

# ENERGY manager

Newspaper for energy suppliers



Big data, data analytics, and artificial intelligence enhance the energy industry

## Data: the new raw material for energy supply

### Product report

Interim model for new market locations and their implementation in PSImarket

Digitization of the energy transition

### User report

Completely virtualized system solution for municipal gas storage company Epe

Energy services in the cloud—can it be done?

### Product report

Maintenance and operational optimization with PSImcommand

Workforce Management 4.0

## EDITORIAL

Dear readers,

The transformation of our energy supply continues with unreduced intensity. Of the “Three big D—Decarbonization, Decentralization, and Digitization”, the digitization continues to move to center stage. It changes all steps of the value add chain of the energy industry and connects it with adjacent areas such as E-mobility and building automation.

In the course of this process, the energy suppliers are becoming customer-focused service providers. Acquisition, analysis, and commercialization of energy data in combination with other information is becoming an essential part of the business model. Big data and data analytics are playing an increasingly central role in this shift. This requires inclusion of new technologies and algorithms in software



products for the energy industry as well as seamless integration into the respective business processes.

As our customers go through this transformation process, we at PSI support them with modern technology and innovative applications. Already today, our products use a variety of artificial intelligence methods and al-

gorithms such as neural network and fuzzy logic which are continuously improved and enhanced.

Please read in our editorial how data is becoming “the new raw material of the energy industry”. The other articles present current developments in the areas of energy trading, optimization, gas network management, network control systems, and workforce management.

I hope you enjoy reading this edition of the Energy Manager and gain interesting insights.

Michael Haischer  
Managing director  
PSI Energy Markets GmbH

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Big data, data analytics, and artificial intelligence enhance the energy industry

## Data: the new raw material for energy supply

In many industries, big data and the closely related data analytics are becoming the new drivers for process optimization and the development of new business models—under technical as well as commercial aspects. The continuously increasing volume of data of any kind provides the basis for, and actually accelerates, this development. Most of the data will be available only as unstructured data which requires new processing and analysis methods.

**M**arket researchers and industry experts are forecasting a massive increase of available data. The technologies for technical and commercial use of the data are considered important initiators for future and completely new business models. Market researchers and analysts expect broad use on an industrial scale in three to eight years.

### Energy transition as key driver

Like almost all other areas of the economy, this development is also sig-

nificantly impacting the energy supply. The key drivers are the energy transition including the fast growth of distributed energy generation and the introduction of smart meters, the increasing number of market participants, and the combination of the energy value add chain with building automation, smart homes, and the control of industrial production processes.

The government accelerates this development by various laws and regulations regarding the digitization of the energy transition and the new energy

statistics law (EnStatG). This results in a massive increase of the available data and in better networking of the market participants and the technical infrastructure.

The Internet of Things (IoT) and the related technologies for networking, data analysis, and artificial intelligence have now reached the energy industry and provide great potential for groundbreaking innovations.

### Predictive analytics play a key role

The big data applications cover the entire value add chain of the energy industry. The potential is illustrated by the following application examples from the energy industry and their benefits.

The emphasis is on predictive analytics which are innovative and powerful forecast methods to make the volatil-

ity of the energy business more manageable. The processed energy business mass data are typically time series of any kind such as smart meter data and other load values, price data, and weather data.

In addition, the sales and customer service organizations have access to large amounts of structured and unstructured customer data which can

sible in order to avoid downtime. Big data and in particular the “Predictive maintenance” approach analyze the operating history and the current operating data of the plant.

This allows early detection of anomalies and prediction of extreme situations caused by external influences in order to take appropriate countermeasures.

which are mandated by the EEG law. The analysis of the infeed and network congestion data as well as the combination of network data with weather data enables derivation of practical alternatives and reduces the need for capital-intensive network enhancements.

**Energy trading:** Especially in the energy industry, load and price forecasts play a particularly important role. The factors causing certain load states or price scenarios in the past can usually be very easily explained later. Once these dependencies are known, they can be used for reliable forecasting and trend analysis.

A simple and well-known example is the similar day load forecast. Big data can analyze a significantly higher number of influencing factors and can be used for early detection of indicators.

Artificial intelligence methods such as deep learning are already successfully used for forecasting the energy consumption of buildings and district heating networks.

**Risk management:** Big data can derive new insights into the risk exposure of a company based on a multitude of individual data. In addition to well-known risk indicators such as VAR (value at risk), other statistical correlations can be determined for a broader risk analysis.

A typical example is the credit risk where the creditworthiness of customers is rated by rating agencies based on a large basis of data.

**Sales:** Big data provides completely new forms of customer analysis for early detection of customer needs and customer behavior based on smart



*Big data analysis extracts the relevant information from the available data.*

be enhanced by other internal and external sources and used by big data analyses.

**Generation:** For all technical plants and equipment, potential operating risks must be detected as early as possible

**Transmission networks:** The increasing volatile infeed of renewable energy is pushing today's transmission networks to their physical limits. This requires comprehensive infeed measures (EISman) and results in expensive compensation obligations

meter data, the customer master data, and even public data which can be combined from an ecological perspective.

In most cases, the predictive analysis is a continuous process. The ongoing optimization of the analysis models in the actual production environment will also improve the forecast accuracy. Especially the energy industry has strict requirements for outage prevention and reliability.

### 3Ds: Data protection, Data quality, and Data security

As interesting and attractive

as these new opportunities may appear initially, they involve certain risks and require legal frameworks which must be considered. The always sensitive topics data protection, data quality, and data security become even more relevant.

Many of the stored data may be personal information which can be provided to the public only in anonymized form. The regulatory requirements regarding unbundling must also be observed. There is no “one size fits all” solution.

