With advancements in technology and the volatility of worldwide fuel prices, battery powered generators are on the rise. how a hybrid generator could be incorporated into your next project along with the four key advantages. To incorporate real numbers into the blog we will also look at the advantages in relation to a Power Electrics case study.

THE GREEN FACTOR

The most common and reliable way is a diesel genset with an integrated lipo4 battery. Very much like a hybrid car, the generator acts primarily as a battery charger or power source when demand is higher, therefore greatly reducing the need for the diesel generator to be running. The reduction in the running time of the engine reduces the emissions output of the generator greatly up to 90% less. Hybrid generators may also be combined with renewable sources such as solar or wind to charge the battery. This could mean that in summer months or windy days, the generator is not required to charge the batteries at all, further reducing the project emissions.

REDUCE FUEL BILLS

Along with the green credentials, a Hybrid Generator can reduce the amount of fuel used over a project, therefore reducing project fuel bills. As a matter of fact, the engine will run up to 90% less, compare to a conventional generator, resulting in huge savings on fuel, logistics cost, maintenance cost, and lead to an increased lifetime of the hybrid genset the engine of the generator was only required at certain times of the day to ensure the lipo4 battery was charged

MINIMISE NOISE ON SITE

The battery is absolute silent when it's serving. Although diesel generators have come a long way in acoustic reduction, they still make around 75 dB(A) at 1m, so therefore when sound is critical a hybrid generator solves that problem. F.i. in residential area's the security system, and yard lighting is not asking for an engine running, in the night, as the battery have enough power stored to go on all night

UNINTERRUPTED POWER SUPPLY

In the situation where power is critical it is important that there are no interruptions from gridd supply. With a stand-by diesel generator you will experience a go "trough dark" a few seconds until ATS system takes over. Whit a hybrid generator, the battery system will ensure a continuous power supply. This is important when power is critical, for example computer systems which do not have their own Uninterrupted Power Supply (UPS).

In summary, hybrid generators can provide dependable power which is emissions friendly, can reduce fuel bills, minimise noise on site and provide an uninterrupted power supply.

HOW IT WORKS?

Telecommunications operators, all over the world face severe challenges in powering mobile base station (BTS) sites in remote areas. In many cases, the sites are simply too far or unreliable from the AC grid for AC mains powering to be economic. These sites are often powered by small diesel generator sets, running continuously. Sealed lead acid (VRLA) batteries provide back-up power to generator maintenance, start up and cover the occasional case when fuel runs out.

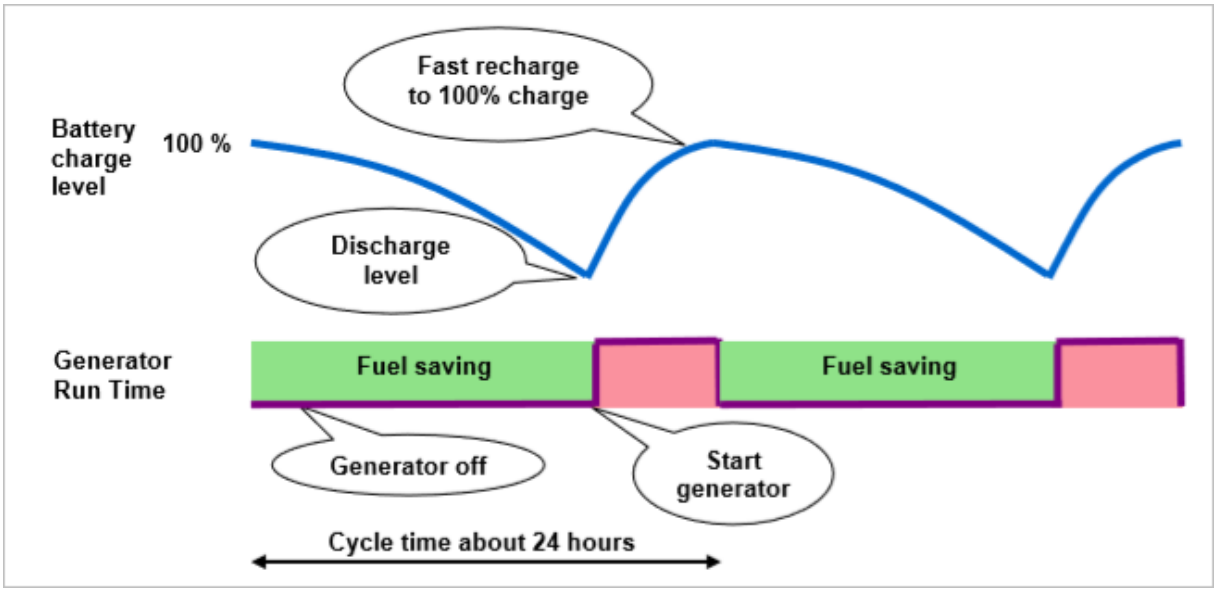
Ongoing costs are high and include:
• Direct fuel cost
• Truck rolls. Refuelling is usually needed every once a week, at a high cost by a very remoted site.
• Generator maintenance.
• Generator replacement. In continuous duty a small generator may only last two years.

