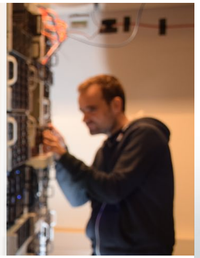
The Virtual Power Plant – successful in operation

Remote control of wind farms at Statkraft

Statkraft, Europe's largest provider of renewable energy sources, has used the Virtual Power Plant since Autumn 2012 to intelligently control wind farms remotely within a direct marketing structure. Thanks to individually developed interfaces, wind farms by different manufacturers can be continuously controlled, delivering real-time information on electricity production in the process. These can be continuously compared with predictions and adapted to market requirements in seconds. Equipped with digital technology, the turbines can be controlled similarly to a large power plant.

Solar plants are additionally integrated into the same system. Also, Statkraft uses the Virtual Power Plant to provide minute reserve power with wind farms. According to Janosch Abegg from Statkraft Markets GmbH, "With good products and great innovation, energy & meteo systems has decisively contributed to the integration of renewable energies into the electricity market."



Marketing balancing power at N-ERGIE

N-ERGIE is among the ten largest German electricity providers. It uses the Virtual Power Plant to provide balancing reserve power. In doing so, the control software bundles various power generating sources and consumers from industrial and business customers, connected via a standardized interface. Gas, steam turbines and hydro-electric power plants as well as bio energy plants and emergency power units, among others, are all part of the comprehensive pool of systems by N-ERGIE.

The Virtual Power Plant controls the distribution of the balancing power on the pooled systems according to availability, reported potentials and current boundary conditions. Apart from controlling the communication between the transmission grid operator and the pool, the Virtual Power Plant includes live monitoring of the respective plant's capacity as well as the execution of calls to implement balancing power. Moreover, all necessary data for plant accounting is processed. N-ERGIE can thus offer its customers a broad range of balancing power services.

Direct Marketing by MVV Energie

The Mannheim energy company, MVV, is one oft he market leaders in Germany in the direct marketing of electricity from wind and solar power within the market premium model framework. This includes round-the-clock trading particularly specialized in portfolios with fluctuating energy generators. The Virtual Power plant implemented as part of this bundles efficient predictions by various forecast providers, prepares trading schedules and professionally executes trading processes.

Also, the MVV uses the Virtual Power Plant to market balancing power and provides secondary and minute reserve power. This includes the calculation of all required data points for the transmission grid operator as well as precise plant control in calls to balancing power. "For us, the Virtual Power Plant by energy & meteo systems is the most important IT system in the marketing of renewable electricity", summarizes Martin Friedrich, director of the Short Term Desk at MVV.

energy & meteo systems

energy & meteo systems fast. dependable. flexible.

energy & meteo systems is among the internationally leading providers of power predictions and virtual power plants. With our services, we substantially contribute to the efficiency of integrating renewable energies into power grids and energy markets.

We predict approximately 50 % of the world-wide installed wind energy power and offer dependable predictions for solar power, together with a real-time estimate of the current power production. By optimally combining these power predictions with our individually customizable Virtual Power Plant, fluctuating, decentralized power sources can be reliably integrated into the energy grid and profitabably marketed at an energy exchange.

Our services are used by grid operators and power traders from Europe, North America, South America, Asia, Africa and Australia. Since 2004, energy & meteo systems has been engaged in research and development projects in power predictions, grid operations, energy trading and load management. Together with our partners at home and abroad, our more than 80 highly motivated employees work towards groundbreaking and marketable solutions and consistently promote a climate-friendly and secure energy production.

Our services – for integrating sources of renewable energy

Virtual Power Plant

- Software for market and grid integration of renewable energies
- Remote control of decentralized generating facilities and consumers
- Processing of direct marketing
- Providing ancillary services (primary, secondary and tertiary reserve)
- Management of measurement and prediction data
- Software as a service with 24/7 monitoring

Wind and solar power forecasts

- Predictions for power scheduling and grid operations for any location worldwide
- for individual power facilities, portfolios, control zones and grid areas
- special, very-short-term forecasts for intraday trading

Solar power estimations

- real-time estimation of the current production of solar power
- available worldwide

Energy economic projects and studies

- for the industry, politics and science
- national and international development projects

