

# ENERGEN

## IntelliStore™

High Power, High Capacity Li-ion Battery Based Mobile  
Energy Storage System



# THE MISSING LINK

What's the key to using alternative energy, like solar and wind? Storage -- so we can have power on tap even when the sun is not out and the wind is not blowing. One of the **most advanced storage solutions** are **Li-ion technology** based batteries today. They offer high energy density, high reliability, long lifetime and environmental responsibility for their users. That is why Energen has chosen this technology as a basis for its IntelliStore™ solutions.



The IntelliStore™ solution can be operated and managed remotely via our proprietary, ENTSO-E compatible, SCADA (Supervisory Control and Data Acquisition) based Virtual Power Plant (VPP) monitoring- and process control system. The standard system is built into a 40' ft. standard high cube maritime container, offering full mobility.

Our standard Li-ion battery based mobile energy storage system. The energy of 384 pieces of 1.000 Ah cells is loaded to or charged from the network through two **specifically developed** bi-directional, high-capacity inverters with 250 kW capacity each.

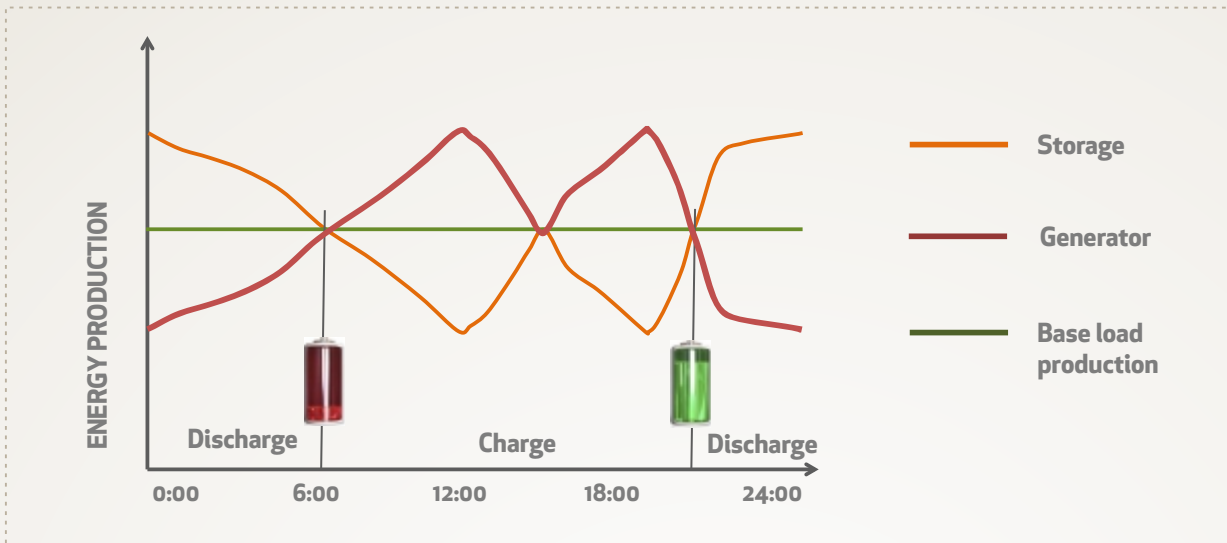


Other fields of application: facilitating the efficient connection of PV – and wind parks, UPS function, energy arbitrage, island mode.



# INTELLIGENT SOLUTION FOR...

## ANCILLARY SERVICES



The IntelliStore™ solution and its innovative control unit is able to execute regulation of different balancing circles in multiple sizes. (TSO/DSO/VPP regulation)



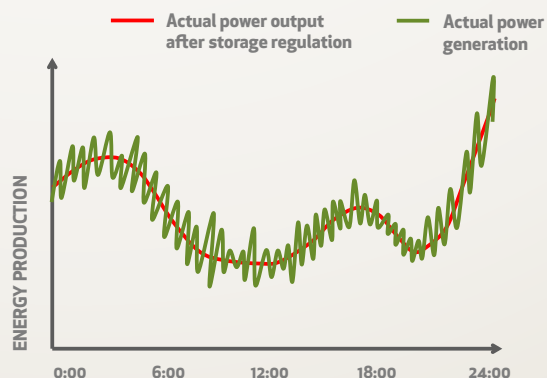
## ISLAND MODE OPERATION

The IntelliStore™ solution executes balancing of electrical islands and it's optimized for providing network supply.

