, business partner management, communication, reporting, and master data management. Capacity management enables the accounting and consolidation of capacities for subsequent transaction processing. It manages firm and interruptible capacities. The contract processing functions, in conjunction with contract monitoring, enable efficient contract processing. Communication, including nomination processing such as matching, can be defined as flexibly as business processes require.

Any resulting aggregation is used to support operational scheduling. Storage facilities are modeled based on their characteristic behavior and inventory. Balancing and allocation using current values provide the necessary information for market partners and billing purposes. A standardized and flexible definition of master data facilitates the appropriate representation of business process objects.

PSIcomcentre

- ✓ Business messages
- ✓ Partner communication

PSIportal

- ✓ Nomination management
- ✓ Allocation
- ✓ Publications

PSIreporting

- ✓ Reports
- ✓ Analytics

PSItransport

- ✓ Booking platform
- ✓ Contract limits
- ✓ Monitoring

Capacity management



- ✓ Validation
- ✓ Nominations
- ✓ Confirmations
- ✓ Matching

Nomination



- ✓ Contract processing
- ✓ Forecasting
- ✓ Congestion management
- ✓ Limits
- ✓ Gas flow planning

Planning



- ✓ OBA
- ✓ Balancing energy
- ✓ Limits

Controlling



- ✓ Allocation
- ✓ Contract monitoring

Billing preparation



- ✓ Business partners
- ✓ Contracts
- ✓ Grid nodes

Master data



Enterprise Integration

The GMS integrates seamlessly into an existing corporate infrastructure and provides all decision-relevant data for both operational and management levels.

Operational Safety

The GMS uses standard IT components and proven network technologies to deliver fault-tolerant solutions.

Cyber-Security

In order to reduce IT-specific risks to the greatest extent possible, PSI GMS has established the following safety protocols:

- ✓ Access points are kept to a minimum number and are restricted
- ✓ Highly segmented network infrastructure through use of firewalls
- ✓ Limited usage of operational systems and third party software
- ✓ Secure authentication processes
- ✓ Inbuilt robustness against attacks

Reliability

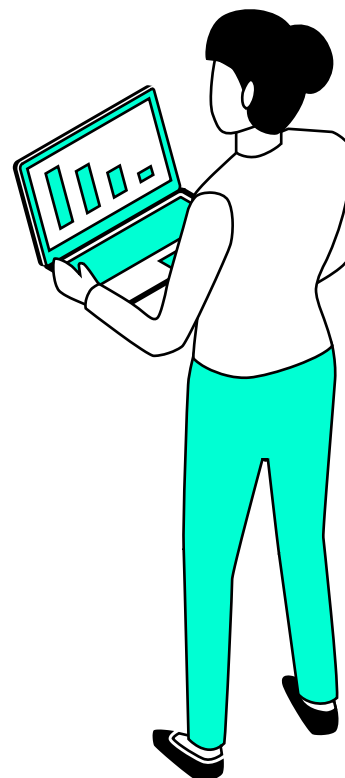
The PSI GMS has been designed for 24/7 operations in mission critical environments.

Business Reporting

PSIportal supports the flow of information and the presentation of data for internal and external use. It stores data from PSI systems as well as from third-party applications. Data is displayed graphically in tabular form or as charts. Users can create reports and have them automatically sent to defined recipients. Data can also be exchanged with other applications in specific standard formats. This reporting solution combines master data, measured values, and calculated values. The system maintains an audit trail throughout the entire data lifecycle.

Operational Reporting

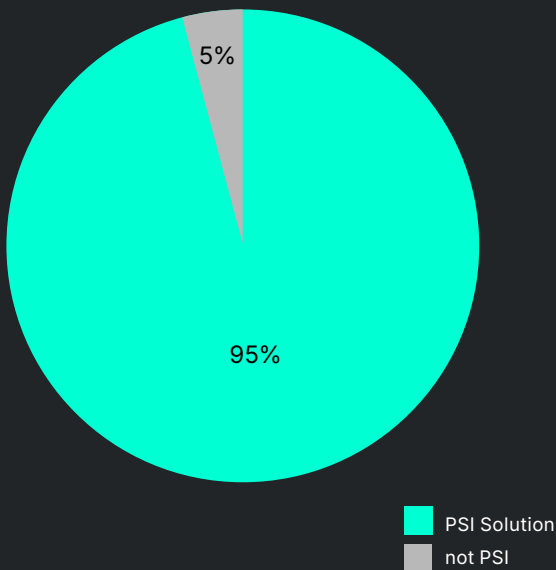
The GMS has an integrated reporting environment based on MS Excel. All Excel functions are available for report creation. Reports can be printed, sent via email, and saved.



