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GRID SUPPORT SERVICES

# PowerExchanger eases the transition to renewables and creates a revenue stream from your UPS



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# Getting more value from your UPS

Power transmission and distribution networks are undergoing dramatic changes. The most challenging of these is the connection of ever more renewable energy resources to the networks. This transition requires new grid support services – for grid stabilization, for example. In a parallel trend, network operators have growing opportunities to leverage installed assets, drastically changing the way the assets interact with the grid.

At the same time, the number of uninterruptible power supplies (UPSs) installed around the world has skyrocketed. UPSs supply electrical energy when the grid supply fails but also, during regular grid operation, they eliminate brownouts, over-voltages, electrical noise, frequency variations and harmonics by cleaning and improving the incoming waveform.

A critical part of any UPS is its energy storage capacity, which supplies energy if the primary source fails. Most of the time, these capital-intensive energy storage systems lie unused or store more energy than is needed. This unused power can be exploited to support the grid and generate a revenue stream for the UPS owner.

ABB's grid support services add capabilities to UPS systems so their untapped or underused reserves of power and intelligence can be used to interact in an innovative way with the grid, providing essential ancillary services such as frequency regulation or operational cost optimization. These ancillary services allow UPS owners to support the transition to renewable energy sources, create new revenue streams and reduce operating costs and energy bills.



# Ancillary service: frequency regulation

A major challenge faced by grid operators is frequency regulation. Regulation is needed to co-ordinate interconnection frequency, manage power flows between areas and match the load in an area to the generation. Severe frequency deviations can cause power blackouts. Frequency regulation functionality (FRF) allows energy to be discharged from or charged to UPS battery banks in response to a decrease or increase, respectively, of grid frequency. Frequency regulation is used to counter unplanned power generation and load imbalances that otherwise cause a frequency stability problem. With PowerExchanger, if there is a grid frequency regulation issue, power can flow to not only support the critical load but also to support the grid and help solve the issue.

**The value proposition from a data center owner perspective:**

Data centers represent a significant and increasing load on the power grid. Given sustainability imperatives and the desire to improve margins, it seems logical that the data center industry will increasingly turn to ancillary services for assistance. Whereas efficiency improvements can only make an incremental reduction in carbon footprint, and carbon offsetting and renewable energy credits (RECs) do not address the core issue, ancillary services can support data centers create a greener grid, solve the world's most pressing environmental problems and provide the opportunity to generate revenue by accessing what are, for a large part of the time, stranded assets.

**How frequency regulation can support UPS owners:**



**Sustainability**

Supports the use of more renewable power, reducing fossil fuel use



**Power reliability**

Offsets the impact of increased renewables on power systems stability



**Additional revenue streams**

New revenue streams from existing investments



**Faster return on investment**

Additional revenues support upfront investment and enable faster return for new customers



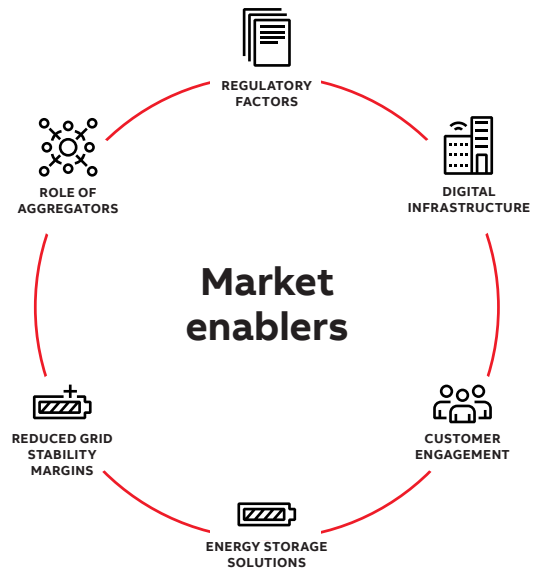
# PowerExchanger turns your UPS into a revenue-generating asset

Modern power grids face many challenges, not least of which is the increasing trend of introducing distributed renewable energy sources onto national power systems and the reliability issues thus raised. To ensure that a reliable supply of clean power is available to their critical loads, no matter what happens to the grid, enterprises will install a UPS. The sheer number of installed UPS systems represents a substantial power reserve, spread over residential energy storage system (RESS), commercial and industrial energy storage (C&I) and utility-scale energy storage.

