

ENERGY manager

Newspaper for energy suppliers



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EDITORIAL

Dear readers,

We are at the end of the gas base year for the next examination of costs for gas supply network operators. But 2014, which is also referred to as a “shadow year”, was groundbreaking and had a special challenge in store for us: four large projects at GAS-CADE Gastransport GmbH, Ontras Gastransport GmbH, RWE Westnetz GmbH and Thyssengas GmbH had to be completed and were done so successfully.

These projects benefited from the standardisation of software that has been taking place steadily for some years. The aim of this development is to provide our customers with annual upgrade releases, taking into account operating systems and third-party software, and not least for reasons of security. In July, the Oil&Gas division introduced and integrated an in-



formation security management system (ISMS), successfully audited by TÜV Süd, based on ISO 27001.

We have also devoted a lot of time to the topic of security within the research project “STEUERUNG”. Intensive research has also been conducted into the potential for cyber attacks at the level of data transmission, system technology, process management and application. This research was carried out using the GO control system at the network operator Netzgesellschaft

Berlin-Brandenburg and also looked at options and procedures for detecting such attacks.

Further articles look back at the participation in the World Gas Conference in Paris and at the Moscow International Oil and Gas Exhibition (MIOGE). On the topic of Russia, together with our Russian subsidiary OOO PSI, we are developing measures to satisfy the measures brought in by the Russian government to counteract the sanctions applied by the EU.

Regards

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Modern large-customer system for transmission system operators

GASCADE relies on integrated PSI network control system

At the beginning of 2013, PSI AG was contracted by GASCADE Gastransport GmbH to renew the ten year old GAMOS network control system as part of the Transport Management Gas Network Project (TMG-N). The new *PSIcontrol/Gas* system has been in operation since the end of 2014 and is working to the complete satisfaction of GASCADE. This project used the most up-to-date large-customer system based on PSI's Gas Management Suite with the *PSIcontrol/Gas*, *PSIganesi*, *PSIreko*, *PSItransport*, *PSIcomcentre* and *PSItase.2* applications.

As one of the largest natural gas transport companies in Germany, GASCADE Gastransport GmbH operates a transport network that is approximately 2400 km long (up to 100 bar). The pipeline network of GASCADE is a hub for European natural gas transport: with eight border crossing points, it connects five European countries with one another directly and will also guarantee a secure energy supply for Germany and Europe in the future.

24/7—uninterrupted monitoring and control

Since gas production is declining within Europe and consumers will be even more dependent on imports in

the future, the GASCADE network is becoming increasingly important. With its pipeline system, which is based on the highest technical standards, the transmission system operator (TSO) in Kassel offers customers competent and comprehensive transport services as an independent transport network provider. GASCADE focuses on security of supply. In the network control centre in Kassel, dispatchers and planners ensure that the natural gas supply companies in Germany deliver gas to their customers at fair market prices, on time and at the correct location. Natural gas can be fed into the transport network at 14 points. At up to 80 discharge stations,

the natural gas reaches final consumers, municipal utility companies, distribution companies as well as domestic or foreign gas network operators. In order to ensure that the gas flow is always reliably guided through the pipeline network (with nine compressor stations and a total of 28 compressor units) in the contractually agreed amount and direction, the dispatchers in the dispatching centre monitor and control the network around the clock—24 hours a day, seven days a week, with no interruptions.

The hardware infrastructure was provided by GASCADE according to a joint specification. It comprises three identical site systems which consist of highly redundant multi-computer systems. The site systems comprise a productive network control system in Kassel, a replacement network control system at the replacement site and a test system. Each site system is designed fully redundant. This site concept allows the master control to be transferred between the two sites for the network control centre in a con-

trolled way, and thus meets all requirements for a high-availability and disaster-tolerant system. In this project, the particular challenge lay in supplying technical data to the sites in parallel, synchronising operator actions and ensuring that commands were given only by the network control system currently selected.

Highly automated handling of gas processes

The servers of the systems are operated with the operating systems Linux and Windows. They are connected to the telecontrol network via multiple redundant telecontrol heads with the IEC 850-5-104 protocol.

GASCADE places high demands on the highly automated handling of the gas processes using the user and system functions of the new network control system; PSI met these demands with its proven standard products. Any nec-

ture. GASCADE had some very clear requirements: absolute security in the operational management, high ergonomic standards and compliance with binding GASCADE IT security guidelines. The new *PSIcontrol/Gas* network control system is integrated in the GASCADE infrastructure and takes the GASCADE security requirements into account. It is divided into different security zones and groups, which are connected with each other and with the GASCADE VLAN network via site-specific firewalls.

Migration and commissioning

The system was tested extensively before and during commissioning with comprehensive test regulations. A detailed migration and commissioning concept, developed together with GASCADE, regulates the process of the highly automated transfer of the data model, the plant and network

commissioning, the time during which parallel data maintenance was required in the old and new system was reduced to a minimum by various special measures.

The *PSIganesi* integrated simulation package used calculates the current network conditions and presents the results in process images or in the topological world view. The predictive simulation variants—automatic or manual on a cyclical basis—allow a view into the future of the network. Automatic leak analyses support operations.

Administration and accounting in the overall concept

With its range of standard functions, *PSItransport* covers time series management, schedule management as the basis of the GASCADE business process along with cooperation partners in the GASPOOL market region, and the network balancing process. The integration into *PSIcontrol/Gas* provides a joint use of the danger and alarm display, the event log, the M42 applications and the control system visualisation.

In the overall concept, *PSItransport* acts as the integrating component. It is responsible for the following: administration and accounting for the data of the external forecast, schedule management, control value specifications from the GASCADE external contract system, submission of the online allocation data and further diverse accounting results, as well as the supply of data to fulfil disclosure obligations.

Integrated gas quality reconstruction

A particular highlight is the integrated gas quality reconstruction with *PSIreko*. A graphically defined station



Dispatching centre at GASCADE.

essary project-specific, low-level modifications were developed and implemented jointly. The modifications were designed so that they can also be used for further TSOs in the fu-

images, the calculation rules and the reconstruction and simulation network model. As GASCADE still had to perform extensive network extensions and modifications during com-



The GASCADE pipeline network is a hub for European natural gas transport.

value accumulation function was integrated in the system to allow input data to be determined. As part of the network model, station quantity values are considered historically correct for the reconstruction calculations. PSIREKO tracks all measured gas qualities and compares the results with the measurements at the reference measuring points. Based on the gas qualities calculated and measured at the reference measuring points, there is a corresponding comparison of the K numbers. Depending on the parametrisation, the K number is calculated in accordance with AGA8-DC92 and/or SGERG88.

Due to modified regulations, in the realisation phase, the design approval by the German National Metrology Institute (PTB) and the calibration by the weights and measurements verification body in Hesse had to be brought forward to 2014. Thanks to the highly qualified experts at GASCADE and PSI and good coordination, this goal was achieved despite a very tight time schedule.