Some of our customers

amprion, EnBW, e·on, EWE, MidwestISO, MVV, N-ERGIE, RWE, Statkraft, TenneT

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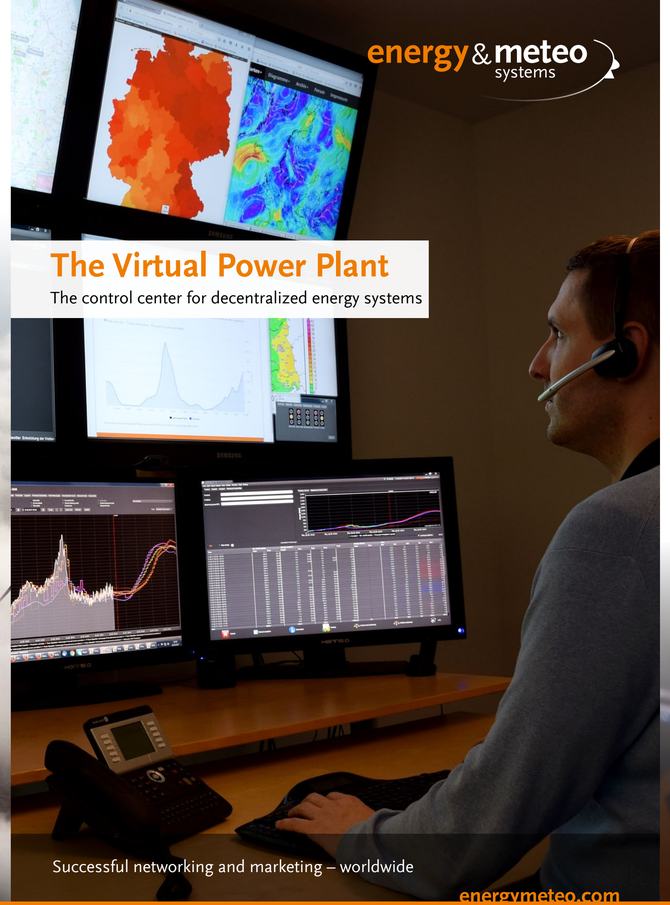


energy & meteo systems

The Virtual Power Plant

The control center for decentralized energy systems

Successful networking and marketing – worldwide

Key technology for renewable energies

With our Virtual Power Plant, we offer you an all-round, carefree package that allows you to devote your entire concentration to power trading in renewable energies and decentralized power generating systems in the intraday, spot and balancing energy markets. The Virtual Power Plant can be optimally implemented for direct marketing of wind and solar power, including remote controlling, as well as the marketing of balancing energy of decentralized power systems. You use our power plant as a software-as-a-service solution, removing the need to create your own infrastructure. As a matter of course, energy & meteo systems also takes care of the hosting incl. 24/7 operations for you.

The Virtual Power Plant is a modularly designed software suite which effectively connects, coordinates and monitors decentralized power-generating sites, storage facilities and controllable loads via a common intelligent control center. As such, it can act within various energy markets as would a conventional power plant and can provide balancing energy. The Virtual Power Plant offers a broad variety of services to power brokers, electricity suppliers, public service providers, grid operators, power plant operators and industrial enterprises.

Your advantages in power trading

- Aggregation of decentralized power sources such as wind, solar or biomass and controllable loads into a high-performance portfolio
- Real-time monitoring of all production data, load profiles and forecasts
- Direct marketing of renewable energies to the electricity market: issuing of detailed schedules for optimal energy trading on the spot and intraday markets
- Realisation of remote control capability for all renewable energy plants
- Making ancillary services available such as primary, secondary and minute reserve power according to TSO requirements including dedicated lines to TSO
- Certified connection to EPEX Spot via API (M7, ComXerv)
- Avoidance of balancing energy through regulation within the pool
- Efficient integration of reliable solar and wind power predictions and electricity price forecasts
- Software-as-a-service with 24/7 service