ABB's PowerExchanger unlocks the potential of these energy storage systems, enabling the UPS to provide ancillary services that can be sold to grid operators. The demand for these ancillary services will continue to grow in tandem with the increasing penetration of renewable energy sources. The addition of ancillary services, therefore, not only enables the UPS to support the transition to renewable energy but also turns the UPS into a revenue-generation asset.

## Market enablers

- **Regulatory factors:** New regulations requiring CO2 emission reduction limit conventional thermal generation.
- **Digital infrastructure:** The wide implementation of digital infrastructures is enabling multilayer architecture management, such as remote energy assets control.
- **Customer engagement:** Many grid operators are engaging with customers to set up support policies and encourage intervention initiatives.
- **Role of aggregators:** the growing role of aggregators allows easier access to ancillary services market and enables smaller sites to participate in the energy/ancillary services market.
- **Energy storage solutions:** Advanced energy storage solutions are required to support a UPS in case of need, but their operation is normally not necessary.
- **Reduced grid stability margins:** The major increase in renewable power sources, which are unpredictable by nature, is reducing grid stability margins.



# PowerExchanger: highly flexible to match all customer needs

Protection of the critical load is always guaranteed while providing the ancillary grid services offered by PowerExchanger. Data centers do not have to fear loss of autonomy or possible forced downtime when they become energy conscious. The mission-critical operation of the data center will be a priority in every respect and critical loads will always be backed up.

The data center sets all parameters and the aggregators can operate within those set parameters. Protection of the critical load is always guaranteed.

Full flexibility is assured by:

- A programmable battery capacity value (minimum and maximum state of charge) for each mode of operation, with dynamic management
- Programmable power requirements for each mode of operation, with dynamic management
- A programmable mode of operation, including backfeed to the grid with dynamic management
- Communication with external controllers via dry contacts or Modbus
- License agreement valid for a predefined time
- New advanced battery solutions designed for higher cyclability and longer lifetime provided with dedicated battery management system (BMS)

## **Ensure maximum availability with Grid Value Service Pack:**

Regular maintenance is of utmost importance as a system in perfect working condition will increase the revenue stream for the user while guaranteeing the load has an uninterrupted supply.

The use of PowerExchanger means batteries will be cycled more than usual. Additional cycling could place more stress on batteries, so extra care may be needed. In this respect, a dedicated maintenance pack is available to give you complete peace of mind, including:

- Two annual maintenance visits:
- Regular maintenance
- Battery health check
- PowerExchanger test functionality and setting optimization
- Battery impedance and infrared scan (lead), datalogging collection and analysis (lithium-ion)
- Firmware and product updates
- Unlimited labor and travel and leisure (T&L) expenses for emergency calls
- Next-day response time
- ABB Ability™ SmartTracker remote monitoring and diagnostics, with predictability algorithms enabled
- License extension



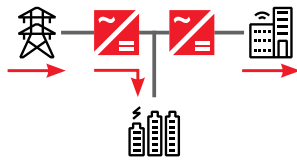
# PowerExchanger: how it works

Usually, energy flows from the grid to the load and a small fraction goes to the battery to keep it charged. If there is a grid issue – for example, an underfrequency – the grid would require loads to reduce their consumption to compensate for the missing generation. The UPS then reacts rapidly (upon request) to partially or completely supply the load from the battery.

With PowerExchanger, the UPS can, on request, also reverse the rectifier power flow and inject power back to the grid (backfeed). Below are two examples: an ABB modular UPS with **double conversion architecture** and a medium-voltage (MV) UPS with a **single conversion design**.

## Example one: FRF with double conversion UPS configuration

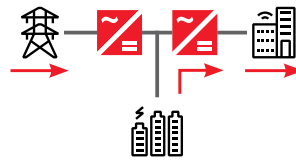
Input power increase mode



### Overfrequency

The power flow is from the grid to the load and battery. Power consumption can be increased by absorbing energy to batteries by charging them.

