Virtual Power Plant Manager activated – grid and energy trading optimized. With ConnectedEnergy Solutions by Bosch Software Innovations.
The energy market is changing: Are you ready?

The metamorphosis of power distribution networks into smart grids is already well underway. This has prompted a surge of interest in software solutions for the smart management of distributed plants.

The shift from centralized to distributed generation
The energy market is changing. The traditional model of a small number of centralized power plants is giving way to the system of distributed generation, in which electricity is generated in many small facilities. Consumers are simultaneously acting as producers, transforming themselves into "prosumers" who feed the energy they produce into the medium- and low-voltage grid. This means that energy flows that were previously unidirectional are increasingly becoming bidirectional.

New challenges for the power grid
The feed-in of electricity into medium and low-voltage grids by distributed generators poses new challenges to distribution companies, particularly in light of the volatility of renewables-based power generation. Targeted interventions to stabilize the grid are required much more frequently than they were in the past, and it is becoming more and more complex for grid operators to manage loads, keep voltage stable across the system, guarantee security of supply, and avoid plant shut-downs. At the same time, new actors are entering the marketplace to exploit the opportunities offered by the direct marketing of renewable energy. Legally binding tariffs are falling and market prices are in a constant state of flux. This makes it more difficult to pursue a marketing strategy that offers long-term profitability. But what if there was an easy way to optimize your energy trading by profiting from rising energy prices? Or to store energy when energy prices fall so that you can sell it at higher prices later? Or to offer secondary and tertiary control reserve?

New market design calls for greater flexibility
Harness the flexibility of distributed facilities to exploit the opportunities of a re-designed market! With the Bosch Virtual Power Plant Manager software solution, you can connect up distributed energy facilities and combine flexibility options. Create a virtual power plant and you will be able to run your business cost-effectively by planning, controlling, and monitoring energy supply, energy consumption, and energy storage. As well as enabling you to manage network stability, this also paves the way to meeting the future performance requirements of a smart grid.
The Virtual Power Plant Manager: Double the optimization

A single solution for two application scenarios? Optimize your grid and your trading revenues at the same time!
The Virtual Power Plant Manager provides a single solution designed to optimize network stability and maximize your energy trading revenues. Whether you are looking to optimize the commercial or technical aspects of your business, the Virtual Power Plant Manager offers you a recommended course of action for each and every scenario based on the rules and conditions you have defined.

Grid or trading – you can go with both!

Overloaded with data on flexible options? You can still get things optimized in a matter of seconds!
The Virtual Power Plant Manager draws on a wealth of data to determine the flexibility of distributed generation plants. Using a specially designed Bosch algorithm, it reduces the calculated optimization conditions for each plant to two flexibility profiles. This keeps the data and calculations to a minimum and ensures they do not grow exponentially. That in turn allows you to optimize a very large number of facilities.

Keeping big data under control without overloading your servers.

So the smart grid needs more flexibility? Reap the rewards of the flexibility you can offer!
The Virtual Power Plant Manager works continuously to determine the ideal production quantities for your plants. It compares this against your storage capacities, your own needs, and any leeway you have for additional energy consumption. It offers recommendations on how much energy you should produce, store or consume with each plant at each point in time and which form of marketing is most likely to fulfill the objectives you have set.

Generate profits through flexibility – it’s easier than you think.

What’s the deal with the final mile? Unexpected sunshine is fine by us!
Do you have only limited control when it comes to monitoring and managing your grid voltage? The Virtual Power Plant Manager can put you back in the driving seat. It uses the grid voltage data from smart measuring systems such as the Meter Gateway Manager from Bosch Software Innovations. That enables you to analyze the status of your distribution network online and predict and optimize changes in load over time.

Acting is better than reacting – manage your distribution network proactively.

Grid costs constantly on the rise? Use software and meter data instead of cables!
Have you invested in smart metering systems? Then you can go beyond smart metering and use them to optimize your grid. How? By feeding your network voltage data into the Virtual Power Plant Manager. That will enable you to shift loads to the parts of your grid that have free capacity. And that means you can take a far more cost-efficient approach to planning the maintenance and expansion of your grid.

Optimize your grid – cut your maintenance and grid expansion costs.