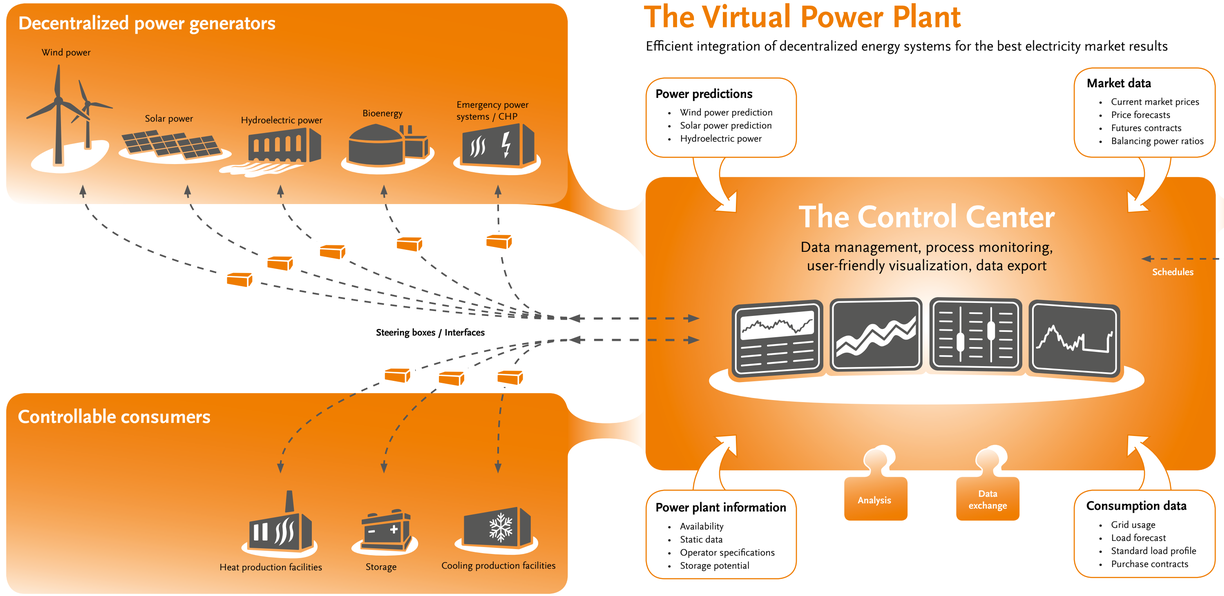
Connecting and tailor-made

For the connection to the Virtual Power Plant, we support all standard interfaces. On request, we can provide you with individual solutions for a quick and reliable entry into the electricity trade with renewable energies. Contact us!

The Virtual Power Plant

Efficient integration of decentralized energy systems for the best electricity market results

energy & meteo systems



Decentralized power generators

One central function of the Virtual Power Plant is the remote control and the intelligent coupling of energy production plants, consumers and storage facilities. Decentralized power generators include, for example, wind energy, photovoltaics, hydropower, biofuel facilities or heat controlled thermal power stations (CHP).

Steering boxes / Interfaces

The Virtual Power Plant is compatible with all standard market interfaces (steering boxes). Via these connections the Virtual Power Plant retrieves data from the units and submits individual schedules to the units, e.g. for remote control.

Controllable consumers

The intelligent networking of decentralized power generators with controllable consumers and loads, such as cooling and heat production facilities, as well as with storage facilities is one of the core functions of the Virtual Power Plant. Schedule deviations, power plant failures or unforeseen overproduction can thus be mostly counteracted.

Control center

The control and communication center is where all the information from the Virtual Power Plant comes together. Different views on one or several screens can be individually configured by users. This creates a summary of all relevant planning and market activities as well as of current generation and consumption.

Boundary conditions such as maintenance intervals for plants, futures and long-term contracts or price forecasts are imported via an interface or entered by hand. Additionally, monitoring of loads and consumption is possible.

Scheduling

Operational planning integrates all outside and plant-specific conditions and prepares an optimized aggregated schedule for multiple trading platforms. This includes the spot, intraday or balancing energy market. Moreover, existing futures and long-term contracts can be taken into account. Even the energy consumption is factored into the continuous online optimization.

The scheduling process can take place automatically or be manually activated. Operational planning avoids unnecessary shut-off (or switch on) events and saves operational resources. For the scheduling of balancing power a safety reserve can also be configured.

Central control and operational management

The central control provides the plants with individual schedules and guarantees the adherence to those schedules passed on to the markets. Based on trend calculations a continuous monitoring and rescheduling is possible.

If balancing power is called for, it is provided by a pool of pre-qualified generation units. Here, signals by the transmission grid operator can be directly processed. A readjustment evens out the balancing group, avoiding deviations in the pool.

The Virtual Power Plant by energy & meteo systems aggregates decentralized energy systems as well as controllable consumers and turns them into successful participants in the energy market.

The software's operational planning is geared towards the intraday, spot and balancing energy markets, which can all be simultaneously serviced.