Integrity beyond the system boundaries

The customer's in-house systems and external partner systems are

the context of the network control system. The customer has been using the system productively since the autumn of 2014 to their complete sat-

Our control centre is one of the most modern gas monitoring and control systems in existence and supports us in our current and future tasks with a high level of efficiency.

connected using PSICOMCENTRE and PSITASE.2 in the form of a single, robust and extremely efficient system solution. Technical aspects such as the integrity beyond the system boundaries and across different data models are taken into consideration, as well as technical safety requirements for transparent, clear data communication that meets IT security directives. Parallel to the commissioning of the control system, the dispatching centre was also relocated to the GASCADE main building. With a long-term service contract with PSI, GASCADE ensures smooth operation and real-time support for future challenges in

isfaction and with a very high level of availability. GASCADE proudly stated: "Our control centre is one of the most modern gas monitoring and control systems in existence and supports us in our current and future tasks with a high level of efficiency".

In 2015, PSI was contracted to deliver additional functions after the successful implementation of the solution in everyday operations. ☉

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TAL relies on PSI solutions for controlling and monitoring its pipelines

New requirements for operating crude oil lines

Due to legal and environmental regulations, the requirements for the safe transport of crude oil have increasingly risen. At the same time, line capacities must be fully exhausted and standstill times avoided with the exception of required measures.

Meeting all of the requirements requires new ideas and solutions that guarantee safe and damage-free operation at all times, save energy sustainably as

and controlling pipelines and plants for the TAL (Transalpine Pipeline). From a tank farm in Trieste, the TAL transports more than 41 million tonnes of crude oil per year over

ern route, with the control centre in Germany responsible for the northern route. A further centre is on permanent standby to ensure continuous supply in the event of a failure. Based on the new operational requirements, such as higher throughput, more security and sustainable energy savings, in cooperation with TAL, PSI has implemented new solutions.



Monitoring and control of the pipelines and plants at TAL.

well as reduce operating costs and ultimately avoid environmental damage. Stable systems and applications that completely fulfil the needs of the operator are the prerequisite for optimal solutions. For decades, many pipeline operators have been cooperating in a partnership with PSI and rely on proven PSI products.

TAL relies on PSI solutions

For 20 years, PSI has been the main supplier of systems for monitoring

a distance of 753 km. The oil supplies refineries in Germany, Austria and the Czech Republic. Along the route there are 11 pumping stations with a total of 40 pumps. The highest geographical point of the line is located approximately 1600 meters above sea level.

The SCADA system *PSIcontrol V7* and the application package *PSIpipelines* are in use around the clock at TAL. The control centre in Italy is responsible for the south-

Pump optimisation reduces costs and wear

TAL achieves a higher throughput both by increasing the pump performance and by using flow improvers (drag-reducing agents—DRA). With the help of the *PSIpipelines* pump optimisation, optimum combinations of the available pumps are determined—on one hand to reduce energy costs, and on the other hand to minimise the wear on the pumps. The characteristic curve monitor also creates up-to-date pump characteristic curves.

To optimally adapt the quantity and duration of injection of DRA to the respective operating conditions, the *PSIpipelines* simulation has been extended. Operators receive precise information on the effectiveness of the DRA, volume flows, pressure gradients and other important operating data. Through the combination of pump and DRA optimisation, *PSIpipelines* determines the best mode of operation for the pipeline. For example, to minimise oper-

ating costs, the system calculates the optimal ratio between the pump performance and the DRA quantity to be injected.

New two-phase model improves performance

PSI*pipelines*/RTTM (real-time transient modelling) now has a new two-phase model with even better algorithms and higher resolution. This improved the performance of the

leak detection enormously, particularly along the free-fall sections of the TAL pipeline. But the new two-phase model also provides the operator with important information about the current phase condition along level sections.

As part of various measures for energy recovery, TAL will operate a pipeline power plant. PSI is supporting this worldwide unique solution with the integration of the hydrau-

lic model for the turbine used in PSI*pipelines*. ☉

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Monitoring and control of the gas network based on PSI*control*

Disaster-tolerant network control system for Thyssengas

Thyssengas GmbH, with headquarters in Dortmund, is a group of independent transmission system operators and is one of the leading natural gas transport companies in Germany. Founded in 1921, the company can look back on a long tradition in natural gas logistics and is regarded as a future-oriented pioneer in the industry. Today, the company operates a modern cable system that is more than 4 200 kilometres long.

Every year, this extensive transport network transports up to 10 billion cubic meters of natural gas to distribution system operators, industrial operations and power plants in an environmentally friendly way, primarily in the most densely populated German federal state of North Rhine-Westphalia.

To monitor and control its gas network, Thyssengas operates a PSI network control system based on PSI*control*, with the additional components PSI*ganesi*, PSI*transport* and PSI*comcentre* as integrated functions for network balancing, online simulation and for exchanging business messages. To enable this, an overall redundantly designed computer

system is available at two geographically separated sites.

Disaster-tolerant network control system design

In the middle of 2014, Thyssengas contracted PSI to perform a system upgrade and extend the system to make it a disaster-tolerant network control system. The future network control system consists of two geographically separated sites with equal authority, each with redundant system design. In operation, the operating personnel electively give one system at one site power of command. PSI delivers the complete, turnkey system with hardware and system software, network control system application software and engineering.

Thyssengas awarded the contract on the condition that the new network control system be set up in the commercially operated data centres specified by Thyssengas. The complete project will be implemented in two parts with full consideration of regulatory constraints. The first part was com-



Thyssengas natural gas transport network.

pleted in 2014 and the second part will be available to Thyssengas in 2016.


Automatic site synchronisation

A major feature of the new network control system is the site synchronisation which synchronises the complete system automatically. Amongst other things, it ensures that entries made at the main site (which currently has the power of command) are transferred to the replacement site so that both sites have the same data base in terms of process image, master data and manual entries (commands and acknowledgements). The network control system at

the replacement site can thus be given power of command at any time without the need for manual data alignment and therefore take over management of the network.

The site synchronisation is also used to migrate data from the current release of the operating system to a new version. The systems of both sites can be operated from the existing dispatcher operator stations. This allows the change of leading operating system to be tested regularly and to be used for testing future software updates before operational use. The dispatchers only have to switch to the planned or

existing alternative control centre in the event of a disaster or on the rare occurrence of complete trials of serious situations.

With the upgrade of the PSI application software to the latest version, in terms of IT security the new Thyssengas network control system is based on the BDEW white paper and the current requirements of IT security legislation. 

