

BROCHURE

ABB Ability™ Virtual Power Pools

Central control and optimization system



Executive summary

Virtual power plants (VPP) are fast becoming a driving force in the power industry, due to rising demand for energy and the global turn to renewables. ABB's solution portfolio covers the entire spectrum of requirements for operating virtual power pools. As an integral part of this portfolio, ABB Ability Virtual Power Pools assume coordinated control of networked generation systems or virtual power plants. The operating points of each connected technical unit and the provision of grid services are optimized in real time while taking the current system constraints into consideration. In this way ABB allows for bundled trading of power plants, generation units, energy storages and controllable loads.

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Requirements and market drivers

The energy market is currently in a transition phase brought on by increasing generation from renewable sources. The power market of the future will be more diverse, more fragmented, more volatile and predominantly decentralized. These conditions require intelligent system structures which are supported by the most modern information technologies.

The ever increasing number of regenerative production units means that balancing power is quickly gaining significance as a grid service. Energy companies are making their generation systems more flexible in order to provide balancing power and to take advantage of the lucrative trading opportunities on the balancing energy market. They aggregate decentralized generation and integrate flexible loads and storage systems.

Pooling is the intelligent networking and control of many small units and in this way it enables direct trading on the futures and spot market.

It is possible to further increase the flexibility and profitability of the pool, for example by incorporating power-to-heat / power-to-gas, balancing battery solutions or flexible loads for demand response. ABB's optimization solutions allow for efficient operation of innovative business ideas and lucrative operation of controllable and steerable technical units as a whole.

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01 Balancing power calls are distributed to the available units.

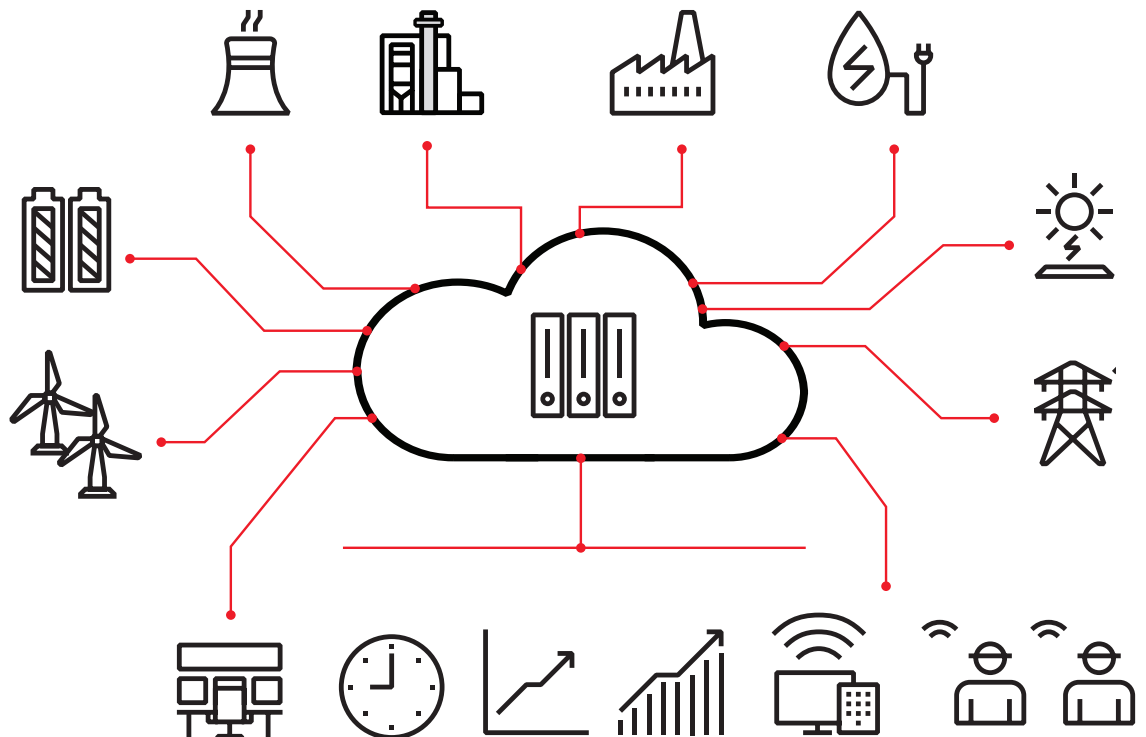


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ABB Ability Virtual Power Pools for virtual power plants, pooling and unit commitment:

ABB Ability Virtual Power Pools offers a new solution for an energy market which is currently in transition. ABB Ability Virtual Power Pools employs a mathematical model in order to optimally distribute the power set points to the individual technical units in real time. System limitations, disruptions and information from schedules are registered online and are directly incorporated into controlling the use of the system. Therefore, it is possible to flexibly adjust the optimization goals to changing framework requirements. The optimization goal is to minimize the generation costs and maximize the revenues from the virtual power pool.

ABB Ability Virtual Power Pools are suited for providing secondary control, minute reserve and reactive power for both direct power trading and for schedule management functions such as balancing group optimization, division of overall schedules into single schedules and intra-day optimization.

ABB Ability Virtual Power Pools automates communication between energy management and the technical units via standardized interfaces. Information regarding prognosis, trading, scheduling and invoicing are exchanged with energy management. Balancing power calls are exchanged with the transmission grid operators, and real time and system information is exchanged with the technical units. This information is available for diagnosis, analysis and statistics through ABB Ability Virtual Power Pools archiving.

ABB Ability Virtual Power Pools informs the user in a configurable manner regarding alarms and notifications in cases of disruptions and changes in the statuses of technical units.

Operation and monitoring is simple and easy via ABB Ability Virtual Power Pools' intuitive user interface or an already existing control system. The planned and current power values as well as the balancing power calls are indicated directly. Current power and the status of the virtual power plant are always at a glance with the simple display.

