AGI ENERGY SERVICE CENTRE
Sustainable Energy for Profitability

SIZING AN OFF-GRID SOLAR PV COMBINED WITH A GENSET.

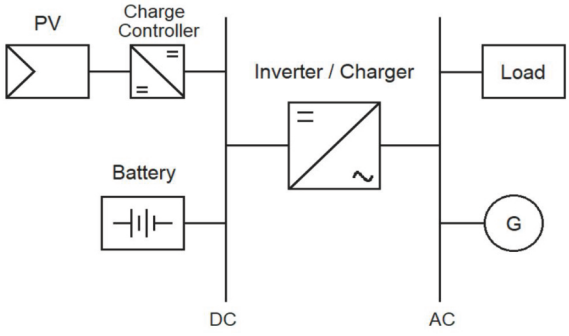
01 Background

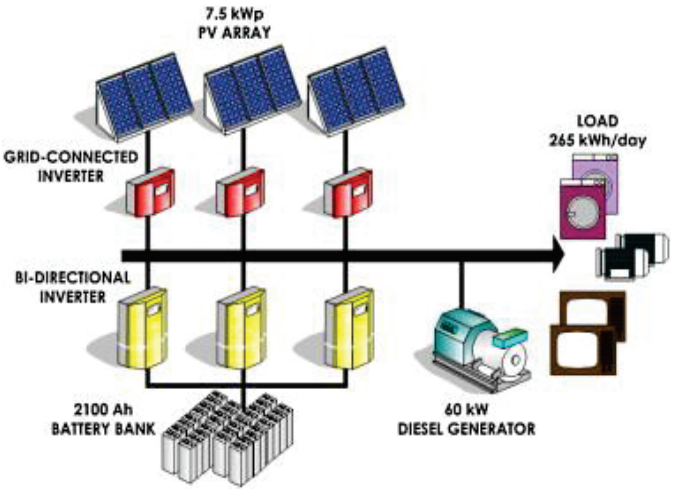
In recent years, solar PV system costs have steeply dropped, making it an affordable energy source for companies in remote areas. Using only a solar PV system and solely relying on solar irradiation (even if there's plenty of it and it's free), isn't a safe bet for an industrial consumer, as solar PV production is inconsistent or intermittent. This is why industries are resorting to solar PV diesel hybrid system.

02 What is a solar diesel hybrid system?

Solar hybrid systems are power systems that combine solar power from a photovoltaic system with another energy source. One of the most common hybrid systems is solar PV diesel hybr id system, which couples solar PV and diesel gensets.

The diesel gensets are used to steadily fill in the gap between the load and the power generated by the solar PV system. Battery storage can be incorporated to enhance the overall system per formance to ensure that the amount of energy meets the demand. An energy management system can also be included to optimize the system as the diesel gensets capacity is limited and the solar energy production is inconsistent.





03 System Sizing

Sizing a solar PV diesel genset hybrid system depends on when peak load is experienced. Peak loads during the day may require larger capacity solar PV, whereas peak loads at night may require larger capacity genset. The availability of the genset also means that it may not be necessary to build in many 'days of autonomy' for the storage system as it is expected that the genset supports power generation whenever the solar PV isn't generating power.

04 Key factors to consider when sizing

- Variety of loads to be run
- Peak consumption
- Average consumption
- Minimum / continuous consumption: any load that needs to be run all the time
- Degree of automation required: whether supply needs to have 100% availability

05 Sizing the PV modules and Battery

The PV modules and batteries should be sized to meet daytime loads. The capacities will ultimately depend on when peak load occurs. Solar panels and battery should meet daytime loads, with a few ext ra hours of battery power when the sun goes d o w n . Actual sizing is hi ghly dependent on solar irradiation level of the locality and the load pattern.

06 Sizing the Inverter

In addition to the average power consumption, pe akpower consumption needs to be considered in sizing the inverter. This is estimated by adding the wattages of the largest number of devices that are likely to be operated at the same time. The continuous rating of the inverter should be greater than this figure. Most inver ters have an over load capability, for short periods, of two or more times their rated output, and this is needed for it to cope with the starting surges involved in electric motors. If several motors can start automatically (e.g., fridge and freezer) then it is possible for them to start simultaneously, so their combined starting surge must be taken account of.

07 Genset sizing

In order to save on battery, inverter and module costs, a back-up genset can be incorporated and the use of the heaviest loads restricted to when the generator is running. However, the costs of batter ies have been dropping and it is now cheaper to add batteries than a genset capacity. Gensets may be left for peak power consumption of all appliances with the aim to run it only for shor t periods or if there is a lack of solar irradiation. Load management and p r o per timing of peak power consumption can lead to considerable cost benefits. Selection of efficient electrical appliances can also improve system efficiency

For additional information on this opportunity, please contact:

AGI Association of Ghana Industries

german cooperation DEUTSCHE ZUSAMMENARBEIT

Implemented by: giz

+233 507 977 902
info.esc@agighana.org
www.esc.agighana.org
AGI Energy Service Centre
@agi_energy