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Polish pipeline operator PERN uses PSICarlos nationwide

Planning and monitoring of oil transports and oil storage

PSI subsidiary PSI Polska Sp. z o.o. was contracted by Przedsiębiorstwo Eksploatacji Rurociągów Naftowych (PERN) “Przyjaźń” S.A. to implement a system based on a standard software of the PSI division Gas and Oil. The system is intended to support and optimise the planning and monitoring of the pipeline transports and storage operations for crude oil, and in the future, for petroleum products and chemicals as well.

Modern and optimised planning

In the future, modern and optimised planning will ensure the continuous supply of the required types of oil or oil mixtures to the refineries, in particular with regard to the more extensive and more diversified deliver-

PERN “Przyjaźń” S.A. is one of the leading pipeline and tank farm operators in the Polish market for oil logistics. The pipeline system covers the “friendship” pipeline (Polish.: “Przyjaźń”, Russian: “Дружба”), which takes over Russian oil on the eastern border of Poland. It also covers the Gdańsk-Płock pipeline, which connects the port terminal in Gdansk with the tank farms in Płock. Both pipelines are operated as one transport system and supply the refineries in Poland and in the east of Germany.



Optimised planning ensures continuous supply to the refineries.

ies via the Baltic Sea expected in the future. The oil storage and type management are to be planned and implemented exactly with reference to both customers and delivery points.

Optimising energy requirements

The functional scope of the system to be implemented includes contract management, nomination and processing of oil deliveries, planning

the transport and storage of the oil batches, reducing contamination as well as reporting and measurement functions for billing.

In particular, the future system will also consider and optimise the energy consumption during pumping in detail as part of planning. The system is based on the standard software solution PSICarlos, which is already used by leading pipeline, tank farm and

port terminal operators in Europe. The project is expected to last 24 months and be implemented as part of the PERN "Development, Information and Environment" investment plan. ☉

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PSI receives order for a new system from Swedegas

Tracking gas qualities in the gas network

PSI has been chosen to implement a Gas Quality Tracking System for the Swedish transmission gas grid operator Swedegas. Stricter requirements for tracking gas quality and heat values in the gas transmission network had to be met. This was due to the unpredictable mixes of gas quality being fed in from the European gas network via Denmark as well as new in-feeds of biogas from plants in Sweden.

Data from the Gas Quality Tracking system, based on the PSIGanesi gas network simulation system, is primarily used to calculate heat values and gas composi-

tion at the various exit points. These values are then forwarded to an existing system which executes the accounting process with Swedegas' customers.

Additional functionality of PSIGanesi are line-pack calculation, leak detection, pig tracking and the calculation of the network's future behaviour based on forecast data. ☉

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PSI presentation at the World Gas Conference in Paris

Solution portfolio for gas supply companies

At the 26th World Gas Conference (WGC) in Paris, from 1–5 June 2015, the PSI Gas and Oil division presented its comprehensive solution portfolio for gas supply companies.

PSI offers high-quality systems and services for controlling the entire process chain for the transmission, distribution, storage and supply of natural gas. These systems and services provide the gas suppliers with optimal support for accomplishing their tasks.

PSI provides fully integrated solutions and modular systems for the safe and reliable transport of natural gas.

The World Gas Conference (WGC), organised by the International Gas Union (IGU), offers around 3 000 industry representatives from around

the world the opportunity (every three years) to discuss the key challenges and prospects of the gas sector. The 27th WGC will take place from 25 to 29 June 2018 in Washington DC in the USA. ☉

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Research project: STEUERUNG

Protecting critical IT infrastructure for energy supply

In association with several renowned research bodies and infrastructure operators in Berlin, the PSI Oil and Gas division has been looking into cyber attacks on critical infrastructure, their effects and the possibilities for detecting such attacks. The results are available as a guide for network operators and in the form of a demonstrator.

Protecting critical IT infrastructure for the gas, water and electricity supply is a key challenge of the changing control system world. Since the discovery of the STUXNET computer worm and subsequent later attacks such as FLAME and DUQU, security gaps in industrial control systems have become apparent. Control systems for monitoring and conducting gas transports, which were previously completely encapsulated, are increasingly interlinked with other systems both inside and

outside of company areas due to the high level of automation.

PSI control systems meet security criteria

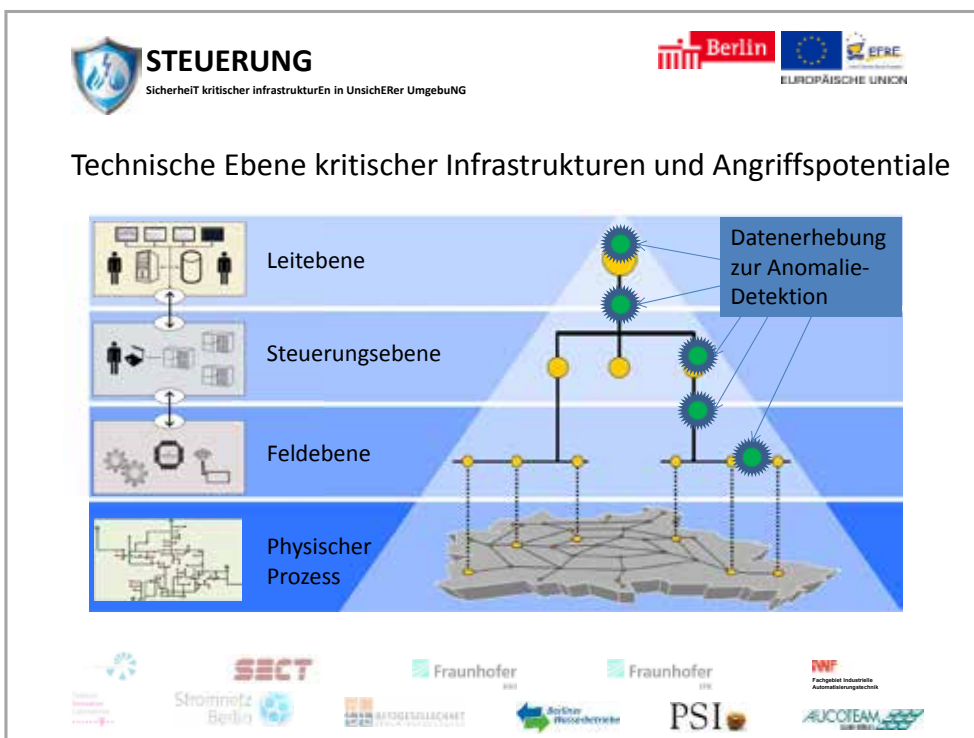
Therefore, today, PSI control systems are already integrated in the customer's network infrastructure with due consideration of current security criteria. However, as a single measure this is not enough. In recent years, the Gas and Oil division has entered into a cooperation with research bodies of the Technischen Universität Berlin, the Fraun-

hofer Institute and other institutions dealing with IT security to look more closely at the technical aspects of cyber attacks on control systems, their potential impact and detecting and preventing such attacks.