02 VPP control and optimization system modules

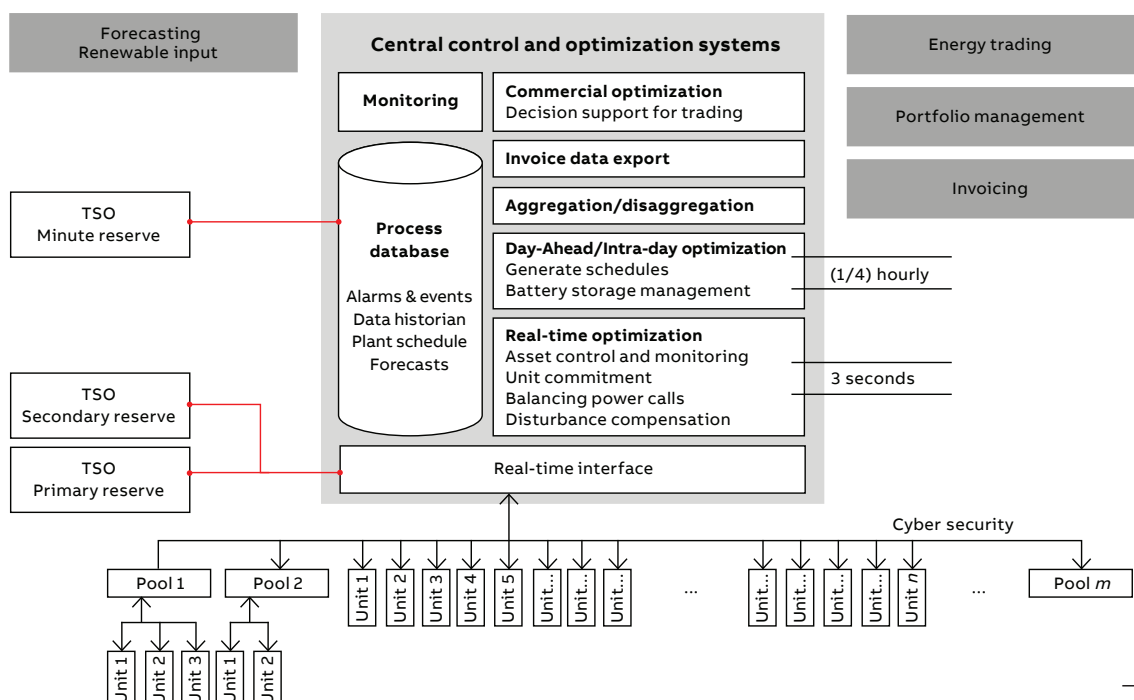


ABB Ability Virtual Power Pools is a control and optimization system to automate control of power generation units, storages and controllable loads.

Profitable grid services and direct trading

- Powerful control and optimization system for profitable operation with direct marketing and grid services
- Optimized system for real-time processing of large signal and data sets

Optimal and commitment and asset steering in one step

- Real-time optimization of set points and provision of balancing power while considering current system constraints and ramp speeds
- Dynamic balancing of deviations from forecasts and disruptions without costly recalculation of individual schedules
- Simplification of superordinate optimization through real-time distribution of pool set points to individual assets without elaborate individual schedules

Standard packages:

- Optimal schedules
- Unit commitment
- Balancing group optimization
- Balancing power calls
- Combined heat and power optimization
- Multi-energy site optimization
- Demand response
- Autonomous operation of distribution grids

Scalability, flexibility, availability

- Scalable system architecture, from a few up to many thousands of units
- Simple integration into virtual server architecture in data processing centers
- Easy system expansion by simply adding further instances and modules to the base system
- Continuously redundant system architecture for fully automated 24/7 operation (e.g. virtual machines in geographically dispersed data centers)

Automated communication across all levels

- Comprehensive information basis for fast decisions
- Seamless recording of operations for archiving, diagnosis, invoicing and continuous improvement of the dataset
- Automated communication between energy management and technical units via standardized interfaces

Standardized open interfaces

- Open interfaces to portfolio management, forecasting, trading and accounting

Proven solutions

- Many years of experience in power plant automation, substation automation and telecontrol
- References from virtual power plants/pools (> 5,000 assets), conventional power plants, multi-unit plants and municipal power generation

Tailor-made service packages

- Expert team for basic design, engineering, supply and training related to ABB Ability Virtual Power Pools in line with the project-specific requirements of our customers
- Use of ABB's know-how to automate thermal processes and electrical systems
- Integration into the existing IT landscape and linking of technical units
- Service contracts from software maintenance to user supported interfaces

03 VPP reference cases. ABB realizes the optimal interconnection of power generation units, storage devices, flexible consumers and production

Application area	Customer benefit	Reference
Central control and optimization system for one of Europe's biggest virtual power plant	- Balancing power - Direct marketing / EPEX	Next Kraftwerke
Balance group management and intra-day optimization of municipal power supply	- Load balancing - Direct trading - Autarkic energy cluster	Stadtwerke Trier
Pooling and optimization of generation, storage and consumption units	- Ancillary services - Power-2-heat	Infraserv Höchst
Maximize the renewable integration in an island grid	- Microgrid application	WEB Aruba
Internal optimization of conventional multi-unit plants	- Efficiency and flexibility - Increase balancing power	Jänschwalde power plant
Power flow optimization between off-shore wind parks	- Optimal power flow - Grid balance	Offshore wind parks
Demand response in a steel mill	- Load management - Peak shaving	Thyssen Krupp, Acciai Speciali Terni, IT
Central power optimization of an international company with multiple site locations	- Optimization own consumption - Grid services and spot market - Flexibility of the sites	International Company

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