

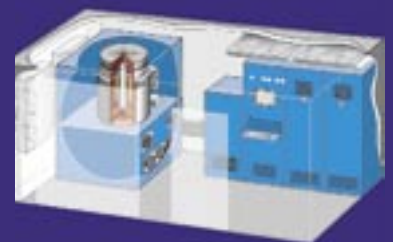
Want to get more value from your wind/diesel plant?

We can help.



Are you achieving high wind penetration?

If not, PowerStore can help stabilise your power system and get more from your wind plant!



PowerStore
solving stability problems
associated with integrating
wind energy.

Dynamic Power Solutions

... giving you the power to achieve your goals.



Get more out of your wind plant

Wind turbines, indeed all renewable generators, are a capital intensive solution requiring years to pay back the investment. If this plant is not fully utilized then the investment is at risk. To allow the wind turbine to run free in the wind and generate all that it can, it is necessary to manage the power fluctuations and surges caused by the change in wind speed. Even in seemingly low turbulent regions high levels of power fluctuations are experienced. As you progress to higher penetration the problem becomes so significant that outages and damage to diesel plant is inevitable. Load dump systems, battery banks and turbine control have all been tried and found to fail in solving this major problem. The reason is that the time base for the damping is far too long in all of these solutions. Only a very high speed power sink and source such as the PowerStore can dampen the surges and assure Utility standard electrical supply.

What is “high penetration”?

“Penetration” is a term used to describe the amount of wind energy compared to the amount of diesel supplied energy in a generation system. If the wind turbines are only supplying a small amount of the overall energy then the system is called a low penetration system. This can be confusing though as there is a difference between instantaneous wind contribution and the annual contribution to the systems fuel demand. A high penetration system may often see the wind turbines contributing +90% of the electrical energy but the annual contribution may only be 50% due to low wind periods throughout the year. A low penetration system of say 20% max instantaneous contribution may only supply a marginal percentage of the annual fuel demand. Thus high penetration systems are desired and prove to be the most economical solution in most cases.

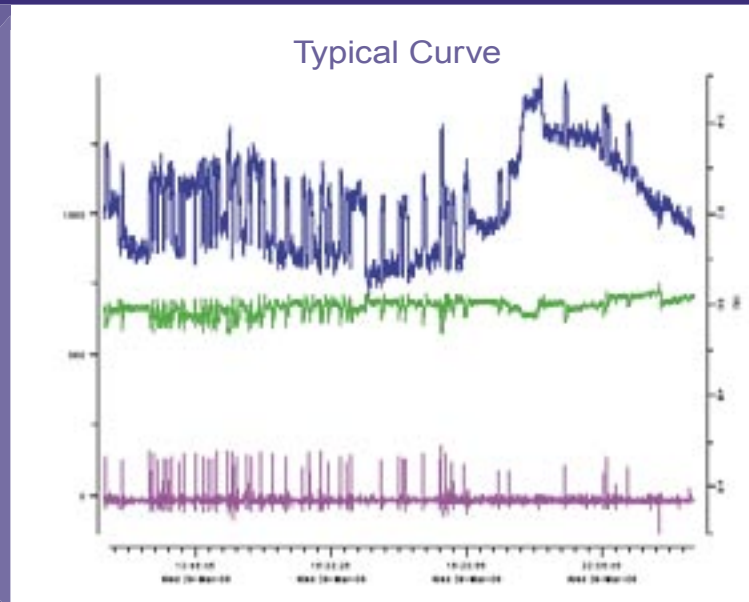
Why does my diesel station go crazy when the wind turbines are on-line?

The chief problem of high penetration systems is the fluctuation of the wind speed. Because the power is the cube of the velocity, the wind speed fluctuations are amplified in the electrical system. We have observed many installations where the wind output drops to less than 20% of generated output over a few seconds then back to full output. Such fluctuations are intolerable when the diesel contribution is low (high penetration systems). Power outages and extreme engine hunting or surging are commonplace. This phenomenon is the main reason for failure in wind diesel systems.

The solution that helps things run smoothly.

— Grid Power Curve
— Stable Frequency
— PowerStore Output

The graph shows operation of the PowerStore installed on Flores Island at 04:24:53, Thursday 30th of March, 2006.



Fuel saver mode

Fuel saver mode is a low penetration system where the wind turbine is designed to act as a negative load only and minor fuel savings are achieved. Usually such systems are not attractive financially as the capital cost of the wind turbine is not able to be recovered by the small savings made.