### Big data requires new competencies, methods, and tools

The opportunities related to big data are not an automatic byproduct. Companies must deal with the challenges which are primarily related to the management of data.

Various tasks must be solved which result from the volume of data, the necessary analysis speed, the interpretation of the variety of both structured and unstructured data, and analytics requirements.



Example for trend analysis from PSImarket using R-Studio

The additional insights provided by big data are based on comprehensive analysis of the correlations using the appropriate IT tools. The involved analysis processes change from the traditional approach to an exploratory approach. The exploratory approach is characterized by iterative processing of results based on varying hypotheses. This may require inclusion of additional data sources in the analysis process in order to improve the probability of good results.

### Planning and designing analysis models

In the bigger picture, entirely new analysis methods are now available which must first be learned by the staff tasked with the analysis. In the future, the planning and design of analysis models will be a key aspect of analysis. This requires using advanced algorithms for data analysis, in particular statistic methods, machine learning, linear algebra, optimization, and signal processing as well as data mining, text mining,

graph mining, video mining, and visual analysis.

### PSI designs new technologies

Software products for the energy industry must include the new technologies in order to enable the new applications. Already today, PSI products use various artificial intelligence methods and algorithms such as neural networks or optimization based on fuzzy logic. Tools and function libraries from third-party manufacturers can also be integrated; for example, the math and analysis package R-Serv is already used

in the energy trading system PSImarket as analysis tool for trading data.

The use of these new technologies is continuously and quickly expanded in order to make big data and data analytics available to the customers.

### Paradigm shift enables new kinds of applications

Big data will result in a paradigm shift for data analysis languages, data analysis systems, and data analysis algorithms and enable new kinds of applications.

Energy companies on all levels of the value add chain must now get involved in this topic and develop a strategy for big data in order to participate in the coming business models or to develop their own innovative business models. ☉

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Product report: Interim model for new market locations and their realization in PSImarket

## Digitization of the energy transition

The guidelines of the Federal Network Agency (BNetzA) dated December 20, 2016 for adapting the specifications for electronic market communication to the requirements of the law for digitization of the energy transition / interim model (BK6-16-200 and BK7-16-142) require the network operators to assign a new and unique identification number to all market locations and to use these numbers for identification of market locations (MaLo) within the market communication framework. This guideline requires extensions in the sales module of PSImarket.

The term measurement location corresponds to the measurement point as defined in § 2 No. 11 MsbG. The term market location replaces the terms abstraction point, tap point, delivery point, and infeed point which have been used in the market communication.

The introduction of the MaLo ID as part of the market communication will be effective on February 1, 2018 in all of Germany. After the effective date, all market locations will be identified only with the MaLo ID which will be used for all communications. The MaLo ID is not used before the effective date. Therefore all delivery points for electricity and gas must be set up with a new code number type.

### Implementation of an electronic process

The large number of affected objects requires the implementation of an electronic process. The necessary data formats are specified by the Federal Network Agency. The following have been specified for issuing codes: for the central issuing of codes, the ID must not be identical to the identification numbers which are used to identify measurement locations. Furthermore, after the initial assignment

an ID permanently identifies a market location for the entire existence of the market location. This also applies when the concession changes and when a checksum is added to the ID. The schedule of the Federal Network Agency provides milestones, starting with the issuing of codes on June 1, 2017, followed by the start of the interim model on October 1, 2017, and ending with the termination of the request and answer process on April 1, 2019.

This transition process also affects the handling of metering points and tariff customers in PSImarket. For the updating of the MaLo ID for the delivery points stored in the system, a "Request process MaLo" as well as enhanced storage of the MaLo ID are provided by the system.

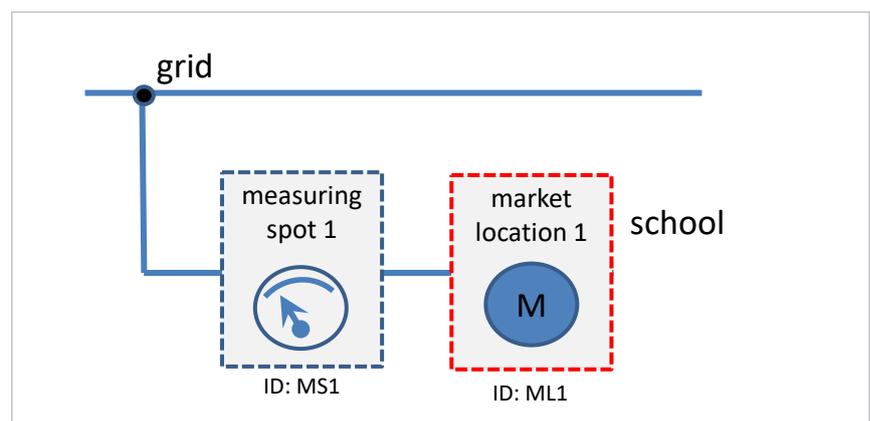
This request process enables the electronic exchange of the MaLo ID of a metering point identifier with the network operator by way of UTILMD files. The exchange can be performed mostly automated.

The flexible filter technique allows easy discovery of the delivery points for which the responsible network operator has not yet provided a MaLo ID and when the corresponding request has been submitted to the network operator.

In order to distinguish the newly introduced terms market location and measurement location, PSImarket will continue to provide an information point type for delivery points. Relationships between these information points can set up in order to model complex delivery locations.

### Complex delivery points

A market location supplied by several measurement points is called a complex market location. The network operator reports a change of the complex market location to the supplier via a master data change. For illustration purposes, the BDEW publi-



This delivery situation is known to the supplier prior to the change.

cations use the follow structure as an example.