Software as a Service? SaaS powered by Bosch.
You can also enjoy the benefits of our Virtual Power Plant Manager in the form of Software as a Service hosted by the Bosch computer center. So you can combine your facilities into virtual power plants without having to make major capital investments or make resources available for hardware, software, maintenance, and IT personnel. That gives you the freedom to offer new services in the energy market and seize market opportunities.

No need to invest in new systems – lower operating risks.

Benefits at a glance

▶ A single solution for optimizing grids and energy trading
▶ Integrates all kinds of distributed smart grid components including storage systems
▶ Reduces the volume of data to a minimum
▶ Optimizes existing flexibility
▶ Intelligent energy trading
▶ Proactive management of your distribution network
▶ Reduces grid expansion costs
The Virtual Power Plant Manager in action:  
Feedback from the Smart City Rheintal

“Smart City Rheintal” is a consortia of several forward-looking projects in the state of Vorarlberg in western Austria that share the goal of attaining CO₂-free energy autonomy by 2050.

Virtual Power Plant

In the Smart Grid sub-project, Bosch Software Innovations and its project partners are developing a Virtual Power Plant for the monitoring and management of distributed power generation and demand. Using load distribution, the region is aiming for coordinated energy balance as well as offering new energy services based on the existing infrastructure.

Currently Bosch Software Innovations is implementing three key projects for the Virtual Power Plant Smart City Rheintal:

1 | Monitoring power generation of PV systems and pools

A group of PV systems is aggregated to power generating pools. These pools form the base for an available local energy supply. Therefore the PV systems’ de facto capacities have to be measured and, in combination with weather forecast data, day-ahead forecasts for power generation are provided.

2 | Load management for charging infrastructure of electric vehicles

To integrate the charging infrastructure of electric vehicles into load management, eMobility services access the charging infrastructure (vehicle-to-grid) by using the OCPP protocol. Vehicle-related data, such as the latest SOC (state of charge) or reservation data, are being used to forecast energy consumption. Hence an optimized schedule for charging is calculated and used to access the charging infrastructure.

3 | Control & energy management of in-house consumers

Predicted consumption data is used for instance for managing electric water heater or heat pump demand. On the basis of defined threshold values, commands can be transmitted in order to manage local consumers. The energy management system makes decisions about switching devices on or off. Algorithms are being used to realize different shifting strategies, e.g. on the basis of pricing signals or via schedules.

Other ConnectedEnergy projects

Bosch Software Innovations is involved in a variety of other projects whose benefits spectrum ranges from trans-regional load balancing through Virtual Power Plants (VPP) over regional consumption optimization (micro-grid) to on-site consumption by producers themselves (nano-grid).

Dipl. Ing. Christian Eugster, project manager Smart City Rheintal:

“The central idea behind Smart City Rheintal is to link technological and societal innovations together and then implement them in a way that benefits people in the region. Bosch is our partner in setting up a Virtual Power Plant and is providing precisely the help we need to balance power consumption and generation, with electro mobility as a key element in the equation.”
The Virtual Power Plant Manager draws on various external data that are available via web-based interfaces, including weather forecast data and market prices. The forecast data for the plant portfolio are consolidated in terms of power generation and demand. Finally the plants in the portfolio are prioritized for activation in a merit order list based on their properties and contractual conditions.

**Trading optimization**

The flexibility profiles of the individual plants are aggregated and then optimized taking into account the predefined rules and framework conditions. Depending on the selected optimization strategy, various optimization stages are executed. For commercial optimization, the Virtual Power Plant Manager determines what quantities of power should be generated, sold or stored at which point in time, taking multiple different prices into consideration.

**Grid optimization**

If the focus is on optimizing network stability, the Virtual Power Plant Manager identifies the optimum strategy for the distribution grid, incorporating additional data on the grid voltage in order to harmonize power demand and power generation and keep voltage levels stable. This guarantees optimum load profiles on the distribution grid.

The two optimization approaches can either be used independently of each other or simultaneously, in which case one of the objectives is prioritized whenever conflicting aspects emerge.