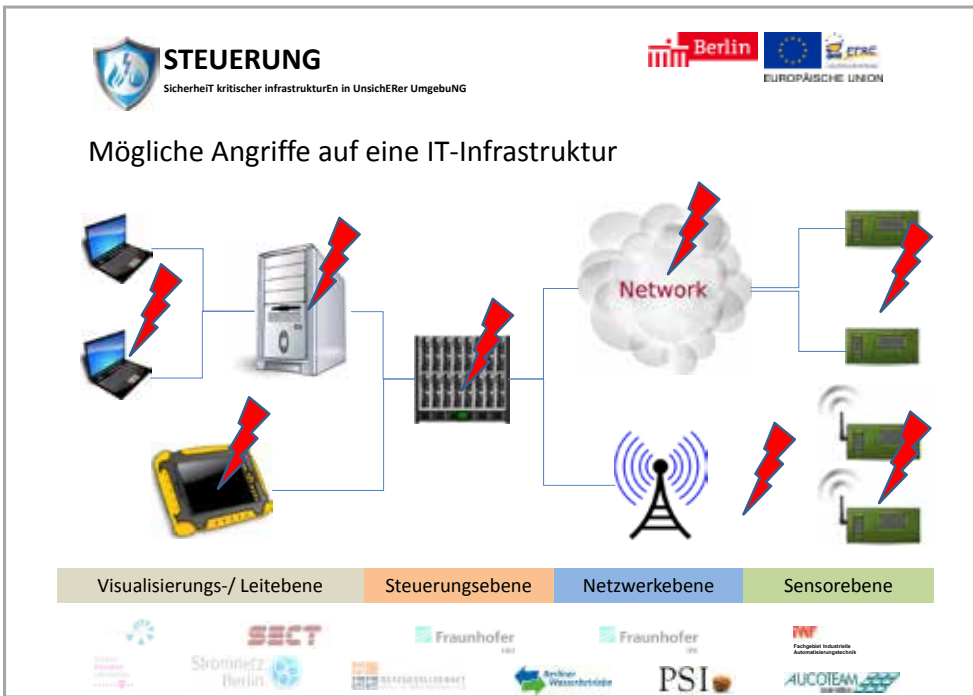
As part of the research project "STEUERUNG" (which looks at the security of critical infrastructure in an insecure environment), this cooperation dealt with the highly complex question effectively at different levels.

In particular, the ever more frequently used wireless communication for the transfer of measurement data was subjected to jamming attacks, for example, in order to gain knowledge about the exact scope for potentially effective attacks and to allow these findings to be incorporated into detection

procedures. With regard to platform security, the project investigated hardware-related integrated elements for remote administration of servers as well as the possibilities for back-door attacks and the camouflaging of malicious code at the lowest level of common operating systems. At the application level, areas for attack and potential propagation routes were determined and then used, by means of simulated attacks, to develop detection and analysis tools. In addition to the technical content, there was a special focus on the person as the user



Attack potential at technical levels of critical infrastructure.



Possible attacks on an IT infrastructure.

in such control centres: in joint workshops and simulation exercises, the research partners were able to learn a lot about the way dispatchers (i.e. users of control systems) handle malfunction and crisis situations. In particular, the comprehensive consideration of various aspects at different levels was an outstanding distinguishing feature of the research project.

Surveillance and monitoring

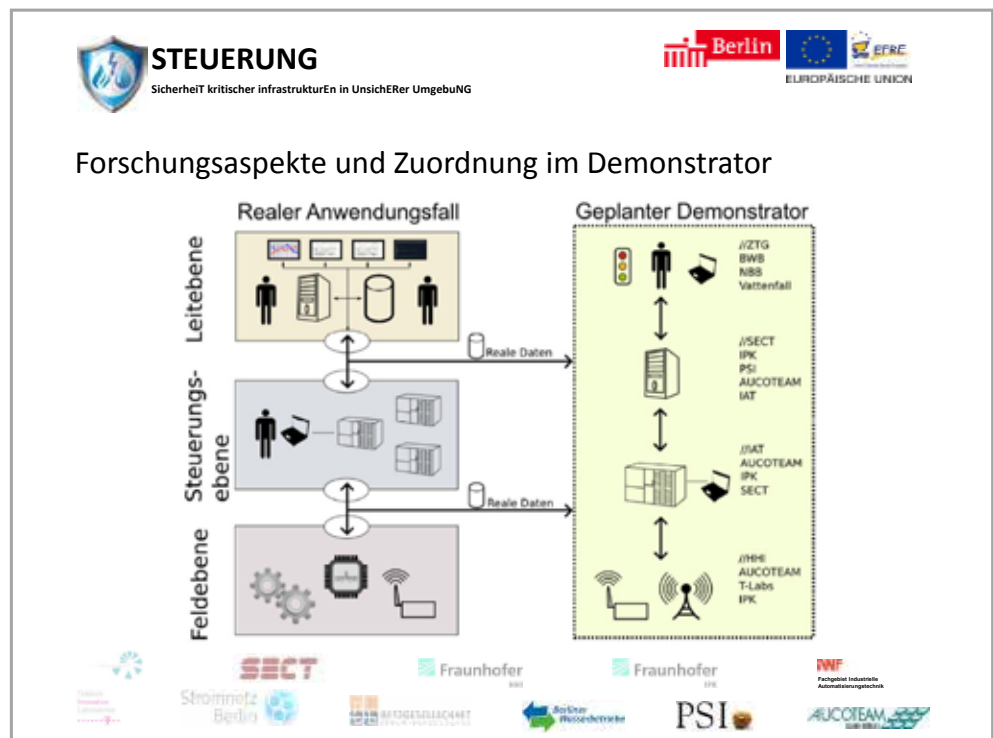
Important detailed results were obtained for users of PSI systems: amongst other things, the performance of PSIcontrol/Gas, with its detailed surveillance and monitoring functions, enables dispatchers to control malfunctions that can be made plausible, allowing these malfunctions to be explained and resolved accordingly with the dis-

played information and the experience of the dispatcher. But the control system also provides extensive resources that the dispatchers can use effectively for “new” risk situations. The results are available as a guide

for network operators and in the form of a demonstrator.

PSI successfully participated in the research project in cooperation with Netzgesellschaft Berlin Brandenburg (NBB). As a long-standing customer of PSI, NBB has been using the PSIcontrol/Gas solution for controlling gas transports in the network in the Berlin Brandenburg region for many years. Together, they were able to gain a lot of knowledge to make the use of the PSI control system even more secure. ☺

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Research aspects and assignment in the demonstrator.