Changing the master data from a school to a custodian-school construct

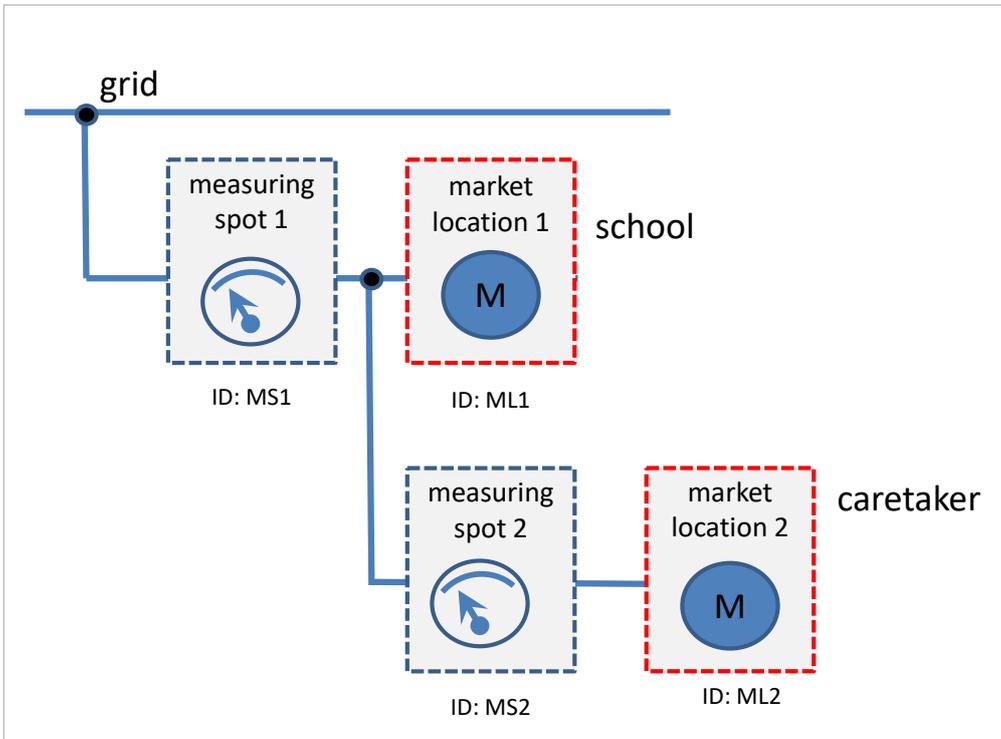
### Adding measurement change processes

Modern measurement equipment allows end customers and facility oper-

advance the objectives of the energy transition, in particular increased energy efficiency.

Starting in 2017, modern measurement equipment is installed in all new buildings. For existing facilities, the installation obligation depends on the annual consumption. The respective threshold has been lowered and now intelligent measurement equipment is increasingly used for SLP delivery points.

Within the framework of the measurement change processes, the suppliers are informed about the situation. Here they can decide whether the billing is handled by the responsible measurement point operator or by the supplier. These requests are exchanged by Edifact messages. PSImarket supports the market communication processes in



After the change, these changes processes are automatically handled in PSImarket.

requires a change of the complex market location structure. When differences which require a manual verification process are detected in the conversion process, this report situation is noted in a clarification list.

ators to access both the meter reading and the daily, weekly, monthly, and annual electricity consumption values for the last 24 months. With the introduction of modern measurement equipment, the legislature intends to

this context. Numerous extensions are available as standard in release 4.2.4. 

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News: Successful startup of the energy trading system PSImarket 4.1 in Poland

## Standard software for all processes

One of the largest energy utilities in Poland recently announced the successful completion of a PSI project based on the standard software solution PSImarket 4.1. This PSI customer produces, transmits, and sells electricity to 2.4 million customers all over Poland which represents a 12.5 % share of the Polish retail electricity market.

**T**he standard software solution covers all processes in energy sales and energy

trading in form of a modular and integrated solution for electricity, gas, and other commodities. The modular de-

sign allows a flexible implementation of the system for different functionalities and commodities.

PSImarket was realized as a central system for portfolio management, tendering, and energy demand forecasting. The project started in early 2016 and was successfully completed one year later. All obligations speci-

fied by the customer were completely fulfilled.

The scope of services included design, delivery, and implementation of the system as well as performing acceptance tests, system documentation, and training for users and system administrators. In addition to data exchange interfaces to several third-party systems, an integrated workflow engine and an EDM module were implemented as system extensions.

During all phases of the project, the PSI staff cooperated closely with the customer. Since the final acceptance

The implementation of the system is based on the standard product PSImarket version 4.1 and supports the following functional areas

- Assessments and generation of price lists,
- Portfolio management and analysis,
- Contract management,
- Short-term and long-term forecasts,
- Storage of measurement data and reports.

of the project, PSI has been providing support services including system and software maintenance as well as a 24/7 support.

In addition to the appreciation of the reliability and innovative technical capabilities of the solution, the customer also expressed his appreciation of PSI as a reliable and trustworthy partner. 

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**News: Basel-based IWB is taking the energy optimization platform TS-Energy into operation**

## Hydroelectric power plants and gas procurement contracts

Basel-based energy supply company IWB is aiming for full supply from renewable sources in the long term. With intelligent products and services, IWB harmonizes production and consumption. For this purpose, the company is relying on the energy optimization platform TS-Energy of the Swiss PSI subsidiary Time-steps AG, which IWB is now putting into operation.

**I**WB has decided in favor of Time-steps in a corresponding invitation to tender. In addition

to supplying the optimization platform TS-Energy, the contract also includes services for the commission-

ing of the entire system as well as a modelling of the power plant and gas procurement portfolio. Currently the system is in the productive testing phase.

