

# energy manager

Newspaper for energy suppliers

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Solar park Leibertingen

Fotographer: EnBW/Uli Deck, Karlsruhe

## Photovoltaic electricity marketing

### PSI and EnBW TNG cooperate for optimised marketing system

The unexpectedly high increase of photovoltaic installation in the last several years presents transmission and distribution network operators with new challenges. The control zone of EnBW is at the cutting edge of this development since the ratio of PV installations to service area is the highest in Germany. EnBW Transportnetze (TNG) and EnBW Regional AG (REG) have developed a forecast system for integration and optimised trading of photovoltaic electricity. PSI<sup>passage</sup> is part of this system and provides data collection and verification as well as graphic display of results and trade recommendations.

In compliance with German Renewable Energy Act, the generated photovoltaic electricity is fed into the distribution network, and from there into the transmission network. The operator of the

transmission network is responsible for selling the generated photovoltaic electricity. For this purpose, the TNG is trading at the electricity exchange.

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## News ticker

+++ Cleaning Specialist Kärcher Banks on PSI – Warehouse management software PSIums will control logistics processes in the expanded logistics center+++ PSI Receives New Orders from the Vallourec Group – PSImetals for the Youngstown finishing mill and the new forge at Changzhou  
 +++ PSI to Deliver New Network Control System for the City of Muscat - Muscat Electricity Distribution Company, SAOC, decides in favour of PSIcontrol+++ PSI Awarded Additional Traction Power Contract from the Netherlands – New, central PSIcontrol control system replaces four existing control stations+++ PSI wins follow-up order from Müller-Technik – PSI material flow controller for logistics centre of plastic injection-moulded components expert+++ PSIPENTA manages maintenance processes for Airbus 340 at SR Technics – MRO service provider goes online with Planning, Execution and Control (PEC)+++ PSI Receives Order from 50Hertz Transmission – Grid calculations for the operation of the 380/220 kilovolt transmission network+++ PSI receives logistics order from Würth Elektronik eiSos – Warehouse Management System PSIums to optimises processes+++ PSI Supplies New Energy Trading System for N-ERGIE – Standardisation of processes for all relevant goods such as electricity and gas+++

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## Editorial



Dear readers,

While the laws adopted by the Federal Government in the second quarter to speed up the move towards alternative sources of energy and other forthcoming laws open the way for substantial investments, the regulator is slowing down investments in the grid by limiting grid revenues.

As the share of renewable energies grows, so too does the importance of optimising the mix of renewable and

conventional energies, large-scale balancing via grids as well as stores and taxable consumption. More and more areas within the grid are experiencing a power reflux. The original centralised control structure must also adapt accordingly, initially by enabling grid endpoints to be observed, controlled and ultimately optimised. PSI has therefore developed innovative technologies that primarily take into account real-life operating costs and restrictions.

It is still unclear in many respects as to how the energy policy objectives are to be achieved. Regulators, market players and technology providers are embarking on a joint learning curve, setting an example the world over. This presents great opportunities and great risks for us all. This is why we aim to continue cooperating closely on a professional level with you, our customers, and on shaping the future together.

Enjoy reading the latest issue of the energy manager.

Armin Stein  
 CEO, PSI AG

Dr. Harald Schrimpf  
 CEO, PSI AG

## Events

25.10.-26.10.2011	<b>GAT 2011</b> www.gat-dvgw.de	<b>Hamburg</b> Germany
23.11.-24.11.2011	<b>EMART Energy 2011</b> www.emart-energy.com	<b>Lyon</b> France
29.11.-02.12.2010	<b>Elektroseti</b> www.expoelectroseti.ru	<b>Moskow</b> Russia
04.12.-08.12.2011	<b>WPC 2011</b> www.20wpc.com	<b>Doha</b> Qatar
07.02.-09.02.2012	<b>E-world 2012</b> www.e-world-2012.com	<b>Essen</b> German
12.06.-14.06.2012	<b>Powertage 2012</b> www.powertage.ch	<b>Zurich</b> Switzerland
27.08.-31.08.2012	<b>cigré</b> www.cigre.org	<b>Paris</b> France

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In the past, the photovoltaic electricity available for trading was predicted using standard in feed profiles. The photovoltaic in feed profile for the entire following month was computed based on historic weather information. Current weather data was not included in the calculation. For excessively sunny or cloudy days, this procedure resulted in significant discrepancies between traded and actually generated energy. These discrepancies had to be compensated with expensive control energy.