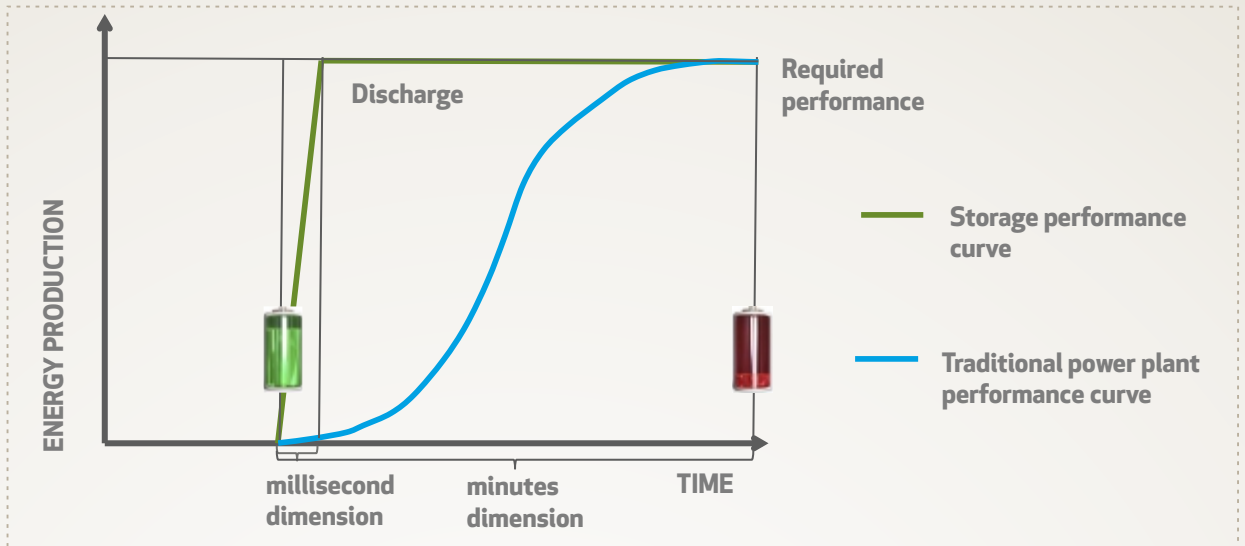
The IntelliStore™ solution enhances the development of smart grid systems, and the supply security.

## RENEWABLE PEAK SHAVING

The IntelliStore™ solution is optimized to regulate the hectical production of renewable energy sources, causing minimal difference to schedule.



## RAMPING

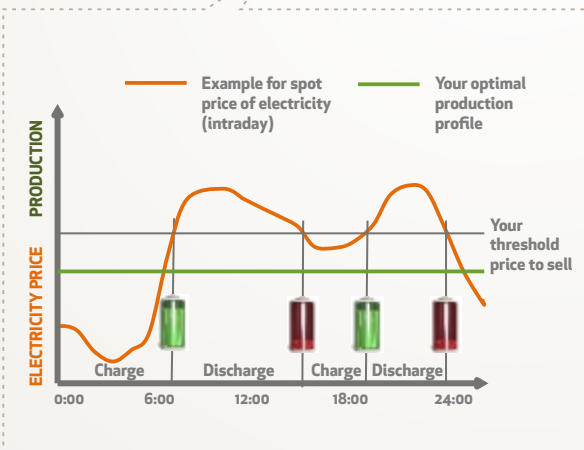


For ramping service our storage resources can help traditional energy producers e.g. gas turbines, to fulfill generation demand increases with steep gradient.

With the aid of the ramping support these traditional producers can offer higher gradient ancillary services to TSO than their default built-in gradient allows them.

## ARBITRAGE

The uneven consumption of consumers makes energy prices very volatile even on a daily basis. With IntelliStore™ solution the markets' volatility can be turned into a risk free profit.



## UPS

For highly sensitive industrial and commercial applications, where high volume UPSes and immediate response time is needed, our IntelliStore™ solution provides all the functions of an intelligent UPS that saves users' devices from unplanned downtime and its collateral losses.