### Operational management of hydroelectric power plants, of gas procurement contracts and the optimization of energy procurement portfolio

With the use of TS-Energy, IWB is using a well-established system to ensure the operational management of hydroelectric power plants, the management of gas procurement contracts and the optimization of the entire energy procurement portfolio in the long term. 

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Power station Birsefelden in Basel at sunset.

Product report: Measure, document, and analyze with PSIrwin

## Revision of gas measurement stations

The purpose of the technical revision is the frequent verification of the measurement accuracy of all billing-relevant gas measurement equipment in order to minimize measurement errors and the associated commercial risk. Standardized procedures for reproducible test results are used for this purpose.

The revision and calibration of measurement equipment in multiple locations involving multiple offices provides particular planning and execution challenges. The detection of long-term measurement accuracy trends requires complete documentation of all measurement data and results.

An integrated system environment with comprehensive central (server) and decentral (notebook) functions is available to fulfill these complex requirements. Station-specific and device-specific master data in structured form are managed centrally and decentrally; data integrity is ensured by bidirectional data synchronization.

### Convenient execution and documentation

The user has convenient functions at his disposal for performing the tests



Technical revision of gas measurement equipment.

and generating the revision reports, calibration logs, and calibration certificates on site. All required procedures for analysis of the tests are integrated in the system. The revision history and trend displays are other important components of the application.

The revision system PSIrwin is the standard system for effectively completing all tasks related to revision and calibration of gas measurement equipment. Extensions and company-spe-

cific adaptations can easily be realized due to the open system architecture.

### A “Must” for each test office—Integrated measurement deviation assessment

The calibration office of Saxony has issued a test certificate for the calibration regulation-relevant tests which highlights the special features of the system as an additional quality feature. The integrated measurement accuracy for the normal test and the test object—which is a “Must” for every test office—ensures compliance with the permitted deviation limits.

In addition to these standard functions, PSIrwin provides numerous functions to facilitate the daily revision workflow: revision planning, storage of the documents at the objects, and revision-proof storage of documents. ☉

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News from the PSI Energy Gas & Oil business unit

## News from management and sales

In November 2017, Reinhard Bösel was named Deputy Division Director of the Gas & Oil business unit where he served many years as manager of the projects department

Dr. Wilhelm Terlau and newly hired Anatole von Lilienfeld-Toal will now provide sales support for gas management systems. Dieter Scheibe, our

highly esteemed and long-time sales colleague, has left having earned a well-deserved retirement.

The combination of PSI's strong team and the sustainability of their gas

management and pipeline suites will ensure that all customers are best-suited to manage any future digital challenges. ☉

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User report: Completely virtualized system solution for municipal gas storage company Epe

## Energy services in the cloud—can it be done?

The municipal gas storage company Epe mbH & Co. KG is a subsidiary of Gelsenwasser that has been successful in the energy services sector for many years. Their core task is the commercial operation of an underground storage facility at the Eperaner gas field where a large salt mine provides excellent conditions for several gas storage operators. As commercial operator, the primary objective of Gelsenwasser is to optimize the field's storage utilization.

The technical experts at KGE focus on the core services that they provide. They thus—at the end of 2017—transferred all technical responsibility for the storage management system and the necessary infrastructure to PSI Software AG. In conjunction

tions within the integrated solution and are directly managed by trustworthy third-party partners.

### Highly secure communication between gas partners

The core of the storage management system consists of the PSITranstore,

ble for operational training of users, easy testing of complex configuration modifications, and verifying system updates prior to operational production.

### The new system structure fulfills the requirements perfectly

Together with caplog-x, a system structure was designed that perfectly fulfilled the most diverse requirements. KGE, as user, has access to various user clients (LVis server) of the storage management system via a primary channel as well as a mobile phone-based alternative chan-



Above ground equipment of KGE Epe underground storage.

with caplog-x, a 31.3 percent subsidiary of PSI, the Gas & Oil business unit developed a completely virtualized system solution which enables KGE to utilize its application environment for the commercialization and operation of the underground storage facility as a service. The website and underground storage simulation are run as third party applica-

PSIcompact, and PSIcomcentre solutions in a highly-available production system.

They are enhanced by a web-based nomination module and the PSI-proprietary AS2 module for highly secure communication between gas partners. Both these modules were implemented in a demilitarized zone. In addition, a test system is availa-

nel using a VPN tunnel and various Microsoft RDP sessions. The partner companies have their own separate access channels for installation and management of their applications. PSI has secure, high-performance administrator access for the installation and maintenance of the core system (production system and test system). The application systems are strictly

separated from each other but have a dedicated data exchange channel in order to implement the business processes system wide. The provisioning of virtualized instances, services, and infrastructure is based on a very detailed operation and availability model; every instance can be specifically assigned a specified service, availability, and response time.