In order to better forecast the photovoltaic energy available for trading, TNG and REG have developed a forecast system based on realtime readings of infeed profiles of representative photovoltaic installations.

The PSI*passageII-T* system is a key component of the system. The system has been used by TNG for schedule, control energy and congestion management as well as wind energy trading. Every 15

minutes, PSI*passageII-T* imports the representative realtime infeed values which have been extrapolated for the entire associated areas. In addition, updated weather information from multiple providers is received at frequent intervals.

Using these data and special calculation software developed by TNG, an optimised forecast of the available photovoltaic energy in the control zone is generated. The comparison of the forecast infeed and the already executed day-ahead trading of renewable energy enable optimised corrective intraday spot trading. For the control centre, PSI*passageII-T* provides monitors with respective trading recommendations.

Since the introduction of the system, the control energy purchases have already been significantly reduced. The German Federal Network Agency recommends this procedure for implementation throughout Germany. ☉



PSI supports optimised photovoltaic marketing system

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## New Network Control System for the City of Muscat Muscat Electricity Distribution Company decides in favour of PSI*control*

PSI Incontrol Malaysia, a member of the PSI group of companies has, for the first time, been awarded a contract by Muscat Electricity Distribution Company SAOC (MEDC) through a local consortium partner in Oman. PSI will deliver a centralised Network Control SCADA system including remote telemetry automation as well as transmission and distribution communication for the entire 33/11 kV medium voltage grid in the Sultanate of Oman capital city of Muscat.

The PSI*control* SCADA system will be the basis for establishment of a main control centre and a back-up control centre together with remote telemetry automation and telecommunication systems in over 157 electrical substations. The total implementation time of the project is 36 months.

During the first phase of the project PSI will connect the entire existing 33/11 kV network substations of MEDC to PSI*control*. The network control system would be upgraded with additional DMS functionalities and remote telemetry automation for 11 kV substations in the next phase.

MEDC is the sole entity responsible for distribution of electricity in the Governorate of Muscat. MEDC is entitled to own, maintain and develop the distribution networks in the Governorate of Muscat. MEDC's main function is to build and maintain the necessary infrastructure for the distribution of electricity in the governorate of Muscat. ☉

#### Information

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## Smart Telecontrol Unit

## Intelligent Control Component for Secure Smart Grids

At CIRED 2011 in Frankfurt, PSI Nentec presented for the first time the Smart Telecontrol Unit, a communication solution for low voltage networks. This innovative control component is especially designed for smart grids. In addition to secure process interfacing, it is also suited for substation automation and smart metering applications.

The Smart Telecontrol Unit (STU) has been developed to enable intelligent power grids, the so-called smart grids. Smart grids require bidirectional communication between control centre,



Secure Smart Grids

control components, and supplier and consumer locations. These requirements are fully supported by the STU. The STU's compact and modular design in a

DIN rail enclosure ensures maximum flexibility for multiple applications.

#### Secure Process Interfacing

For conventional process interfacing, the STU offers the proven functionality from the well-known Telecontrol Gateway product family. The versatile communication interfaces of the STU provide high availability and scalability using any transmission medium. System and data security is ensured by a comprehensive security concept based on international standards (NERC CIP). The STU security concept supports secure start-up with central user authentication. All communication with the control center is encrypted via VPN tunnels. Unused services and interfaces can be deactivated. The integrated firewall provides additional protection.