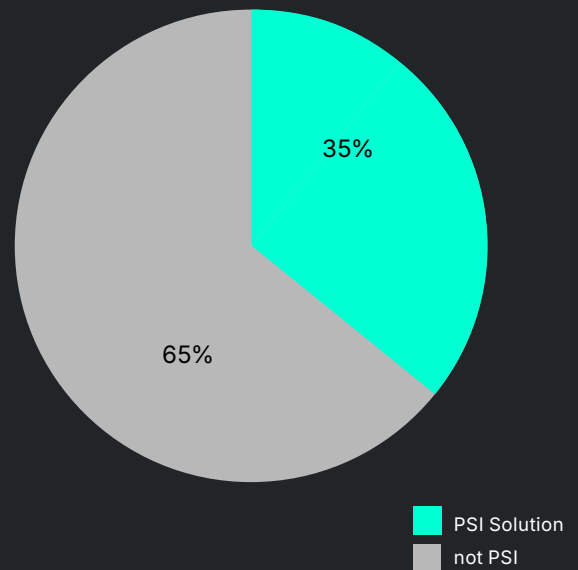
Market Leadership

PSI is a long-standing business partner of the oil and gas industry. We develop and implement cutting-edge technology for the safe and continuous operation of natural gas networks and underground storages.

- ✔ PSI GMS is used to control and monitor 95% of the pipelines in the German natural gas transmission network. This demonstrates the operators' high level of confidence in the reliability, safety, and efficiency of our systems.



- ✔ PSI GMS is used to manage more than 35% of Germany's total gas storage capacity. Operators can make the required volumes available according to supply demand.



Impressum

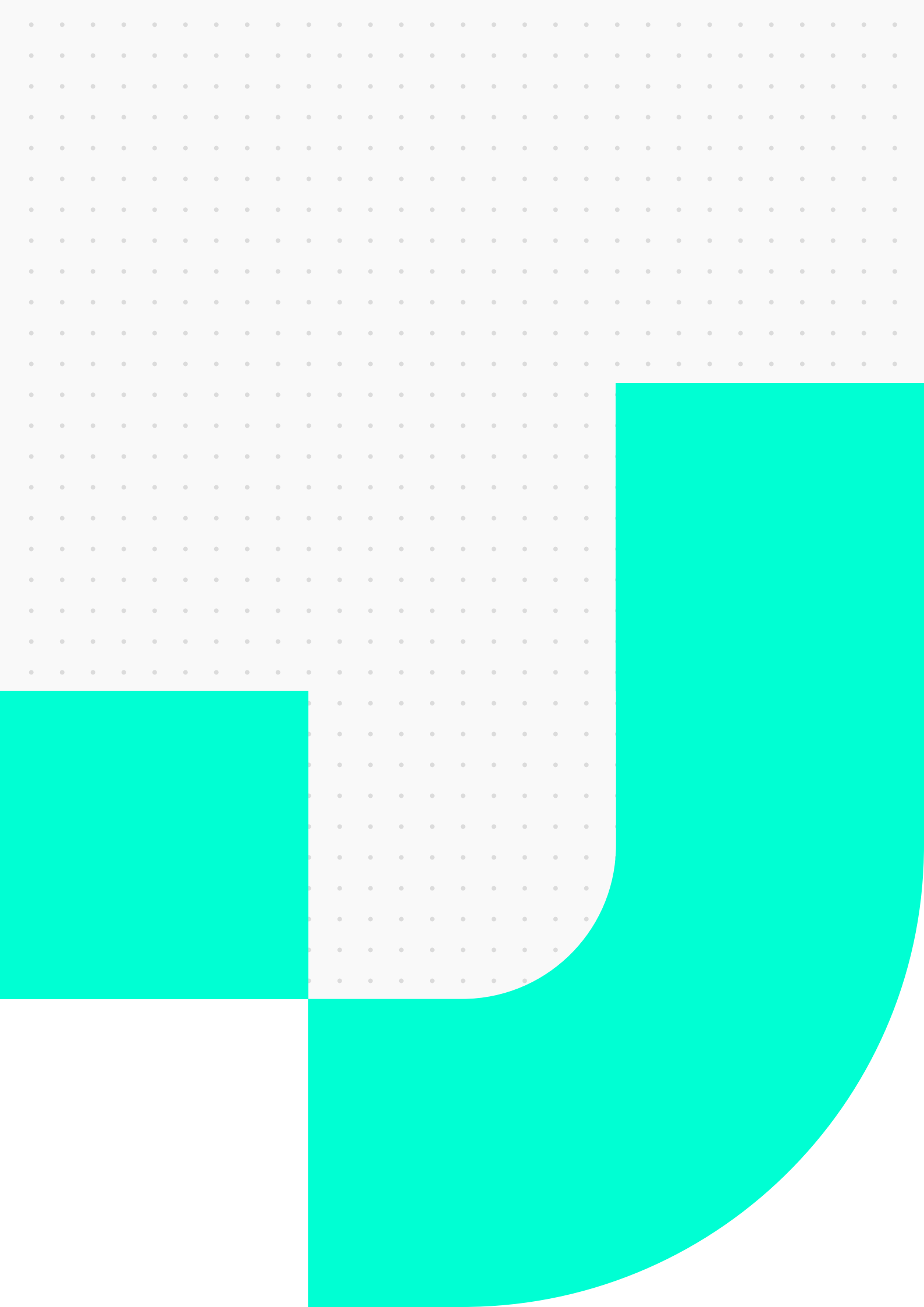
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