# INTELLISTORE 1000™

## SYSTEM BUILD-UP



- 40ft standard container
- Gross weight of 28,8 tonnes
- Fully air conditioned
- Grid connection ready
- Certified



384 pieces of 1000Ah Li-ion



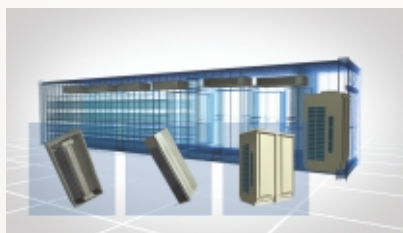
Intelligent battery management system (BMS) for each battery



Bi-directional inverters - 0,25 MWx2 = 0.5MW



Main control unit with touchscreen GUI panel



Robust air-conditioning system



Fire protection, safety and security systems

The IntelliStore™ 1000 is a ready to grid, multifunctional mobile energy storage solution. The maximum power is 0,5 MW and the provided energy is 1 MWh per container. Custom size energy and/or power rates can be easily reached by our IntelliStore™ Multi-container system, however for very large, geographically fixed storage needs we propose to install storage systems in a storage hall.

# INTELLISTORE™ 1000 SPECS

## MAIN FEATURES

Configuration	40 Ft. standard size, high cube maritime container
Electrical power connection:	3 x 400/230 V rated voltage grid
Nominal built -in storage capacity:	1.220 kWh
Nominal net storage capacity:	1.000 kWh
Battery	384 pcs. of 1000 Ah Li -ion cells
Maximum charge/discharge power:	500 kW
Maximum energy:	1.000 kWh
Average efficiency: (full cycle)	App. 82%
Cycle and lifetime	Up to 7.000 cycles, up to 20 years
Weight	28.800 kg
Accessibility	Remote access through VPP

## INVERTER SPECIFICATIONS

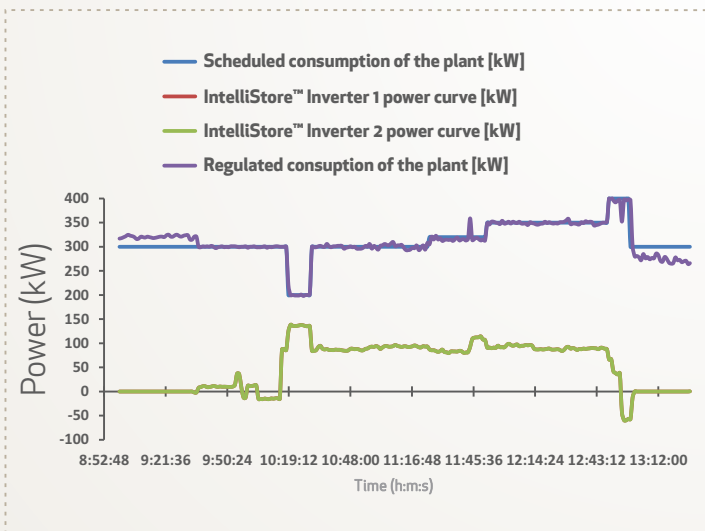
Configuration	2*250 kVA built -in bidirectional inverters
Grid voltage	3 x 400V ± 10%
Grid frequency	50 Hz (49,5 ÷ 50,5)
Battery voltage	565 ÷ 740V DC
Control voltage	1 x 230V / 50Hz / 2A uninterruptible
Nominal power	250 kVA
Maximal power	262,5 kVA
Grid interference suppression	Built -in 3 phase line filter
Battery side interference suppression	Built -in DC line filter
Control voltage suppression	Built -in 1 phase line filter
Reaction time	Stand -by to operating mode: 1ms Stand -by to max. charge/discharge: 2-50ms

## INDUSTRY STANDARDS AND CERTIFICATIONS

Electromagnetic compatibility (EMC) Emission standards	EN 61000 -6 -4 : 2007+A1
Electromagnetic compatibility (EMC) Immunity standards	EN 61000 -6 -2 : 2005
Islanding Prevention	IEC 62116:2008
Safety of power converters	IEC 6109 -1 :2010
Characteristics of the utility interface	IEC 61727:2004
Certified by:	TÜV Rheinland



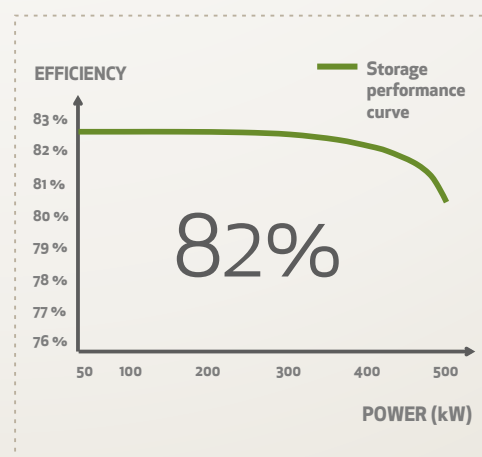
# WORKING REFERENCE



Our IntelliStore™ 1000 has been connected to a gas-fired electricity generator plant. With its **900 MW** installed generator capacity the plant is an ideal site to use the storage device for ramping and phasing services. If idle, the plant's own electricity usage is optimized - no peak prices need to be paid.