#### Substation Automation

Traditionally, controlling high and medium voltage networks has been the main application. For smart grids, low voltage applications and processes require sophisticated and decentralized control capabilities. In this environment, the Smart Telecontrol Unit operates as an RTU with integrated PLC functionality based on IEC 61131. Sensors and actuators are controlled via field bus protocols, for example CANopen for I/O modules and Modbus for counters. Using these features, the STU can execute automation functions such as volt-



Intelligent Control Component

age regulation, load control, and control of distributed generation plants.

#### Smart Metering Applications

As a data concentrator, the STU provides smart meter network information to the control system. For this purpose, the STU operates as WAN communication gateway. Counter data is transmitted via the SML protocol. Metered values from distribution substations can be transmitted via IEC 60870-5-104 protocol to the control system.

#### Flexible Solution

The Smart Telecontrol Unit supports all of the above applications in a single device. It is optimized for the new communication requirements and supports upload of new intelligent algorithms in the field. This makes the Smart Telecontrol Unit an investment for the future.

You are welcome to request a test installation for your system. ☺

#### Information

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## New Project in Thailand

# Control System for the Electricity Distribution Network of Bangkok

The Metropolitan Electricity Authority (MEA) of Thailand has awarded PSI Incontrol Sdn Bhd, a PSI AG Group Company, a new project to supply and implement a Supervisory Control and Data Acquisition (SCADA) and Distribution Management System (DMS) for the Electricity Distribution Network of Bangkok. PSI Incontrol participated in the Tender in a Consortium with its group companies and a local Thailand company.

The contract is a part of MEA's plan for an integrated state of the art SCADA/DMS System covering its entire area of operation.

The current scope of the contract is to deliver two redundant SCADA/DMS Control Systems at Chidlom and Jangawattana, two Distribution System Control Centres at each of these locations, and DCC Workstations at four of the

18 District Offices. The project execution will be carried out jointly by PSI Incontrol's engineers in Malaysia and Thailand.

The contractual completion period is 26 Months.

The commissioning of the system supplied will enable MEA to plan, monitor and control the Distribution Network in the whole of Bangkok.

PSI Incontrol is well-known for its astounding track record in supplying large SCADA systems in this region. The award of this project clearly underlines PSI Incontrol's capability into delivering exquisite engineering solutions.

The Metropolitan Electricity Authority, or MEA, was established in 1958. It supplies the electrical power to its consumers in Bangkok, Samutprakarn and Nontaburi, covering 3,192 square kilometres. ☉

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## Web portal for gas dispatching

# PSIportal for accessing data on the Web

On behalf of an international client, PSI designed a Web-based solution for accessing dynamic gas dispatching data. The application *PSIportal* enables the visualisation of data from various sources in a Web portal.

Interfaces are available for transferring measurement data from the retrieval sys-



tem *PSIfetch*, data from the gas control system *PSIcontrol V7*, data from the

*PSItransport* family of management solutions for transporting, trading and storing gas, and data from *PSImetering* for technical volume determination and accounting.

*PSIportal* can also be used and parameterised to display data from other networks, such as electricity, water or district heating. Real-time, e.g. hourly, data is displayed in the *PSIportal*, which can be visualised in the form of tables and graphs and analysed using a report function. The data model for master and dynamic data keeps an audit-proof data log. This log enables previous data records to



be recovered. *PSIportal* is multilingual and has extensive user and role administration. The solution can be integrated in existing Web portals or used independently. ☉

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Order from 50Hertz Transmission

## NGrid calculations for the operation of the 380/220 kilovolt transmission networks

PSI AG has been contracted by the 50Hertz Transmission GmbH with the delivery of grid calculation functions for the 380/220 kilovolt transmission network in northern and eastern Germany. On the basis of the PSIcontrol control system, PSI will provide functions for the support of the network operations with the dramatically increasing decentralised input of renewable energies. These functions will initially be coupled through interfaces with the control system which 50Hertz has used to date.