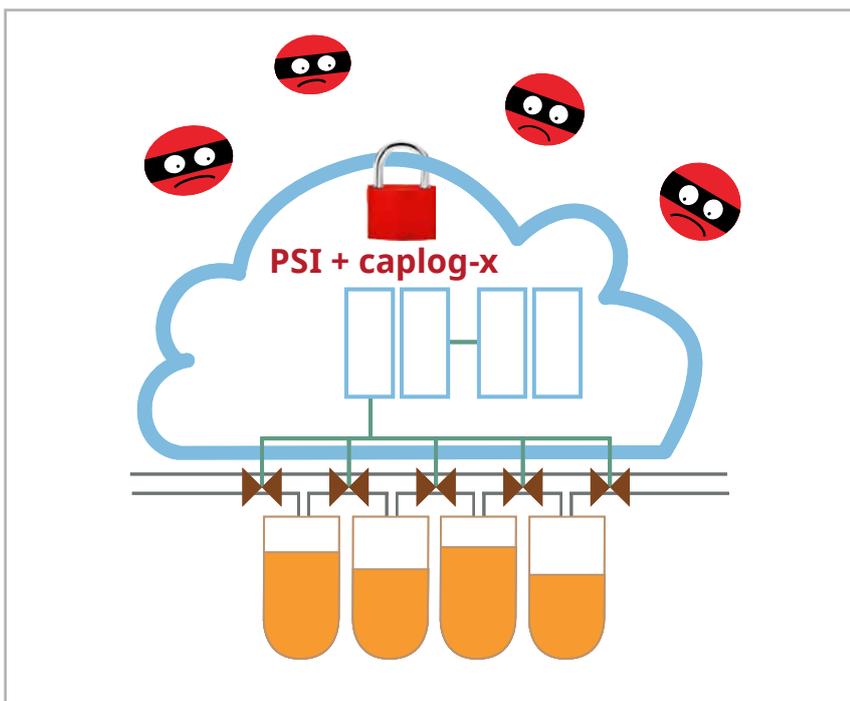
### Maximum availability

A project solution completely fulfilling the commercial and technical conditions was developed that provides 99.95 percent availability

implemented as Windows servers. For KGE's website, the TYPO3 and TOMCAT standards were used running on an Ubuntu LINUX system. User management for the Windows servers was implemented using Active Directory services. caplog-x provided additional services including antivirus management, time synchronization, backup, and monitoring for the entire network. PSI provided the main contact for KGE on a 24/7 basis for routing all requests and potential findings; this included questions about parameterization of the applications as well as PKI services

### KGE—Kommunale Gasspeichergesellschaft Epe mbH & Co. KG

was founded on November 9, 2007 in Epe for the purpose of planning, construction, and operation of an underground storage facility for five companies—Energie- und Wasserversorgung Mittleres Ruhrgebiet GmbH, Dortmunder Energie- und Wasserversorgung GmbH (DEW21), Stadtwerke Essen AG, Gas-Union GmbH, and GELSENWASSER AG.



Secure cloud applications for the gas industry by PSI and caplog-x.

for mapping the core business process. caplog-x and PSI closely cooperated throughout the project, beginning with the specification of the individual systems and their interrelationships up to implementation. The system architecture consists of application servers running primarily SuSE LINUX Enterprise as well as Windows servers; the LVIS servers have been

and incident resolution. caplog-x, as PSI's trusted partner also provided all necessary support services whenever required.

### Hosted infrastructure

The hosting solution of KGE, which can be characterized as a private cloud, benefits from the recent implementation of several PSI tools

that significantly simplify "Continuous integration" and light-weight software distribution and management. caplog-x successfully demonstrated its capabilities as a competent data center operator and an expert in managing infrastructures. PSI is the main contact for KGE "the user" which allows them to focus on their core business.

The implementation of KGE's system as hosted infrastructure in caplog-x's data center is the first productive success towards cloud-based services. The infrastructure of caplog-x is particularly suited to implement similar projects for companies in the gas sector. The caplog-x data center fulfills high security requirements and provides various network interfaces. The combination of PSI and caplog-x with their application portfolio and technical know-how is ideal for cloud solutions such as Infrastructure (IaaS), Platform (PaaS), or Software (SaaS). ☉

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News: PSI awarded Software Contract from Trans Adriatic Pipeline

## Commercial Dispatching Software

Trans Adriatic Pipeline (TAP) AG has selected PSI Software AG to supply its new Commercial Dispatching Software (CDS). The state-of-the-art software will enable TAP to perform its commercial dispatching activities for the transport of natural gas.

ply to several Southeastern European countries including Bulgaria, Albania, Bosnia and Herzegovina, Montenegro and Croatia. TAP's foothold

The CDS will optimize TAP's business processes, including managing transportation contracts, nominations, matching and balancing positions, allocations, as well as ensuring smooth communication between TAP, its shippers and the adjacent Transmission System Operators (TSOs). The CDS is part of TAP's Supervisory Control and Data Acquisition (SCADA) telecommunications and security systems contract



Construction in Northern Greece, November 2016.

*The award of the commercial dispatching software is an important milestone for TAP. We look forward to working together with PSI in our future operations to come.*

**Ulrike Andres**

Commercial and External Affairs  
Director at TAP

that was awarded in December 2016 to Honeywell.

TAP will transport natural gas from the giant Shah Deniz II field in Azerbaijan to Europe. The 878 km pipeline will connect with the Trans Anatolian Pipeline (TANAP) at the Turkish-Greek border at Kipoi, cross Greece, Albania and the Adriatic Sea before reaching Southern Italy. TAP will be able to facilitate gas sup-

in Italy will enable them to transport Caspian natural gas to some of the largest European markets such as Germany, France, the UK, Switzerland and Austria. ☉

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PSI 

Industry 4.0 - Creating Value

PSI presents from 23.-27. April 2018 comprehensive solutions from production, logistics and energy at the Hannover Messe.

**We look forward  
to your visit in  
hall 7, booth A26.**



News: Upgrade and expansion contracts from major energy suppliers

## PSI successful in the energy sector

PSI Software AG has once again received important orders from major energy suppliers in the Electrical Energy business unit. These include both upgrades of existing systems as well as large expansion orders.

**R**heinenergie, which has been a PSI customer for more than 30 years, has ordered an upgrade for the integrated system for operation of the sections electricity (medium and low voltage), gas, water and district heating.