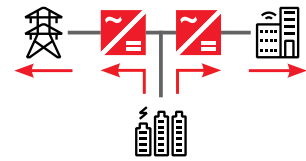
Input power reduction



### Underfrequency

The consumption from the grid is reduced (or halted) by transferring partly (or totally) the load over to the batteries

Backfeed to grid\*



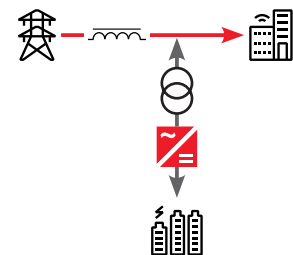
### Underfrequency

In this mode of operation, energy flows from the battery to the load and the grid. \*

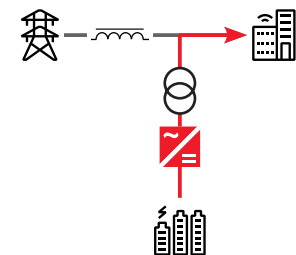
\*To activate this function, it is required to comply with national grid codes, standards and requirements defined by local grid operators, utilities, and aggregators. The ABB UPS provides the functionality. Certificate of compliances and approvals need to be discussed separately with local grid companies and regulators.

## Example two: FRF with medium-voltage (MV) UPS with single conversion design

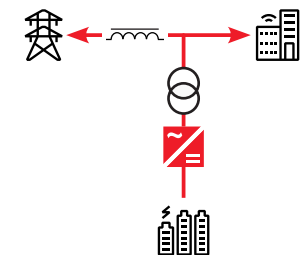
Normal mode



Underfrequency



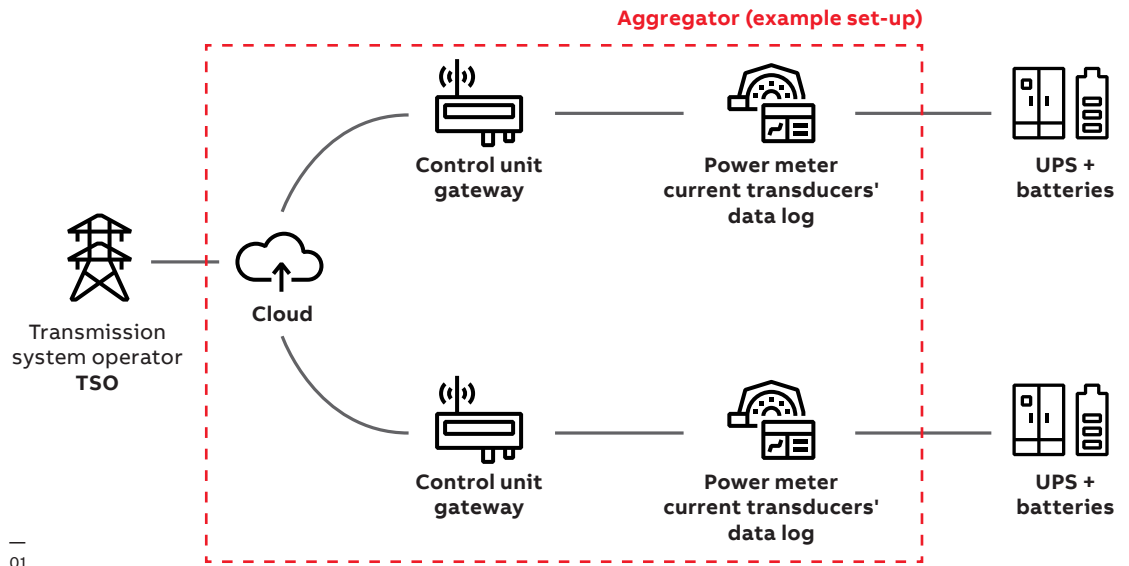
Underfrequency



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01 Aggregators provide all parts needed to manage and control demand response functionalities.

**Interface with aggregators**

The benefit of selling ancillary services through an aggregator is that participation in the energy market is simplified because they handle grid integration, control signaling and practical implementation, and make it obvious what services should be offered. Aggregators can also consolidate available energy (from assets) from multiple sites (customers) when bidding, so even smaller sites can tap into the ancillary services markets and its benefits with reduced risks.



**Product compatibility table**

	PowerExchanger
DPA 500 IEC	Yes
MegaFlex DPA IEC	Yes
HiPerGuard MV UPS	Yes

PowerExchanger is typically purchased by means of a license during the commissioning process. It can also be installed as an upgrade to existing systems with an extra investment.





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**ABB Switzerland Ltd.**

Via Luserte Sud 9  
6572 Quartino  
Switzerland

**[abb.com/ups](http://abb.com/ups)**



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