The result is a new, updated, and aggregated target schedule which is further broken down for each individual plant.
Virtual Power Plant Manager:
Modular expandability

Virtual Power Plant Manager – the solution for virtual power plants

- Intelligent CLS control (Controllable Local Systems) of renewables-based plants
- Enhancement and optimization of grid stability
- Commercial optimization of energy trading

Making grid operation or energy trading more efficient

You can also add further optional components to the Virtual Power Plant Manager:

**Meter Gateway Manager**
- Smart Meter Gateway Administration (SMGWA) in accordance with BSI TR-03109
- Control of Controllable Local Systems (CLS)
- Rollout and operational support
- Extensive process automation
- E2E monitoring of all SMGWA processes

**Market Communication**
- Communication of metering and process data in line with market requirements
- Complete modeling of market processes such as switching processes in metering
- E2E process monitoring across diverse systems
Bosch: Your partner in the energy market

Intelligently connected – simplifying energy management
Use the Virtual Power Plant Manager’s potential to integrate all types of decentralized smart grid components, including energy storage systems, and optimize the grid and energy trading with a single solution.

With its extensive experience and flexible, modular solutions, you know you can rely on Bosch Software Innovations. Our software solutions are already being used successfully by more than 250 energy companies and are continuously being developed and enhanced. Bosch ConnectedEnergy solutions set new standards in smart energy management. Our solutions are designed to help you meet the constantly changing requirements of the energy industry. Our portfolio includes solutions for virtual power plants, market communication, smart meter gateway administration and rollout management. Our expertise in smart and innovative radio-based systems for the management of distributed energy resources rounds off our offer.

The Bosch IoT Suite – the technological foundation
Our ConnectedEnergy solutions are based on the technology of the Bosch IoT Suite. The flexible components of this modular IoT platform make it ideally suited for projects in the Internet of Things as well as commercial applications, which companies can implement using Business Process Management (BPM) and Business Rules Management (BRM). Using the Suite, businesses can efficiently develop innovative and forward-looking solutions for new business models.

The Bosch Group – a pioneer in the energy market
The Bosch Group is one of the world’s leading technology companies. Bosch has spent many years offering technology and solutions for the entire value chain in the energy market. As well as having extensive development and market experience in fields such as wind power, thermotechnology, storage technology, and building technology, we are also proud to be a pioneer in electromobility. That makes us a reliable and dedicated partner for the energy industry and enables us to open up new potential for a connected energy market.
Bosch Software Innovations GmbH, the Bosch Group’s software and systems house, designs, develops, and operates innovative software and system solutions that help our customers around the world both in the Internet of Things (IoT) and in the traditional enterprise environment. We place particular focus on the topics of mobility, energy, manufacturing, and building. Our IoT platform – the Bosch IoT Suite – allows the interaction of devices, users, companies and partners on a centralized platform. This enables the development of innovative and future-oriented solutions for new business models.

With some 500 associates worldwide, Bosch Software Innovations has locations in Germany (Berlin, Immenstaad, and Stuttgart), Singapore, China (Shanghai), and the United States (Chicago and Palo Alto).


The Bosch Group is a leading global supplier of technology and services. In 2013, its roughly 281,000 associates generated sales of 46.1 billion euros. (NB: Due to a change in accounting policies, the 2013 figures can only be compared to a limited extent with the 2012 figures). Its operations are divided into four business sectors: Mobility Solutions, Industrial Technology, Consumer Goods, and Energy and Building Technology. The Bosch Group comprises Robert Bosch GmbH and its roughly 360 subsidiaries and regional companies in some 50 countries. If its sales and service partners are included, then Bosch is represented in roughly 150 countries. This worldwide development, manufacturing, and sales network is the foundation for further growth. In 2013, the Bosch Group invested some 4.5 billion euros in research and development and applied for some 5,000 patents. This is an average of 20 patents per day. The Bosch Group’s products and services are designed to fascinate, and to improve the quality of life by providing solutions which are both innovative and beneficial. In this way, the company offers technology worldwide that is “Invented for life.”


Europe     America     Asia
Schöneberger Ufer 89–91  161 N. Clark Street  11 Bishan Street 21
10785 Berlin  Suite 3550  Singapore 573943
Germany  Chicago, Illinois 60601/USA  Tel. +65 6571 2220
Tel. +49 30 726112-0  Tel. +1 312 368-2500  Tel. +65 6571 2220
Fax +49 30 726112-100  Fax +1 312 268-6286  Fax +65 6258 4671