### Standardization of the control systems of many network operators

Parallel to this, in a first stage of the RheinSchiene system is to be implemented, which includes the standardization of the control systems of the network operators of the cities of Cologne, Dusseldorf and Duisburg with the possibility of later redundancy if necessary. The Rheinenergie system is transferred directly to the RheinSchiene system.

### Extensions at Westnetz GmbH

The large systems of Westnetz GmbH are facing relevant extensions in the areas of external network connection with CIM, DZE functionality, network and forecast calculations. Thus, the two systems in the network areas north and south are also being sought. All contracted system extensions will be harmonized with the other distribution network operators

of the innogy Group as part of a harmonization project.

### Data exchange with GLDPM module

In addition, PSI offers the GLDPM module (Generation and Load Data Provision Methodology) to be used from 2018, which distribution system operators require for data exchange with the assigned transmission system operator.

### Enedis modernizes existing control system

The French distribution system operator Enedis modernizes the existing

Enedis supplies 2.1 million inhabitants in the metropolis of Paris with an annual energy consumption of 14,000 GWh. To minimize power interruptions, the Paris network has a high degree of redundancy. The city is surrounded by a 400kV line, from which 225kV cables radiate to the city center.

### Reduced processing time increases system quality

Nearly all of the mentioned customers rely on the comprehensive standard functionality provided by PSI, which largely avoids project-specific customizations. This not only reduces the processing time but also increases the quality of the system.

For all new projects, the current PSI-control version 4.5 with the imple-



The ring network topology of the Paris distribution network requires special adjustments.

control system DANY4 in Paris with an upgrade to PSIcontrol 4.5. The new system will be featured with specific functions to meet the special requirements of the distribution network in Paris (ring network topology) and will fulfill more constrained IT security requirements.

mented IT security technology based on the BDEW/ÖE rules is used. 

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Product report: Maintenance and operational optimization with PSIconmand

## Workforce Management 4.0

In addition to the cost reduction aspect, many companies in the energy supply industry are faced with an investment dilemma: Often barely digitized assets which have been maintained for over 50 years by a proven but intransparent manual process are supposed to be suddenly integrated in “Augmented reality” and a modern IoT process. This requires updating the data basis and the maintenance processes as well as improved tools. Another important driver is the concern about recruitment of young engineers and technicians throughout the industry.

The product PSIconmand provides multi-utility companies with a workforce management system which is closely linked to the network control system PSIcon. In addition to basic functionalities for work planning and dispatching, PSIconmand provides decision support by capacity planning, assists the dispatchers by automated dispatching,

agement often covers only the operational perspective. However, it is worthwhile to change the perspective and to view the work and the related processes from a strategic perspective.

to perform the work scheduled for the next year and whether it can actually be performed with the available staff resources. Thus capacity planning is becoming a prerequisite for work preparation. It is also possible to manage projects and group orders and to model unknown work as reduction of resources. The capacity planning enables early responses to resource bottlenecks and provides planned outage request suggestions for the annual outage planning based on the grouping of work orders.

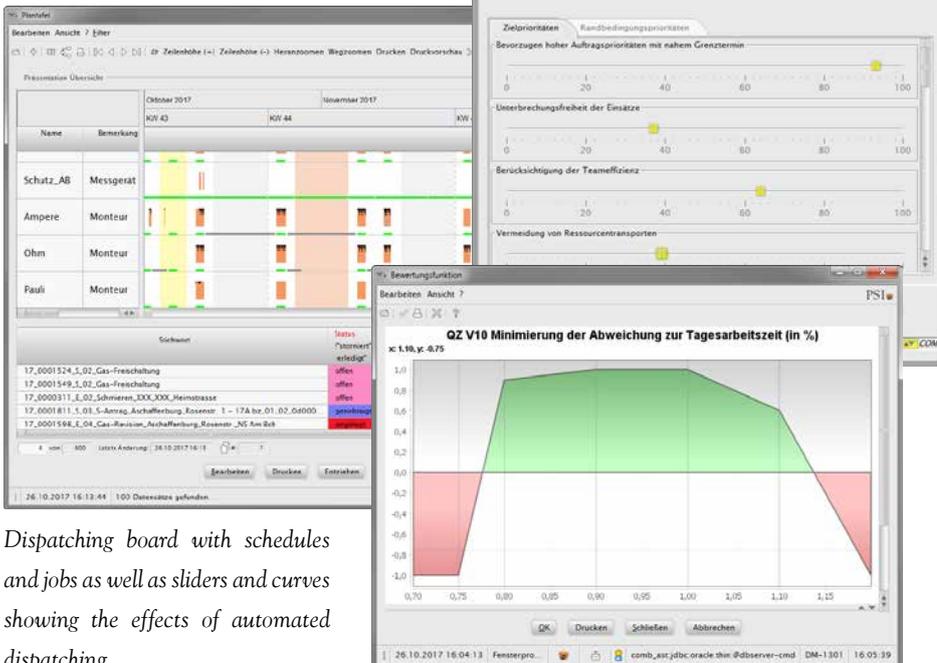
### Work planning and automated dispatching

Automated operational dispatching suggestions enable customers to adapt the work preparation as needed for optimal operation.

After a setup time of several weeks, the purchasing processes, orders to third-party companies, and outage management can also be controlled based on optimal operation. Thus, the entire work process is significantly improved by the automated dispatching.

### Integrated planned outage requests

The switching measures required for the work can be requested directly in PSIconmand. The entire process from the planned outage request to the execution of the switching operations is documented in the outage order. The outage order is automatically generated as part of the overall work. The integration of PSIcon and PSIconmand enables explicit description of the planned outage requests by switching sequences (step



Dispatching board with schedules and jobs as well as sliders and curves showing the effects of automated dispatching.

and supports the technicians by the functionalities of PSI Mobile. A modern asset service process requires effective tools. Workforce man-

### Capacity planning

PSIconmand is the first to provide energy suppliers with a real overview of operations, including the best time

lists) for the approval process in the control center.