50Hertz Transmission is responsible for the operation, maintenance, planning, and expansion of the 380/220 kilovolt transmission grid throughout the northern and eastern part of Germany. The

grid covers an area of 109,000 km<sup>2</sup> and is about 9,750 km long. It secures the network integration of approximately half of all the wind-generated power in Germany.

## New Energy Trading System for N-ERGIE

### Standardisation of processes for all relevant goods such as electricity and gas

PSI subsidiary Energy Markets GmbH has successfully implemented a new portfolio management system for energy trading at the energy supplier N-ERGIE. This replaces the previously existing individual solutions with a centralised system. With the new system landscape a standardisation of the processes will be provided for all the relevant goods such as electricity and gas by means of introducing an audit-compliant trading and optimisation system.

As early as the evaluation phase for the tendering process, it became apparent that with the energy trading system PSImarket and the planning and optimisation functionality, PSI had the optimal solution for N-ERGIE. Following an intensive and detailed concept phase in which the implementation of processes in the systems and relevant interfaces were specified, the data migration and a subsequent parallel operation with the old system could be initiated after only a short period.

The introduction project for the system standards, including the implementation

of some system extensions was completed on time and is currently being concluded with the acceptance of the overall system in a configuration for the support of the energy trading including the contracting, portfolio and risk management modules as well as gas planning and optimisation.

Dieter Seitz, Head of Energy Business at N-ERGIE says, "With our new system solution from PSI, we are in the position to manage the procurement portfolios comprehensively and efficiently. Since then N-ERGIE has been able to reproduce all the processes in energy procure-

The grid calculation and optimisation functions used by 50Hertz in the future have been successfully employed by other larger operators of transmission grids for some time. With 50Hertz Transmission, PSI has won an important new customer and therefore further expanded its strong position in the German energy market. ☉

#### Information

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Customer Center Nuremberg, Photo: N-ERGIE

ment transparently and in compliance with audit requirements."

The N-ERGIE Aktiengesellschaft, headquartered in Nuremberg, is a nationwide energy supplier and one of the leading regional suppliers in Germany. ☉

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PSI Awarded Additional Traction Power Contract from the Netherlands

## New, central PSIcontrol control system replaces four existing control stations

The PSI AG has been contracted by the Dutch rail-infrastructure operator ProRail with the delivery of a centralised control system for the monitoring and controlling of the 1,500 volt direct current, overhead contact grid. The system is based on the PSIcontrol technology and will replace the current four control centres in Amsterdam, Zwolle, Eindhoven and Rotterdam with a main control station in Utrecht and a separately located emergency control centre. The planned project duration is two years.




ProRail

Photo: Ton Poortvliet

Along with extensive SCADA functionality (Supervisory Control and Data Acquisition) and a sophisticated switching administration, the central control station contains other rail-specific functions. Amongst these are rail-specific switching programs, tunnel monitoring and emergency planning. For the complex integration of the ProRail IT infra-

structure PSI is employing web-based portal functions. These guarantee intensive data exchange with the new control system on the basis of the current IT security guidelines.

PSI was once again in a position to win out over major international competitors. After Germany, Sweden and Switzerland, the Netherlands represents the

fourth country that is employing a major traction power control system from PSI. 

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## CIREN 2011

### PSI presented advanced functionalities to distribution network operators

The focus of the PSI presentations were the new functions of PSIcontrol which were implemented in response to the smart grid requirements for increasing distributed injection of renewable energy. The special highlight was a project which has already been implemented for 24/7 Netze GmbH: a virtual power plant for marketing of control energy.

International implementations of PSI control systems were represented by the Thai network operator PEA (Provincial Electricity Authority) and the French distribution network operator ErDF

which supplies Paris. Sophisticated functions for asymmetric network calculation, load shedding and planned outage management implemented in the PEA project were displayed. This project also

meets particularly high cyber security requirements by the customer.