Monitoring and management of the gas processes at ONTRAS Gastransport

Gas network simulation with PSIGanesi

ONTRAS Gastransport GmbH operates a gas transport network that covers the entire area of the German federal states of Mecklenburg-West Pomerania, Brandenburg, Saxony-Anhalt, Saxony and Thuringia. This pipeline network has a total length of approx. 7 000 km, is heavily interconnected and is essentially operated at three pressure levels: the “>55 bar system” for the main supply lines, the “25 bar system” and the “16 bar system”.

Since 1999, the monitoring and management of the technical processes of gas transfer, gas conduction, gas storage and gas handover have been executed with a Gas Management System (GMS) from PSI AG under due consideration of the gas industry conditions

many, this type of system can only be operated with official approval by the German National Metrology Institute (PTB) and by the relevant state calibration and measurement verification authorities.

Furthermore, for network modifications, such as setting up new gas lines

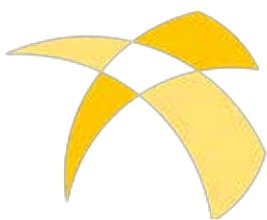
As a result of the changes announced to the Weights and Measures Act, the original project schedule was discarded and the focus moved to a new goal: to get the complex of functions for calculated determination of gas qualities approved by the PTB with the unchanged Weights and Measures Act by the end of 2014. Thus, in the second quarter of 2014, the installed gas network topology was automatically converted for PSIGanesi and reimported into the ONTRAS production system for validation. In the second and third quarter, the customer reference system available at PSI allowed comparative calculations that were performed based on imported customer data. This allowed modelling errors to be identified and eliminated at an early stage. In the fourth quarter of 2014, the migrated network topology was defined in its final form and comparative calculations of the production system and the new system performed on site.

Successful commissioning

In December 2014, ONTRAS provided the proof of the correct calculated determination of gas qualities to the PTB representatives, and the type approval by the authority for the new system was issued.

In March 2015, the new system was calibrated for the first time by the state calibration and measurement verification authority.

Parallel to determining billing-relevant gas qualities, the process-accompanying simulation based on PSIGanesi was successfully commissioned.



ontras
Gastransport GmbH

and compliance with security of supply.

An integral part of the GMS are functions that are based on a gas-specific simulation core.

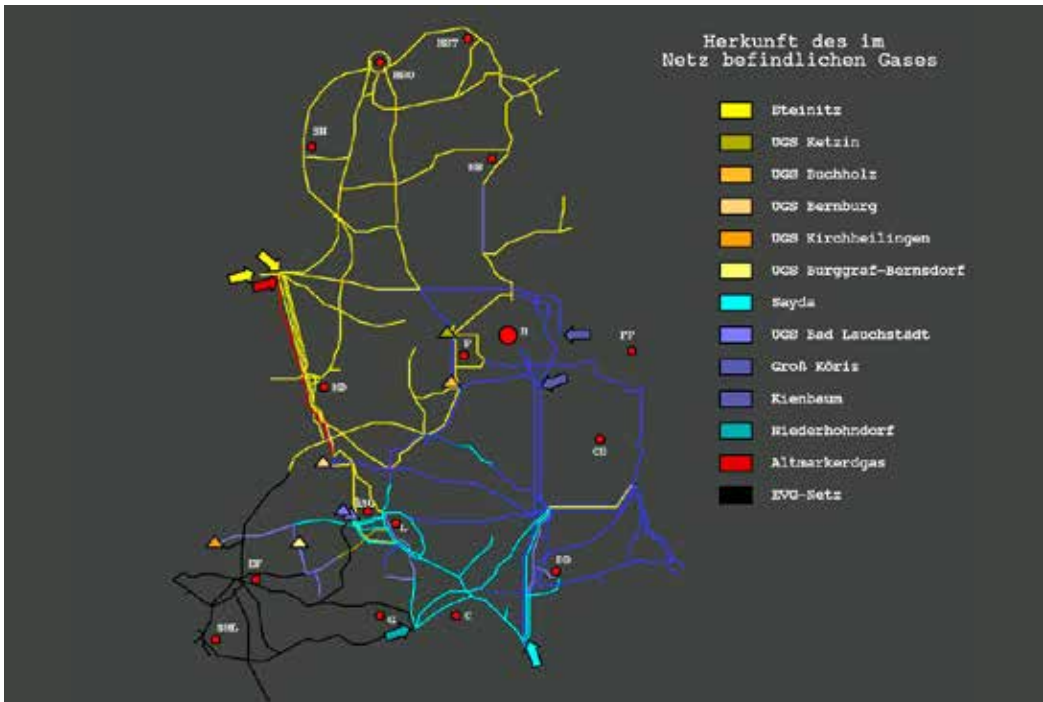
Determination of gas qualities

Unsteady flow statuses of the pipeline network are calculated as part of the process using up-to-date process data such as pressures, flows, temperatures and gas qualities. Another main task of the GMS is the determination of gas qualities based on calculations. These are determined based on the measured data using the model-based process of state reconstruction for all gas handover points and used for thermal gas accounting by ONTRAS with its contractual partners. In Ger-

and gas stations, ONTRAS uses a planning system that also works on the basis of a gas-specific simulation core. Since 1997, ONTRAS has been using the SIMONE simulation package as the simulation core for these tasks.

New gas network simulation system

In 2013, as part of the upcoming GMS upgrade project, ONTRAS contracted PSI with the changeover from SIMONE to the PSIGanesi gas network simulation system. In addition to comparable simulation functionality, ONTRAS was convinced by the expected performance benefits as well as the commitment of 24/7 maintenance.



Origin of the gas in the network.

Significant performance improvements

The promised performance improvements were clearly achieved. A sim-

ulation run for one day was reduced to one third of the time previously required.

The planning system was replaced

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Review of MIOGE 2015 in Moscow

Gas and pipeline management for the Russian market

Since 2003, the PSI Gas and Oil division has been taking part in the annually alternating MIOGE and NEFTEGAZ trade fairs.

At this year's 13th Moscow International Oil and Gas Exhibition (MIOGE), the

focus of the presentation by the Russian PSI subsidiary OOO PSI for the Russian market was the so-

lutions PSIgas and PSIneft for gas and pipeline management. In particular, Russian customers were able to obtain information directly about the new features of the multi-level

dispatching systems for transport and storage.

In recent years, OOO PSI has delivered gas management systems for Gazprom and leak monitoring systems for Lukoil and Transneft, for example. With 25 employees at the site in Moscow, the Gas and Oil division is taking over maintenance for customers in addition to marketing, project management and local software creation.



PSI was awarded the prize for the best trade fair stand.

OOO PSI

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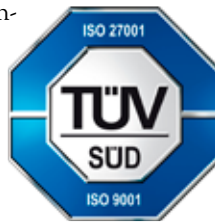
PSI introduces information security management system based on ISO 27001


Successful audit by TÜV Süd

The PSI Gas and Oil division has introduced an information security management system (ISMS) based on ISO 27001 and integrated it into the business processes. In July 2015, this ISMS was successfully audited by TÜV Süd.