### Operational switching integration

After the release by the control center, the technicians are able to autonomously perform the switching operation based on the prepared step list without any further interactions related to the switching. In addition to the local verification by QR codes, the electrical release is issued by the interlock checking in PSIcontrol. If both checks are successful, the step is released for execution and the physical switching operation can be updated in PSI Mobile. The switching operation is immediately documented in the control system. Once the equipment has been isolated, the maintenance and repair work can start.

### Mobile networking

All scheduled operations including switching measures are transferred every night as jobs to the mobile devices of the technicians. Thus all information relevant to the job is available on the road. The digitization of the field crews reduces operational losses. Status updates, time logging, work documentation, and allocation and request of materials are digitally entered by the technician and processed in an integrated system.

### Automated processing of spontaneous events

In case of unscheduled events such as faults, the incoming information is saved via guided information logging and processed automatically. After only a few minutes, the respective technician already has all relevant information in digital form and

The image displays three overlapping screenshots of the PSI control system interface. The top-left screenshot shows a network diagram with red 'X' marks indicating faults. The top-right screenshot shows a desktop view of the 'EINSATZE' (Operations) screen with a list of tasks and their execution times. The bottom-right screenshot shows a mobile phone screen displaying the same task list, with the fourth task highlighted in green.

*Network state with prepared switching measures and mobile step list for the two technicians involved in the switching operation.*

can request navigation to the fault location. In case of widespread outages, PSIcontrol allows standardized responses to the situation based on escalation levels.

### Effective feedback

The digital status updates, the feedback of actual work times, and the consistent work documentation contribute to a significant acceleration of the process cycle. The display of the required work times on the dispatching board visualizes the performed work to the dispatcher.

Immediately after completing a measure, the data required for assessing the asset is immediately available to the asset owner. The data is also forwarded to other systems. This enables seamless and fast follow-up processes such as asset analysis or billing of third parties.

The digitization provides new opportunities to energy supply companies which combine the general cost reduction requirements with the advantages of an attractive and strategically oriented employer. PSI views itself as part of the innovation process of our customers. 🌀

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News: Successful energy transition requires standardization and faster development

## Maintenance concept for all service tasks

In the recent years, PSI Electric Power Business Unit has established a comprehensive maintenance concept for its products, which is now used by most of the customers. The system maintenance refers both to the further development of the software and to the introduction of security patches.

**T**oday, further measures are required for regular system maintenance. The requirements of the energy transition require rapid response to new tasks. This leads to increased standardiza-

tion and faster development. With customized maintenance concepts, customers can receive so-called “evergreen” systems. In addition, security requirements have to be taken into accounts including the

prompt implementation of security patches.

The practical experiences of the first years have led to numerous improvements in the processes, in particular, in the implementation of automatic monitoring in order to facilitate evaluation as well as the implementation and use of security information service to increase transparency. In addition, it led to the improvement of the ICP process for more efficient configuration and patch delivery.

The processes described are always adapted to new and future requirements, such as Software-as-a-Service (SaaS) that involve further system operation by PSI personnel. 

### General requirements

- High availability of services (24/7)
- Defined processes for all activities
- System design that allows easy and low-error maintenance
- Compliance with applicable safety rules
- Continuous, automated monitoring of proper system function
- Consideration of the third-party software used
- Fast action in case of security threats

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News: PSI announces strategic partnership with Advanced Control Systems

## Technology partnership in North America

PSI Software AG (PSI), a global leader in software solutions for utilities and industry, and Advanced Control Systems, Inc. (ACS), a leading provider of Smart Grid solutions, have announced a new partnership in North America.

**T**he technology partnership is a demonstration of Leadership through Technology, and combines PSI’s extensive experience in Transmission Energy Management Systems (EMS) and extensive renewables expertise with ACS’s strong advanced distribution manage-

ment (ADMS) market presence across the Americas.

### Scalable solution

Together, PSI and ACS bring a new level of innovation to the Energy Management market, resulting in a scalable solution equipped to handle

the challenges of renewables integration and optimization of grid assets in both large and small utilities.

ACS is currently deploying the first two projects in North America with the integration of the PSI advanced EMS applications into the ACS PRISM solution. 

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Events: PSI presented energy solutions at E-world 2018

## Digitized processes optimize customer management

PSI presented at the E-world energy & water in Essen (Stand 326, Hall 3), from 6 to 8 February 2018, the latest energy developments in energy trading and distribution, optimization, overhaul, gas network management, gas storage, network control and workforce management.

demands on process management and offers a comfortable integration into the existing IT environment through standard interfaces.

The energy trading system PSImarket enables significantly improved contract management processes for trader navigation, billing and back office thanks to a newly developed, freely configurable contract cockpit. PSImarket supports the ongoing trend towards procurement trading on short-term markets with a special bidding and stock market connection module.

### Support for the key account workflows

In the sales module, the linking of a CRM system from external suppliers provides comprehensive support for the key account workflow with flexible cal-



Inspiring discussions about trend topics in the energy industry.

plex energy portfolios, the TS-Energy system now features EPEX Intraday Gateway and Intraday Trading Robot and has been migrated to a generic database environment.

### Revision and measuring

The system PSIrwin offers, in addition to standardized procedures for reproducible test results, interfaces to external systems for the revision of gas measuring systems, in order to provide technical measures, relevant test and control results.