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International presentation at the CIREN

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PSI displays as well as the booth itself with two rear projection walls (3 x 2m and 2 x 2m) were well received by the international expert customers.

In addition to PSI customers from Denmark and Thailand, we delighted to wel-

come Mr. Al Abri, General Manager of our customer in Oman, at our booth.

Next year, PSI will be represented at the CIGRE in Paris.

CIGRE is the international trade show for transmission network operators and the

companion trade show of CIRED which focuses on distribution networks. ☉

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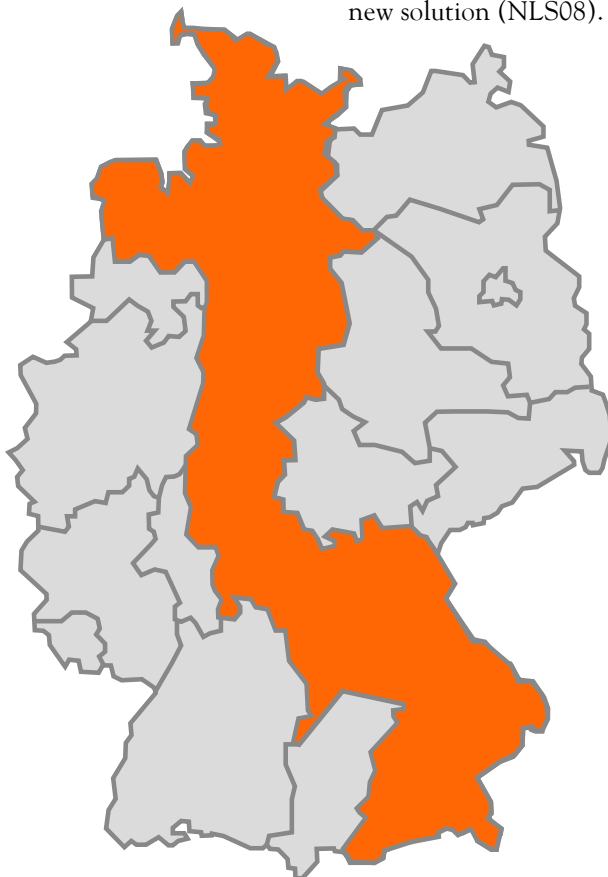
## PSIcontrol installation for TenneT

### Optimised network management and maintenance

New legal requirements and the changing operational environment present new challenges to transmission network operators. In addition, energy transmission in the existing networks must be safely optimised without the risk of outages. This requires implementation of sophisticated software for optimisation of all network management aspects. The network operator TenneT is a strategic pioneer in this area.

TenneT and PSI have jointly developed functions for optimized network management and monitoring which signifi-

cantly increase security of supply. They are implemented in the PSI control system PSIcontrol which is the core of the new solution (NLS08).



Supply area TenneT TSO GmbH

The following functions are described in detail below.

- Alarm management
- Joint network control
- Forecast calculation including analysis tools
- Day-Ahead-Congestion-Forecast and Intra-Day-Congestion-Forecast
- Congestion management
- OPF with voltage control
- Voltage distribution using KIVIAT diagrams of the network groups
- Dynamic network connection and dynamic network reduction
- Operational security (Policy 3)

Additional functions such as for load frequency control, forecasts, and optimization of overhead line monitoring have been implemented but are not described in this article.

#### Alarm management monitor

The alarm management monitors the load and frequency stability of the entire UCTE (Union for the Coordination of Transmission of Electricity) network.

#### Joint network control

The joint network control by the four transmission network operators in Germany optimizes the generation of secondary control power. International ex-

pansions of the cooperation are currently being planned.

### Forecast calculation including analysis tools

Forecast calculation determines network congestions ahead of time. The data used for the forecast includes load and injections throughout Europe, weather and

relationship to the current forecast while avoiding congestions.