As preparation for the audit, the PSI AG guideline system was adapted in an internal project and the technical and organisational prerequisites for the certification created.

Through the introduction of a continuous improvement process, the systematic de-



tection of weaknesses and systematic risk management, the topic of security has become an integral part of the business processes in the division. 

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PSI receives order from Austrian Power Grid AG

Network regulator system based on PSIcontrol

Austrian Power Grid AG (APG), the Austrian transmission grid operator headquartered in Vienna, has entrusted PSI AG with rebuilding a computer system for the secondary and tertiary control of the Austrian transmission grid.

APG is Austria's control area manager and therefore responsible for the

stable functioning of the electrical energy system. Amongst the cooperations arranged to date are a grid



regulator cooperation with the ELES (Slovenia) control area as well as a cross-control-area procurement of primary power control. An inclusion in the International Grid Control Cooperation (IGCC—transmission grid operators from Germany, Denmark, Netherlands, Switzerland, Czech Republic and Belgium) has also already been implemented. Beyond that, in the future a cross-control-area activation of secondary power control and tertiary power control with Germany will be implemented. Furthermore, in future, there will be a cross-control zone activation of secondary and tertiary power control with Germany.

Increased availability of the network regulator

PSI is providing a network regulator on the basis of its PSIcontrol energy



The APG control centre at night.

control system for the implementation of this project. This system will allow APG to flexibly reproduce the legal and market-related conditions of the secondary and tertiary control as well as an increased availability of the network regulator.

Along with an advanced power frequency regulator, the project includes

a training system, a test system as well as flexible interfaces for the connection of additional IT systems for a secure data exchange and an integrated HMI functionality for the presentation of various systems on a uniform display.

Naturally, the network regulator system will fully meet the BDEW white

paper requirements in connection with the increasingly important IT security topics. ☉

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New orders from major distribution system operators

Renewal of network control systems

PSI AG has received a number of contracts from important distribution network operators for the renewal of network control systems on the basis of the third generation of the PSIcontrol system. The Pfalzwerke Netz AG, the Energienetz Mitte GmbH and the Syna GmbH have each awarded comprehensive upgrading contracts.

Along with the modernisation of the existing PSI systems, expanded functions—in particular in the field of IT security, network calculation, new procedures for handling renewable energies and a further improvement of the user interface—represent major advantages and increase the efficiency of network management. Especially important aspects are the management of renewable energies as well as the fulfilment of increased IT security requirements, whereby the requirements established by the BDEW for IT security have been completely implemented.

Special requirements for distribution system operators

Company-specific features will also be taken into account.



For Pfalzwerke these are various additional data imports and exports as

well as adjustments to transmission interfaces and functional support for specific work processes.



At EnergieNetz Mitte, a workforce management system will be integrated to support the acceptance of calls reporting disruptions.



At Syna, extensive functions for in-feed management will be implemented in the area of network security management.

PSIcontrol in the third generation

The third generation of PSIcontrol is being used at all three distribution network operators, each of which operates two control centres with a total of up to 24 working places.

The orders for further development and renewal of all network control systems of the regional supply companies of E.ON Deutschland as a convoy project is also a special feature (see the separate article).

Stadtwerke Münster renews its network control technology

The municipal utility company division of PSI has also received an



order for the renewal of the existing network control technology of Stadtwerke Münster. This municipal utility company operates the power and pipeline networks (gas, water) in the city and the surrounding area. With the renewal of the technology, Stadtwerke Münster aims to meet the new requirements resulting from the energy revolution. ☉

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PSI renews network control systems of the regional supply companies of E.ON Deutschland

Standardisation and further development of the network control systems

The PSI AG Electrical Energy division has received an order from E.ON Deutschland for further development and renewal of all network control systems in their regional supply companies.

The background to this is the reorganisation of the responsibilities of the E.ON network operators in Germany: the former E.ON Netz GmbH, with its 110 kV network, has been demerged. This gave Bayernwerk and Hansewerk 110 kV networks in addition to their existing distribution networks. Avacon, which already had a high-voltage network in Saxony-Anhalt, received 110 kV network areas in Lower Saxony, North Rhine Westphalia and Hesse. E.DIS was already operating a 110 kV network. These four companies are now responsible for managing the entire distribution network in the 110 kV/20 kV range of E.ON Deutschland. Combining the voltage levels will provide even more effective support for the energy revolution in the future and maintain the security of supply at a high level despite fluctuating in-feed volumes.



Network control centre of Avacon AG in Salzgitter.

Efficient network management

The standardisation and further development of the network control systems are an essential prerequisite here. The aim is to make the network management more efficient. Aspects that are particularly important here are the management of renewable energies, improving network calculations, support for company-wide relevant processes in combination with further E.ON IT systems, as well as compliance with increased safety requirements. In the Avacon and Hansewerk projects, higher gas functions of the PSI Gas and Oil division will also be integrated.

Synergies in system support

The previous network control technology from PSI and, to some extent, from other manufacturers, will be replaced by fully standardised, modernised systems based on PSIcontrol, Version 4.3. The extended functionality

and improved user interface will enable synergy effects to be achieved for the investment and for subsequent system support.

All companies will receive two or three connected control centres with approximately 12–20

work stations per system. However, it will be possible to manage the entire network of the respective regional company from any site at any time.



“E.ON map”: management of the entire network of the respective E.ON regional company from any site.

The specific assignment is achieved via defined areas of responsibility. The existing process coupling based on PSI information nodes can be largely reused.

In all new projects, the requirements formulated by the German Association of Energy and Water Industries (BDEW) for safety technology will be implemented. Comprehensive system maintenance contracts will safeguard the investment over the long term. ○

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Twelve network operators in Jutland manage their energy networks with PSIcontrol

Joint network control system goes into trial operation

After a realisation phase of nearly two years, at the end of August 2015, the PSIcontrol joint network control system for Net-Sam SCADA A/S, Aarhus in Denmark with the redundant central system and the first SYD ENERGI Net A/S region went into trial operation. In the future, twelve network operators in Jutland will use this system to manage their energy networks. It replaces the former ABB single control systems that the operators used.