### Gas network and storage

Gas network and storage operators could inform about the PSI Gas Management Suite for highly automated processes. This fulfils the increased

### Network control and workforce management system

For utilities, the PSIcontrol Release 4.5 network control system offers comprehensive fault analysis, overhead line monitoring and advanced control functions for distributed feed-in.

In the workforce management system PSIconmand, in particular the mobile switching support from the field for planned measures and automated resupply was presented. ☉



The PSI fair booth at the E-world 2017.

ulation options for end customers and key accounts, as well as all energy management processes via PSImarket. The usage of cloud providers, i.e. MS-Azure is designed to help reduce IT costs. For optimization and risk assessment of contracts, power plants and com-

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F & E; MathEnergy—Mathematic key techniques for energy networks in transition

## Scenarios for the energy supply of the future

Together with several partners, PSI is working on the research project MathEnergy for realizing a software library which models all levels of the coupled gas and electricity network in Germany. The new procedures not only meet the massively increased requirements for network calculation due to the energy transition but also result in significant cost savings and reduction of CO<sub>2</sub> emissions in actual operations.

The starting point of the project is the question how future network stability can be ensured and costs can be reduced in combination with a sustainable and CO<sub>2</sub>-neutral energy supply. This is possible only by analysis of the entire energy cycle in electricity, gas, and district heating networks. For this purpose, mathematical methods must be developed in order to calculate and simulate the flow of gas and electricity in large complex networks. The challenge is the modeling of comprehensive hierarchical systems and dependencies between the individual networks as well as the reduction of the complex model into a simpler model for faster computation.



### Simulation of various scenarios

The procedures must be able to provide support for long-term decisions in order to ensure the energy supply as well as the raw material supply and to advance local network enhancements. The fast simulations for various scenarios are also designed for fast and sound decision support in the daily operational business. Furthermore the control of the entire network must be improved significantly. PSI is embedded in a research network of scientists from four universities and three institutes. At the same time, PSI

works on practical applications of the jointly developed procedures. Examples of concrete objectives are the use of dynamic calculation of the electricity network in online systems (control systems) in order to better utilize the available transmission capacity, and the determination of optimal locations for measurement points in order to reduce the cost of measurement equipment in the network. Another objective of the project is improved reactive power management including balancing between the transmission and distribution network operators.

### Accelerated procedures reduce CO<sub>2</sub> emission

In the gas industry, accelerated simulation and reconstruction procedures are important for interactive use as well as for an improved system for recommending operating modes, in particular for compressors, in order to accomplish a significant CO<sub>2</sub> reduction by using less propellant gas. Other work packages focus on the implementation of an optimal data management system between the control system and the calculation system and on a scenario management for planning simulation on the basis of accelerated calculation procedures. Additional information about the research project MathEnergy and the involved partners is available at [www.mathenergy.de](http://www.mathenergy.de).



Modeling of all levels of the coupled gas and electricity network in Germany.

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News: Banedanmark relies on railway electricity control system from PSI

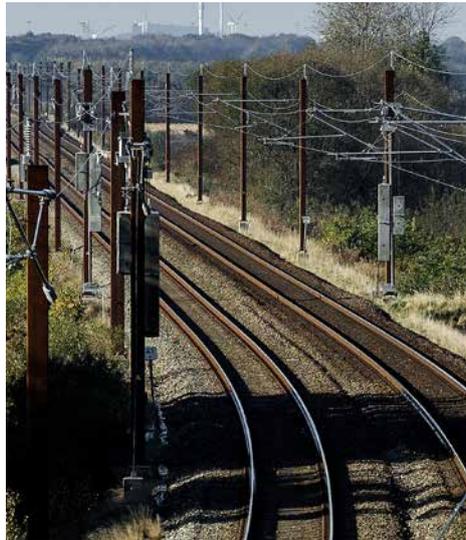
## Control of railway electricity with PSIcontrol

PSI Software AG supplies the Danish rail infrastructure company Banedanmark, Copenhagen, with the new railway electricity control system based on the PSIcontrol network control system. In the future, this system will be used to visualize, monitor and control the Danish railway network nationwide.

With a large number of interfaces for connecting additional systems, the new railway electricity control system at Banedanmark will replace the previous control systems for the city trains (S-Bane) and long-distance rail network. One of the most important interfaces is the data exchange with the already existing PSI railway electricity control system at Trafikverket, the responsible authority for rail and road traffic in Sweden.

The use of the modern railway electricity control system from PSI makes a significant contribution to the reliable operation of the Danish traction power network. For optimum customer service in Denmark, PSI has set up its own site in Roskilde.

The implementation of the project



Traction power plant Esbjerg-Lunderskov.

should be completed by mid-2019. As part of Banedanmark's electrification program, additional rail lines will be added to the system and put into operation by 2029.

The railway electricity control systems based on PSIcontrol not only perform network control tasks, but also meet additional railway-specific requirements. Many of these solutions are already being used successfully by leading European railway network operators. PSIcontrol also complies with all IT security standards in accordance with the guidelines of the BDEW white paper and the ISO 27001 standard. ☉

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## SOURCES

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## EVENTS

[www.psi.de/en/events](http://www.psi.de/en/events)



12.–14.03.2018	13 <sup>th</sup> Pipeline Technology Conference	Berlin, Germany
23.–27.04.2018	Hannover Messe	Hanover, Germany
05.–07.06.2018	Powertage Forum 2018	Zurich, Switzerland
26.–31.08.2018	cigré 2018	Paris, France
18.–21.09.2018	InnoTrans 2018	Berlin, Germany
06.–08.11.2018	European Utility Week 2018	Vienna, Austria
14.–15.11.2018	PSI Energie EE Info Days 2018	Aschaffenburg, Germany

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