### Congestion management

If congestion occurs in spite of the implemented tools, NLS08 determines possible corrections for resolving the congestions in the simulation mode of *PSIcontrol* and submits those to the network manager.

provides the operator with an efficient monitoring tool for the voltage levels. Limit violations by network calculation functions generate alarms in the system.

### Dynamic network connection and dynamic network reduction

*PSIcontrol* is the only control system on the market which offers hourly import



Control room in Dachau

Photo: TenneT TSO GmbH

load forecasts as well as planned transfer across the network borders, and planned outages in the own network. When new data becomes available, the forecast is automatically recalculated. This provides accurate estimation of the network state for the next 48 hours. The Day-Ahead-Congestion-Forecast (DACF) and 2-Day-Ahead-Congestion-Forecast (D-2CF) refers to the next day or the day after next, respectively. The Intra-Day-Congestion-Forecast (IDCF) provides the forecast for the remainder of the current day. The forecast result of the transmission network (topology, loads and injections) is displayed on the DAFC monitor. The Network Transfer Capacity (NTC) calculation determines the maximum possible energy transfer increase between two adjacent regions in

The submissions include predefined steps, OPF results, and topological operations as well as change of power plant injections in the own network area.

### Optimal Power Flow (OPF) with voltage control

OPF uses voltage control for minimization of transmission losses. In *PSIcontrol*, each network group can be set up with its own specific parameters. The backup strategy implemented in NLS08 supports operation of voltage control without OPF, too. This increases the availability of functions under all circumstances.

### Voltage distribution using KIVIAT diagrams of the network groups

The voltages in the network groups are visualized using KIVIAT diagrams. This

of DACF data sets of external networks via dynamic online connection. In addition, each external network area can be dynamically reduced (network group reduction) in case of data transmission errors from the respective external network. This increases the stability of the network security calculation which depends on measured values. Otherwise, if data for a part of the external network is unavailable, the estimation and load flow calculation for the entire network no longer converges.

The dynamic network group reduction implemented in *PSIcontrol* provides the operator with network security calculation regardless of the operational circumstances. In addition, the function is used for locating errors.

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**Operational security**


In current operating environments, operational security becomes increasingly important. NLS08 implements the requirements of the Operational Security Policy 3 by dynamic generation of external networks from the DACF data sets without static data engineering methods. This reduces the operational risks for the customer. The DACF data sets are updated by online connections. If online updates are temporarily unavailable, the already available DACF data sets are

used as fallback for operation without the latest updates.

TenneT TSO GmbH is located in Bayreuth, Germany with about 750 employees.

TenneT operates, maintains and expands the 220 kV and 380 kV transmission network in large parts of Germany.

This includes 10,700 km ultra high voltage lines for efficient long-distance transmission between the Danish border and the Alps.

With 140,000 km<sup>2</sup>, the service area covers 40% of the Germany surface area. TenneT TSO GmbH is a subsidiary of the Dutch grid operator TenneT B.V. 

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**New orders increase****PSI on the move to the energy change**

**PSI Group increased its EBIT by 4 % to 3.8 million Euros in the first six months of 2011. The EBT increased compared to the same period for the previous year by 5 % to 3.0 million Euros, at 1.9 million Euros the group net earnings after interest and taxes were, as a result of deferred taxes, below the value for the previous year. Group sales were about constant at 76.2 million Euros. The volume of new orders increased over the same period for the previous year by 4 % to 97 million Euros.**

Energy Management (electricity, gas, oil, heat, water) achieved 4 % higher sales of 31.7 million Euros. The EBIT decreased as a result of high project costs and investments in systems for electrical distribution grids in Germany and particularly in exports to 2.6 million Euros. PSI is preparing itself for the expected greater demand in Germany resulting from the change its energy policy. The gas and oil business and the business with systems for rail electricity and electrical transmission networks continue to develop very well.


Sales in Production Management (raw materials, industry, logistics) were, at 35.8 million Euros, 9 % above the value for the previous year. The EBIT increased to 1.7 million Euros. PSI expects further increases in sales and profitability

in this segment as a result of follow-up contracts for the raw materials extraction control system.