How does PowerStore stabilize my grid?

PowerStore stabilizes the grid by very rapidly absorbing power surges from the wind turbine or alternatively supplying power to make up for short term lulls. The secret is the speed with which the PowerStore can achieve either function. Full power swings in under 5 milliseconds are necessary to fully dampen the electrical grid. The high speed bi-directional inverter technology is unique to Powercorp's PowerStore technology.

The attraction of the PowerStore solution is the fact that it is independent of the wind or diesel plant. Attached to the electrical grid at some convenient point the PowerStore uses the voltage and frequency of the grid to understand what it has to do. No communication system is required. In advanced systems the PowerStore is supplied with its own communication system to enable sophisticated control of generation plant, data acquisition, visualization and remote control.

Does PowerStore work with gas engines?

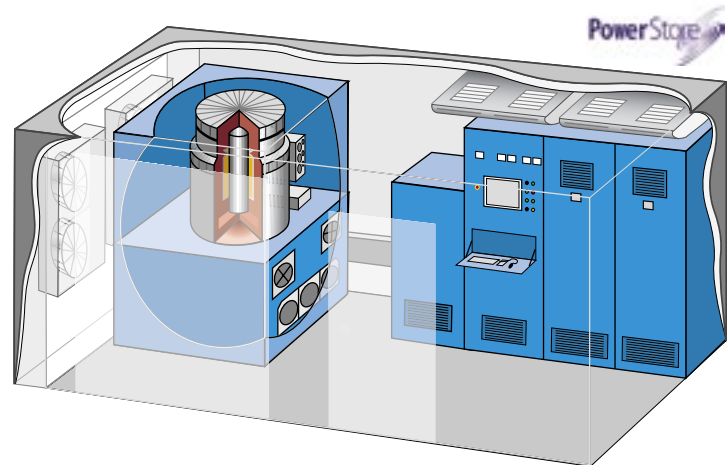
PowerStore works particularly well with gas engine as it is able to manage the natural inability of the low inertia engines in step load situations as well as the wind turbine fluctuations. Indeed any fluctuation on the grid whether caused by generation plant or load switching is dampened by the PowerStore system.

Utility standard power supply

Where the wind diesel system is supplying a village or other community load it is essential that power quality be maintained within Utility standards. In high penetration systems the only way to achieve this is by installing PowerStore. Usually the PowerStore is sized to match the largest single wind turbine installed, thus achieving fault ride through under the most extreme fault conditions expected – the complete loss of a single turbine.

Features

- Frequency support through active power sinking and sourcing
- Smooths out cyclic and transient loads
- Masks load fluctuations from the power supply
- Voltage support through reactive power injection
- Highly dynamic – response measure in milliseconds
- Enables gas reciprocating and gas turbine generators to be used with fluctuating loads
- Modular design – no limit to the number of units paralleled
- Usable on soft grids
- Very low harmonic content
- System designed as liquid/transportable asset
- Financial/leasing options available



PowerStore system Components:

PowerStore combines: Flywheel Grid Interface Control System Flywheel Drive Container Flywheel

PowerStore MODELS

PowerStore Model	Power Rating (kVA)	Total Energy Storage (MJ)
PowerStore 500	500	16.5
PowerStore 750	750	16.5
PowerStore 1000	1000	16.5

Voltage Ride Through capability during distribution faults exceeds Utility standards.

Fault Current capable to full rating of PowerStore.

Low Voltage supply range.....3 ph, 400 - 480V
 Frequency supply range.....40 – 70 Hz
 High Voltage supply range.....6kV - 33kV
 Paralleling of units.....Yes
 Communication.....Ethernet, Mobile GSM/CDMA,
PSTN telephone line available

ELECTRICAL FEATURES

Charge and Discharge Duration Available (estim.):

150 kW.....	100 s
250 kW.....	60 s
500 kW.....	30 s
750kW.....	19 s
1000 kW.....	15 s

Response time from 0kW to full power rating (charge/discharge): 5msec

MECHANICAL FEATURES:

Depth.....6,000mm
 Width.....2,400mm
 Height.....2,900mm
 Weight.....12, 520kg

ENVIRONMENTAL FEATURES:

Env. Temp. range....unit is suitable for various climate conditions
 Noise.....kept within industrial sound standards

PowerStore, proudly developed by the Powercorp Group
engineering innovative power solutions for a better world.

powercorp

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