Energy markets

OTC

Power exchange
- Spot market
- Intraday market

Balancing energy market
- Primary reserve
- Secondary reserve
- Minute reserve

Energy markets

Multiple trading platforms can be simultaneously operated by the Virtual Power Plant via trading connections. This includes OTC, spot, intraday and balancing energy markets. Market-bids can be directly entered or can be passed on to additional external systems via file or API interfaces. Short reaction times are given through the real-time availability or receiving of data. For communication to the balancing energy market, connections are available, e.g. to the Regelleistung.net plattform and to the Merit Order List Server (MOLS) by the transmission grid operator. Participating in the primary and secondary reserve market is then just as possible as the deployment of minute reserves.

External information

Power predictions

In addition to data on the controllable power station, accurate predictions of wind and solar power are crucial information to operational planning.

Therefore, our systems *Previento* and *Suncast* use forecasts by the most important weather providers. They utilize reference facilities and combine this information with specific data from the individual power generators, e.g. wind turbines.

Previento and *Suncast* are important building blocks for reliable power predictions and turn wind and sun into reliable energy sources.

Market data

The current day-ahead and intraday prices as well as the trading results acquired on the different markets can be continuously and immediately transferred to the Virtual Power Plant. Moreover, futures contracts can be taken into account.

Site information

Information on planned outages, for example for plant maintenance, can be reported from the operator portal or via interfaces directly from the plant to the Virtual Power Plant. Moreover, the Virtual Power Plant provides interfaces to the central planning systems of manufacturers or operating managers.

Consumption data

Load predictions also make up part of the most important information regarding operational planning. The current energy consumption of consumers flows into the load prediction in the Virtual Power Plant. The demand of controllable consumers can be continuously adjusted via the constantly optimized load management.

Further developments with potential

Analysis

For analytical purposes, the Virtual Power Plant offers an interface to provide data directly. These can be called via external modules for the desired time frame. A direct data connection reduces data redundancy, thus leading to the prompt availability of data.

Data exchange

Data exchange with the Virtual Power plant takes place via interfaces agreed upon with the customer. Here, all market standard technologies are supported.

energy & meteo systems

High-Performance

Our offer extends from the technical connection of your power installations and adaptation of the existing controlling mechanisms, to the set-up of software, up to smooth operations – all from one source.

Customizable, scalable and multi-user capable

The Virtual Power Plant is suitable for providers starting at 100 kW power up to larger power plant portfolios, as any number of installations can be integrated and parametrized. The software is structured modularly, individual elements may be combined as necessary. All modules work independently from each other and are individually customized to exactly meet your requirements. Upon request, energy & meteo systems connects existing power installations to the Virtual Power Plant and modifies these accordingly. The software can be set up at multiple stations and is multi-user capable.

Fully automatic with integrated alarm function

The Virtual Power Plant operates fully-automatically and requires no permanent personal supervision when in an operational environment. The integrated Notify-Function alerts the responsible person (e.g. per email) of any failures using multiple warning levels.

Easy to operate via user-friendly visualisations

All information such as measurement data, scheduling and deviations, are represented in the control center via easy to understand diagrams and visualisations. It is also possible to make plant-specific groupings or those depending on further criteria. All current and historical actions and events are clearly trackable, easing the process of the manual readjustment if necessary.

Software as a service: hosting and 24/7 support

Operating the Virtual Power Plant does not require one's own IT infrastructure, as energy & meteo systems assumes hosting upon request. Furthermore, our support is available to you around the clock so that immediate action can be taken upon disturbances and other events.

Process monitoring for maximal reliability

Processes are recorded in log files and documented. Permanent process monitoring provides an essential informative basis for meaningful corrections to operational planning and for long-term, strategic decisions.

Communication: main prerequisite for short reaction times

All parties are incorporated in the online communication of the Virtual Power Plant. Important information is gathered in real-time and can be directly implemented towards portfolio optimization. Event-controlled processes guarantee short reaction times, thus meeting the high standards of the secondary reserve market.

Integrated data management: further EDM not necessary

The application encompasses a complete energy data management system that records and further processes all information received. Interface management and exportation of data into formats such as Excel are possible and, in addition, it can be made compatible with the interfaces of existing systems.

Coupled marketing for optimal load management

With the Virtual Power Plant, you can simultaneously participate in the spot and balancing energy markets. Coupled marketing is a decisive criterion for success when it comes to load management under optimal economic conditions.

Employee training

Your employees are trained on-site. Real-world scenarios help to convey the actual software implementation.

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