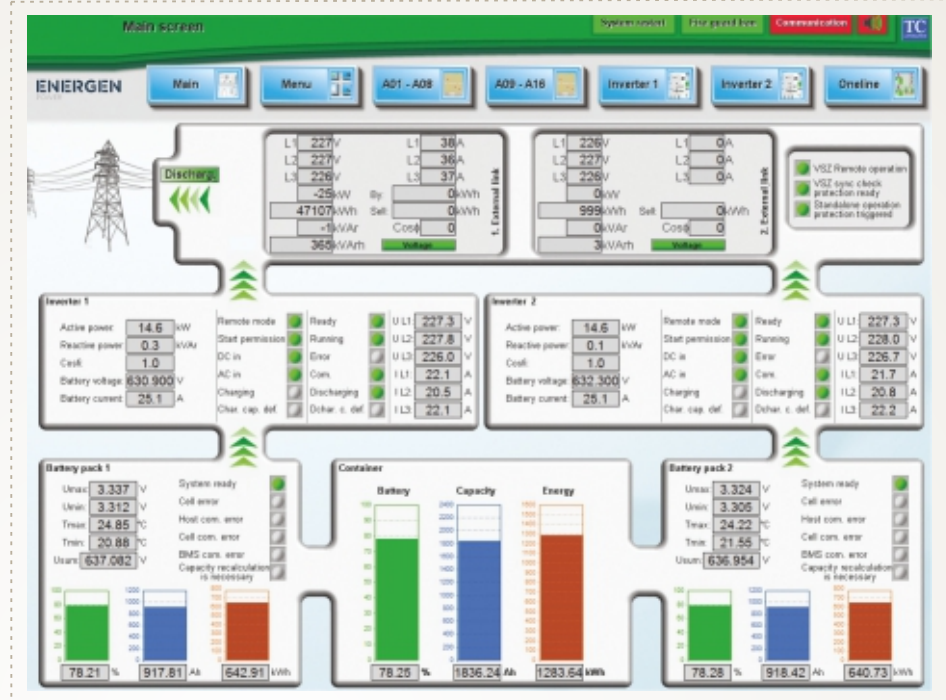
The **82% full cycle efficiency** of the storage system was measured using the generator plant's real-working environment.

The test was performed close to standard temperature, pressure and humidity conditions.



## User Friendly Access...

We consider very important that even complicated devices shall be controlled user friendly. That's why we developed an in-house software which executes the monitoring and controlling of the storage unit.



The control system of IntelliStore™ solution is an individually configured ENTSO-E compatible VPP system, which allows to control the system from the built-in touchscreen, from anywhere around the globe through the internet and the remote control system, just as well as from the headquarters of the TSO/DSO. At the same time, the system is capable to act automatically, following and equalizing pre-entered schedules.



# ...THROUGH A PROPRIETARY VPP - VIRTUAL POWER PLANT SOFTWARE

VPP is a SCADA solution for real-time controlling of not only storage units but power plants and consumers that together represent a smart grid and /or a balancing cycle. It had been fine-tuned in the last five years.



## CHARACTERISTICS OF A CURRENTLY RUNNING (SAMPLE) INSTALLATION:

- Under control currently: 400 MW with 12 controlling area centers
- References: E.ON, Dalkia, RWE, Alpiq
- Running on a Virtual Private Network System
- Tens of thousands metering points
- Open and expandable modular device



## OPPORTUNITIES OF THE SYSTEM

- Standard products and/or ancillary services
- Closed loop service
- Multi-balancing circle operation
- Automatic schedule-driven operation
- Real-time measurement (smart metering)
- Support for accounting and administrative tasks



# ENERGEN

## IntelliStore™



Energen is a Stockholm based company concentrating on intelligent solutions for the storage of high volumes of electricity. Its IntelliStore product line is geared towards TSO's, alternative energy producers and other industrial clients. With its high capacity bi-directional inverters the products' main focus is network and grid operations – but they are equally suitable for purposes of arbitrage, ramping, UPS or island operational mode.

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