

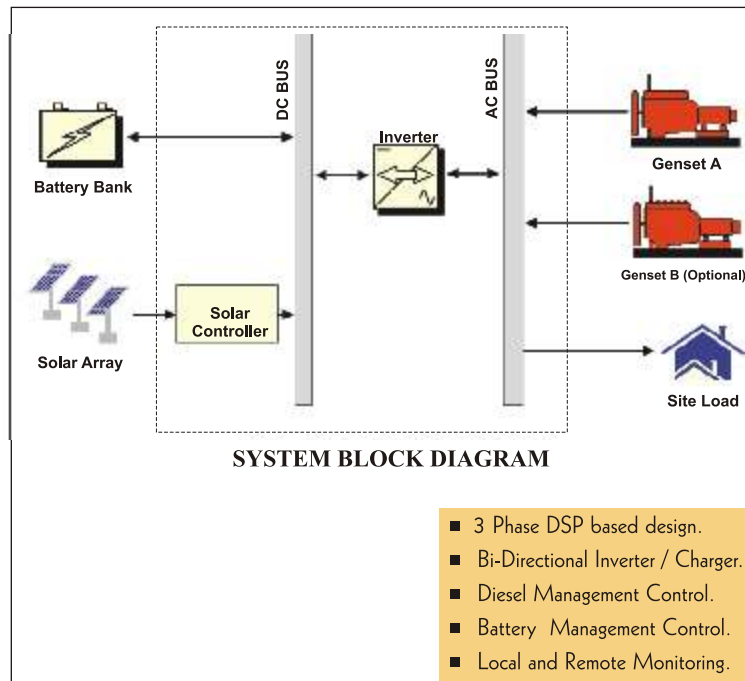


HYBRID POWER CONDITIONER

The 3 phase, DSP based Hybrid Power Conditioner (HPC) system can be configured in one of two source modes: **Dual Source mode** or **Parallel Source mode**.

The **Dual Source** mode can have one or two gensets, whilst the **Parallel Source** mode utilises two gensets with each having their own synchronisers and load sharing modules.

In **Dual Source** mode, there can be a maximum of two gensets available where only one genset is online at a time. In this mode, two configuration options are available to the user: **Back-up** configuration or **Equal Run-Hour** configuration.



The **Back-Up** configuration is typically used where a new genset and an old genset are available. The new genset is used as then primary source of power when a genset is called to start and run. If the new genset faults it will be masked from operation and the back-up genset used in its place

In the **Equal Run-Hour** configuration, both gensets are typically of equal age (run hours) and operation is swapped between each other to achieve an equal number of run hours. This will allow periodic maintenance to be carried out on both gensets at approximately the same time.

If the battery bank is suitably charged and the site load is sufficiently small as to meet the stop conditions for the genset, the system controller will shutdown the genset source and operate in a **Fully Auto- Inverter Only Mode**. The inverter module will continue to provide power to the site by using battery power and any available renewable energy.

As the kVA loading on the inverter module starts to increase beyond a certain limit, or the battery's state-of-charge (SOC) drops to a pre-defined low limit, a genset will be automatically started, brought up to its rated speed/voltage, then connected in parallel with the

inverter module. The genset will then supply the load and also provide power to charge the batteries provided the site load was not too high.

An extension to the **Dual Source** mode is the **Parallel Source** mode configuration. In this case, one or two gensets can be online at the same time to provide the necessary genset capacity to meet the load demand and charge the battery bank. This configuration will require the gensets be interfaced with a **Multi Genset Control System (MGCS)** that will handle all the synchronisation and load sharing aspects between the two gensets.

In the Fully-Auto mode, the **HPC** controller determines when to start and stop the individual gensets based on various factors including the site load demand and state of charge of the batteries.

Similar to the **Dual Source** mode, if the site load is sufficiently small and all the genset stop conditions are met, the system controller will shutdown the last genset online and operate in a **Fully Auto-Inverter Only Mode**. The inverter module will continue to provide the power to the site by using battery power and any available renewable energy.

As the loading on the inverter module starts to increase beyond a certain limit, or the battery's state-of-charge (SOC) is depleted to a pre-defined low limit, the smallest genset will be automatically started, brought up to rated speed and connected in parallel with the inverter module. If both gensets are the same size, the genset with the fewest run hours will be brought online first. The genset will then supply the load and provide power to charge the batteries provided the site load is not too high.

As the load continues to rise, the second genset will be started and brought up to rated speed/voltage and connected in parallel with the online genset and inverter module. The Smallest genset will then go through its cool down phase and then be switched off. Finally, the smallest genset will be brought online in parallel with the online resources as the loading on the operating genset exceeds a defined limit. This configuration provides the optimum spinning capacity to supply the load and charge the batteries.

Conversely, as the loading on the parallel gensets decreases below a pre-defined limit, the smallest genset is switched off and the largest genset will continue to supply the load. As the loading drops further, the smallest genset is brought back online in parallel with the online resources and the largest genset is then switched off. Finally, then smallest genset is switched off when the loading on the genset is below a defined limit and the system will continue in a **Fully Auto-Inverter Only Mode**.