

ANISH WASTRAD
AREA SALES MANAGER FOR INDIA,
FRONIUS INDIA PVT LTD

How to Save Fuel and Money with PV Genset Systems

Remote areas or areas with unstable public electricity grids require continuous or backup supply of electricity that can work without a utility grid. For this purpose diesel generator sets and photovoltaic technology can be combined in perfect harmony. Although these two technologies have rarely been in demand by the same users in the past, bringing the two power generation systems together has become extremely beneficial technically and economically for the operators of diesel gensets.

PV-Genset Solution minimizes operating costs of Diesel Gensets

In remote areas or regions where the electricity supply is patchy or extremely expensive, power grids powered by diesel gensets are an absolute must.

The cost per kilowatt hour of electricity from a diesel genset is largely changeable, depending on fuel and other variable costs. Thus the variable operating costs of a diesel genset can vary widely depending on fuel transport distance and long-term increasing oil costs on the global market (0.05–2.5 per kWh).

The price trend in the photovoltaics sector indeed moves only into one direction, and that is downwards. Over the past few years the costs per kWh generated from PV systems have dropped dramatically around the globe (€ 0.07–0.14 per kWh). Consequently, the high financial attractiveness of integrating PV into permanent off-grid diesel gensets, as used by mining companies to maintain permanent power supply for their mining operations in remote areas, is already common place among informed decision-makers.

Due to the opposite long-term price trends of oil, fuel and transport on the one side, and the cost of kWh energy produced by PV-systems on the other side, the integration of a PV-Genset solution into virtually every diesel-powered system turns into a financially interesting option to be considered by now. This holds true for diesel



Picture 1: SE HRPIC Fronius PV Genset.

gensets utilized as backup systems bridging blackouts in areas with unstable electricity grids as well. As simple as it is, every unused diesel kWh saves money.

Intelligent technology makes it possible.

Maintaining the PV-Genset system stable has the highest priority. Using photovoltaics must not result in diesel gensets being operated at unfavorable or prohibited operating points, where an increased load causes premature ageing. As a result it becomes absolutely essential that the PV inverters and, where necessary, the diesel genset too

in systems above a certain size is subject to an intelligent control mechanism.

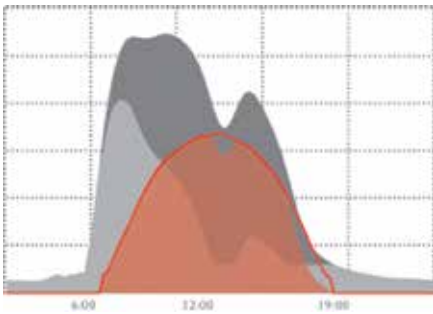
A consistent power balance (reactive and effective power) must be guaranteed within a PV-Genset system at all times. Both the load and the PV power available are subject to fluctuations. In small PV systems (just as in systems with no PV element), these variations are met by the diesel genset. Yet if the power from the photovoltaics system is proportionally quite large, the entire system must be optimally controlled to obtain the best possible diesel savings.

This is where the Fronius PV-System Controller comes into play. By using data from the Fronius inverters together with load measurements (as well as diesel genset measurements where necessary), the entire system can be monitored. This allows the Fronius inverters to be controlled. If several diesel gensets are in use, then these too have to be controlled at the same time. Further potential for optimization exists where controllable (in terms of time) loads can also be taken into account.

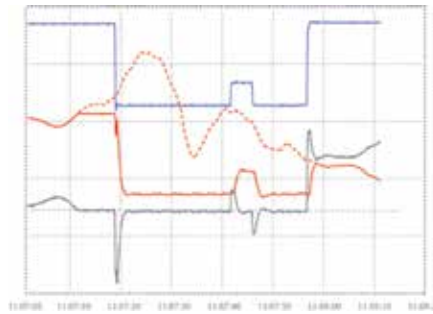
Three Ways how the Fronius PV-System Controller Protects and Optimizes the Diesel Genset

The diesel genset is a fundamental part of the system. Protecting it is therefore absolutely vital, as losing the generator would cause the entire power supply to fail. The Fronius PV-System Controller assumes the following functions: Ensuring that the

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Picture 2: PV-Genset Solution diagram.



Picture 3: PV-Genset Solution.

minimum numbers of diesel gensets needed are in use during any given situation.

Checking that the diesel gensets are always being used in a manner that has the lowest possible impact on service life, even at low loads. Guaranteeing an extremely quick and responsive control over the PV output. As a result, power fluctuations are compensated immediately and the strain on the diesel genset is reduced dramatically.

Optimizing PV-Genset systems

It is very easy for a small PV system in relation to the load to pay for itself financially, but it does not represent a cost effective form of optimization. As the PV output never has to be restricted, the savings can simply be identified from the annual energy calculated in the respective region. The difference between the costs of producing PV energy and the costs of producing electricity from diesel is normally quite large. The saving is therefore much higher if the

size of the PV system has been designed so that temporary power restrictions are the norm. This significantly increases the amount of power supplied from photovoltaics. In order to identify the most cost-effective PV system size for each project, it is important to examine the insolation and load profile alongside the variable diesel power costs and the cost of the PV system.

Simulations are then used to calculate the highest possible savings that could be

All Fronius inverters can be used in a PV-Genset system. The Fronius PV-System Controller assumes all control functions over the system

achieved. Fronius can provide you with unbeatable support in the planning of your PV-Genset system.

Online System Monitoring

Every PV-Genset system equipped with Fronius components can be designed, monitored, analyzed and visualized at any time using the free Fronius Solar.web online portal. Up-to-date system data can be accessed at any time and is clearly presented: the portal is very user-friendly and easy to use, and a comprehensive range of analysis functions is included. Fronius Solar.web is also available as an app to allow you to check your PV system data from your smartphone at your own convenience.

Products for the Fronius PV-Genset solutions

All Fronius inverters can be used in a PV-Genset system. The Fronius PV-System Controller assumes all control functions over the system. Depending on the configuration, the required measuring accessories will also be offered.

Due to the open nature of Fronius communication solutions, it is also possible to implement individual solutions containing third-party components. With the Fronius Datamanager 2.0 or Fronius Datamanager Box 2.0, it is possible to incorporate all components into a control system using Modbus RTU or TCP with the SunSpec Inverter Control Model ◀◀



Picture 4: SE PIC Fronius Datamanager Box 2.0.