In Infrastructure Management (transportation and security) sales decreased by 37 % to 8.7 million Euros as a result of the sale of the telecommunications business at the end of the year and a new procurement behaviour in Europe resulting from new prerequisites for subsidies. As in the previous year the segment had an EBIT of 0.5 million Euros. In this segment PSI was awarded major contracts in South-east Asia in the first six months of this year, which will lead to increases in sales and EBIT in the second half of the year. The number of employees in the Group increased as of 30 June 2011 to 1,441, the order book volume in the Group increased significantly compared to the

previous year to 125 million Euros. The cash flow from operating activities also improved significantly to 1.8 million Euros, so that the liquid funds rose to 26.1 million Euros.

In the first six months, PSI continued to invest in products for the upcoming technical revolution in the medium and low-voltage grids of distribution grid operators. It is expected that customers will be making significant increases in investments in smart grid control in the coming years.

As a consequence of the high volume of new orders in the fourth quarter of 2010 and the first quarter of 2011, PSI expects to have a strong second six months in 2011. On the basis of higher license earnings and an expansion of business in Eastern Europe, the management expects to achieve the year's goal of an EBIT of 13 million Euros. 

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gat 2011

## PSI presents new system features for gas suppliers

PSI will be presented new solutions for gas suppliers at this year's gas industry conference (gat) from 25–26 October 2011 in Hamburg.

PSI subsidiary PSI Energy Markets GmbH demonstrated new system features for the technical revision and calibration of gas pipeline measurement systems (R-Win®) and the gas analysing and planning system for short, medium and long-term sales and acquisitions (GAPS) for gas suppliers.

GAPS 2.8 has been enhanced to reflect the changes in gas market requirements. Besides flexible purchasing, sales and purchases at trading points can now also be

optimised to include daily, monthly, quarterly, seasonal and annual time bands. The characteristic curves of stores are also taken into account. Another new feature is current account monitoring.

R-Win® NX 2.0 was completely ported to Visual Studio.NET 2008 and SQL Server 2008. New features include test equipment management, gas analysis and complete download.

A light version of the system is also available for service companies and

weights and measures offices, as well as a viewer version.

Besides network control technology (PSIcontrol V7), transport management (PSItransport), measurement data management (PSImetering) and storage management (PSItransstore) solutions, PSI's Oil and Gas division showed a variety of other solutions for higher control and management functions. Ⓞ

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## Integrated energy management systems

## PSI and GreenCom Networks conclude a partnership

PSI AG and GreenCom Networks GmbH have concluded a partnership for the development of integrated energy management systems. The primary goal is the linking of existing network control systems with information for the end-customer consumption, distributed generation and electrical vehicles.

The energy sector is currently undergoing major changes. The increasing portion of distributed generation, the future possibilities for improved control of the end consumption and the increasing importance of electrical vehicles require new solutions for controlling the energy system. Today's network control systems allow the monitoring and control of the energy systems in the high and medium voltage range. Distributed generation, intelligent consumption management (demand response) and the use of electro-vehicles is, however, also occurring at the low-voltage level. The partnership between PSI and GreenCom Networks will target this segment.

GreenCom Networks develops solutions for energy suppliers, which allow for demand response and the integration of distributed generation. The information and control possibilities available in the low-voltage range will be of essential importance for distributed network operators to optimally control their networks. This information can be directly processed by the network control systems of the future. PSI and GreenCom Networks will develop common interfaces for these tasks.

The partnership also includes the development of the interfaces to trading systems. This will allow to handle demand response products or the manage-

ment of distributed generators as so-called virtual power plants in the future. Sales companies will then be in a position to significantly increase the value of their customers and obtain additional income on the wholesale market. PSI will bring their expertise in the field of trading systems to the table while GreenCom Networks will contribute solutions for the recording and controlling of demand response and distributed generation products. Ⓞ

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