This project follows the “single point of data” concept consistently. To do this, the data for the medium-voltage network, including the network calculation, and the data for the low voltage is imported via a newly created CIM profile. Several new functions were also implemented for the first time.

central servers are set up with state-of-the-art virtualised technology. Operation within the company at the various different sites is via remote work stations. The total of around 3000 remote control terminals (remote telecontrol unit, RTU) in the maximum configuration with all twelve distribution system operators (DSO) are con-

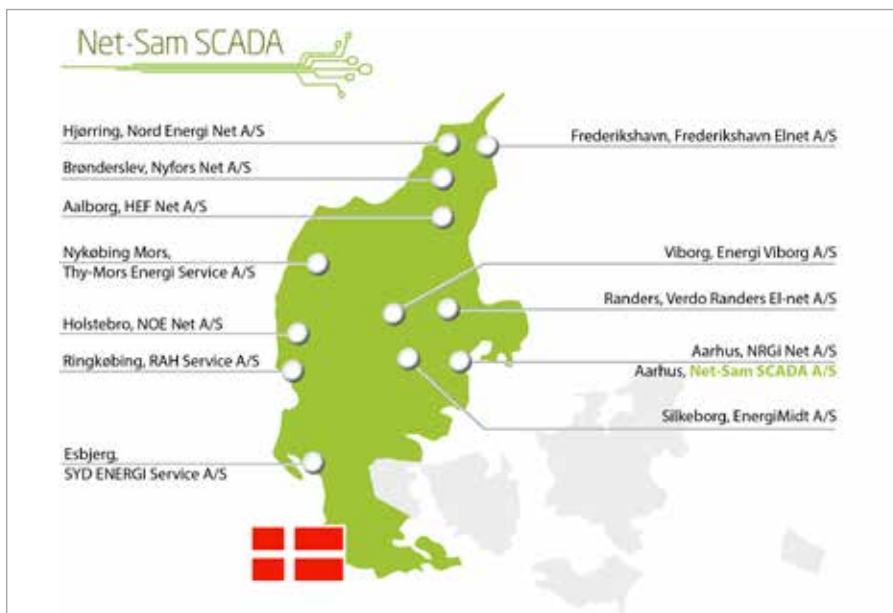
pany has access only to its own network data. The central servers are owned by Net-Sam SCADA A/S and are used jointly by 12 regional Danish distribution system operators.

With this technology, the companies' objective is to make their network management efficient and to profit from the economic advantages of further joint developments. In principle, however, business-specific features are also taken into account. The current requirements with regard to IT security are also implemented in this new project.

Operation of the central computer systems by PSI

There is a new special feature with regard to system operation: PSI is responsible for operating the central computer systems. Relevant information from the system monitoring is recorded using Nagios servers and automatically transmitted to PSI customer service. The investment of the companies connected is secured by long-term maintenance contracts.

With the forthcoming start of operation of this system, PSI can meet the prerequisites for using similar distributed systems for other groups of companies and expand the existing offer. ☉



Joint network control system for twelve energy companies in Jutland.

One central, locally redundant control system

The network operators involved are connected to a central, locally redundant control system as a client. The

nected via WAN with routed telecontrol protocols.

In addition to the medium-voltage networks, low-voltage networks are also managed. Each connected com-

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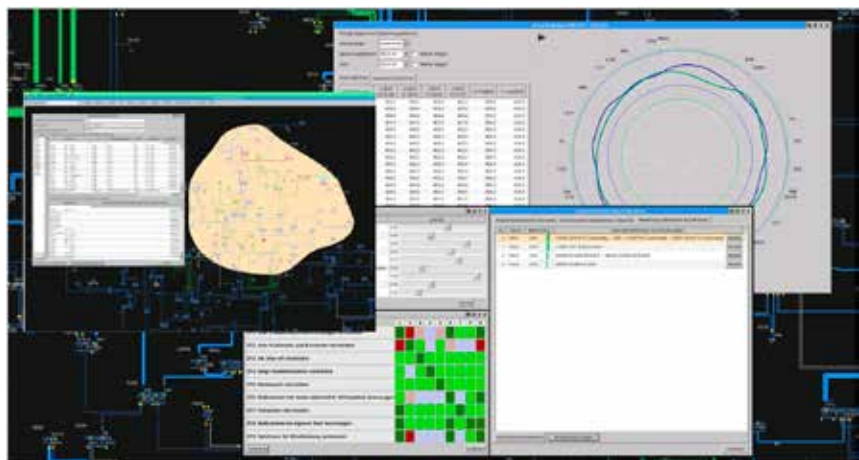
SASO goes live at the transmission system operator TenneT

Network status assessment using Security Assessment and System Optimization

After successful acceptance in July 2015, the SASO system (Security Assessment and System Optimization) at the transmission system operator TenneT went live with the voltage reactive power management function (SBM).

the network status and, if there are any issues with the voltage, uses the voltage reactive power management module (SBM) to determine recom-

As network management is becoming increasingly complex, the transmission system operator TenneT has developed the SASO system together with PSI. This system is intended to help the network operator to detect and rectify critical power statuses more quickly (Energy manager reported on this in issue 1/2015).



Network status visualisation in SASO.



Increasing complexity in network management.

Increasing demands placed on network management

The growing integration of renewable energies and the increasing cross-regional exchange of energy in the European electricity market mean that the transmission networks are being used to a much higher capacity. The demands on network management are therefore increasing, including in terms of voltage stability. This is especially true if, due to closures, insufficient power plant capacity is available to compensate for local reactive power deficits.

Evaluation of the network status

Based on current information, which is transferred from the TenneT network control system every five minutes, the SASO system evaluates

recommendations for correcting the critical status.

In principle, various solution variants can be permitted. Based on complementary advanced fuzzy logic, the PSI decision support tool Qualicision® determines which decision alternatives should be selected to achieve the process goals as accurately as possible.

The next steps are the expansion of the SASO analysis horizon to up to two days in the future and a corresponding adjustment of the visualisation possibilities. 🔄

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ENTSO-E certifies PSIcontrol CGMES conformity

New standard for data exchange between European transmission system operators

ENTSO-E, the European Network of Transmission System Operators for Electricity, has specified a new standard for the exchange of network data for assessing the network situation in the European network.

The Common Grid Model Exchange Standard (CGMES) is based on the IEC Common Information Model (CIM) and was specially designed for the requirements of data exchange between transmission system operators. In particular, these include applications for network security analysis (load flow and failure simulation calculations). At present, the data exchange is still based on the UCTE-DEF format. The goal of ENTSO-E is to replace this format with the more powerful CGMES in the coming years.

Process for conformity assessment

To guarantee the compatibility and interoperability of the applications which exchange network data with one another, and to ensure that all

software providers implement the CGMES standard correctly, ENTSO-E has developed a process for evaluating the conformity and offers to



ENTSO-E certifies PSIcontrol CGMES conformity

perform this evaluation for the corresponding applications.

Data exchange between transmission system operators

PSIcontrol already supports the exchange of data between transmission system operators in the CGMES format by means of the export of the necessary data records for the current network status (snapshot) as well as for the bottleneck forecast processes IDCF (intraday congestion forecast), DACF (day-ahead congestion forecast) and D2CF (day 2 congestion forecast). ENTSO-E checked this functionality as part of a conformity assessment and evaluated it as CGMES-compliant. The implementation of the import process for CGMES is currently in progress. ☺

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Intelligent power network controls and monitors local supply

Smart operator goes live in Wincheringen

Since 2014, the RWE model project “Smart Operator” for controlling and monitoring the low-voltage network has been running in Wincheringen an der Mosel.

In this project, the “smart operator” coordinates the balance of supply and consumption: installed in the transformer station of

the local network, it evaluates converging consumption values of households and with this information, controls the controllable local network trans-



The Smart operator controls and monitors.



Ceremonial commissioning of the smart operator in Wincheringen.

an intelligent power network will now be gathered. The smart operator has already been successfully commissioned in Wertachau and Kisselbach in July and September 2014 respectively.

Smart operator was jointly developed by RWE and PSI and is based on a control model developed in collaboration with the Rhineland Westphalia Technical University of Aachen (RWTH).

The line for the smart operator overall project is owned by RWE Deutschland. ☉

formers and network switching points. In April 2015, the model project was ceremonially commissioned. The

launch of the intelligent network in Wincheringen means that lots of practical experience in operation of

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FLAixEnergy research project—integration of industrial consumers in an energy platform

Marketing industrial energy flexibility

PSI has been awarded the contract for a research project for the optimised inclusion of “smart industrial customers” in an energy platform for the marketing of energy flexibilities. The research project will be implemented as a prototype in the Aachen region and is being sponsored by the Federal Ministry for Economic Affairs and Energy. The project was commenced on 1 August 2015 and run for three years.

The core element of the platform is a mechanism that assesses the flexibility of the smart industrial customer and therefore allows them to participate on the energy spot market and the balancing energy market. In general, this will establish a preference for local balancing in the distribution network over cross-regional balancing in transmission networks. Along with partners from the scientific and industrial



communities, PSI is participating in the research project with its subsidiaries PSI Energy Markets, PSI Metals und PSIPENTA.

Flexibility of industrial consumers

PSI Energy Markets is heading the sub-project Smart Services, which

will pursue the design and expansion of portfolio management for the compensation, marketing and optimisation of the flexibility of industrial customers, energy generation and storage. The PSIPENTA sub-project is aimed at the development of methods and procedures for the prognosis of consumption, planning and control for smart industrial customers in discreet production. In their sub-project, PSI Metals and PSIPENTA will jointly develop energy-flexible planning and controlling processes. Furthermore, a process for the determination of an energy fingerprint will be designed that describes the consumption prognosis and flexibilities of the industrial customers.

Increasing the efficiency of energy use

As one of few providers, PSI has in-depth knowledge in both the energy sector as well as the production and metals industry and sophisticated algorithms and processes for increasing the efficiency of the use of en-

ergy. With the FIAixEnergy research project, PSI is further expanding its strong position in industrial energy management and in the field of virtual power plants.

Beyond that, the research project is making a contribution to an economical and environmentally tolerant en-

ergy supply while simultaneously increasing the security of supply. ☉

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PSI Receives Order from Energy Service Provider badenova

Portfolio management system for energy trading on the basis of PSImarket

badenova AG & Co.KG, headquartered in Freiburg, has contracted the PSI subsidiary PSI Energy Markets GmbH with establishing a portfolio management system on the basis of PSImarket. The primary objective is the transformation of the existing badenova business logic to an audit-secure, integrated and configurable basis.

In the implementation project the current data will be transferred to the PSImarket sys-

tem. Here, suitable portfolio structures will be set up and comprehensive reporting evaluations

Project course

The implementation project has been broken down into a number of phases. Following the design phase, there will be the set-up and customizing of a test system with the integration of the badenova-specific adaptations. Following that, the productive system will be established and operated after the users have been trained in a parallel system. The migration to PSImarket is to be completed by the end of 2015. Subsequent expansion projects are already in the planning phase.

As the environmental and energy service provider in south and mid Baden, badenova Group covers the sectors of sales of electricity and natural gas, network operations, water and heat. Along with the classical supply services, badenova also provides innovative and ecological services involving energy, climate and environment through various subsidiaries and participations. ☉



badenova Headquarter in Freiburg.

tem. A specific reproduction of the contracts with the configuration of the automated processes for contract management will be con-

generated. Implementations of risk assessment and interfaces for the preparation of invoicing complete the functionalities.

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PSI presents network control solutions at the European Utility Week

Safe network management during the energy revolution

The PSI Electrical Energy Division will be presenting its latest network control solutions at the European Utility Week 2015 (Hall A, Stand E36) in Vienna from 3 to 5 November 2015.

The focus will be on the safety requirements on network management within

the framework of a successful implementation of the energy transition.

Presentations will include extensive functions for power and network management, network safety and stability as well as innovative network calculations. Solutions will also be shown for the issues of reactive power management, IT security, load management, decentralised generation and network calculations in the area of low voltage.



Improved integration of renewable energy generation in networks.

Virtual power plants also play a major role in improving the integration of renewable energy generation in net-

European Utility Week

Connecting the smart community

works and the energy market. Based on a central portfolio management system, PSI will be presenting a comprehensive turnkey solution for virtual power plants. The PSI Smart Telecontrol Unit (STU) is used for decentralised process connection and automation. ☉

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From 16 to 18 February 2016, at E-World in Essen PSI will be presenting its comprehensive solution portfolio for the energy sector.


We look forward to seeing you at our stand, 326 in Hall 3.

PSI presented new solutions at CIRED 2015

New user interface and application functions

From 16 to 18 June 2015, the PSI Electrical Energy division successfully presented current further developments of release Base 4.3 of the PSIcontrol control system at CIRED in Lyon, France. The new developments include both the user interface and the application functions.

As part of these developments, the human machine interface and the screen concept have been extensively revised. A new feature is the integration of functions of the infeed management controller in the basic version of PSIcontrol.

PSI also presented switching order management functions and network calculation functions, as well as the hierarchical network management. Furthermore, PSI demonstrated the technical control solutions already being used successfully by customers. 



The PSI exhibition stand at CIRED 2015.

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EVENTS

www.psi.de/en/events



26/10–28/10/2015 GAT 2015
Essen, Germany

03/11–05/11/2015 European Utility Week 2015 RAI Convention Centre
Vienna, Austria Hall A, stand E36

16/02–18/02/2016 E-world 2016
Essen, Germany

Company news

+++ ThyssenKrupp Steel Europe and PSI close strategic partnership—PSI*metals* as standard software for the whole Steel Europe business area +++ Stute Logistics relies on multi-site solution—PSI*ums* controls new logistics centre in Nuremberg +++ PSIPENTA receives major order from special service provider SD Automotive +++ Indian steel producer Tata Steel chooses PSI*metals* for detailed planning in the new steel plant in Kalinganagar +++

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