By changing to a hybrid power unity, an operator can achieve significant savings in running costs. So, the generator only runs part of the time, and the battery runs the load while the generator is off.

In the conventional diesel-powered system, the generator has capacity for running the load and recharging the battery. To ensure a reasonable recharge time, the generator must be sized much greater than the load. But most of the time the generator is just powering the load, running at anywhere from 30% to 60% of maximum load.

The hybrid system changes this so that the generator is always running at close to full load. How? It only operates to charge the batteries. Once the batteries are charged, it stops.

• The system starts with a fully charged battery.
• The generator is turned off and the battery takes the load.
• Once the battery has discharged to a set level, the generator starts again and quickly recharges the battery.
• The generator is turned off again and the cycle repeats.



Typically, the generator will run for about 10 to 20% of the time. For the rest of the time, the battery is discharging. A full cycle can take around one day, depending the characteristics of the load, and how operation is optimized. More on this later.

2. Where are the savings?

Direct Fuel costs Consider this example:
A 15-kVA generator in a 24/24/7 duty at a load of 40% load. Takes 1.5 litres per hour, or 252 litres per week. Change this to hybrid operation at 80% load, 20% duty cycle. Then the fuel use is 2.65 litres per hour, or 89 litres per week at 20% duty cycle. This gives a 65% fuel saving.
Additional Refuelling cost Along with the reduced fuel consumption comes a corresponding reduction in truck rolls for refuelling. For remote sites, the cost of bringing fuel to a site is likely to be higher than the direct fuel cost.
Generator maintenance interval Instead of running 100% of the time at moderate load, the generator runs at full load for 20% of the time or less. The generator service interval is based on run time (not load), so the service interval is now at least 4 times as long. This provides a direct saving in truck rolls. Generator life is similarly increased, so replacement costs are much lower.

3. Batteries

Compare to VRLA batteries our lipo4 batteries are rated for at least 5000 deep cycles. In practice, with 80% depth of discharge, means the deeper the discharge, the longer the system runs on battery and the larger the fuel saving. The BMS (battery manager system) will automatically connect to the UPS/inverter to load accurate the recharge. The BMS + UPS must accurately manage charge and discharge cycles, including charge voltage, charge duration, charge rate and depth of discharge. Discharge accurately integrates the amperes discharged from the battery with time, to give an ampere-hours discharged total for the discharge / charge cycle. When this reaches the planned depth of discharge (20%) the UPS closes a contact to start the engine. With a well-controlled temperature and a good cyclic rating, we can expect a life span of 10 years or more. This needs to be factored into the calculated savings as part of an overall cost.

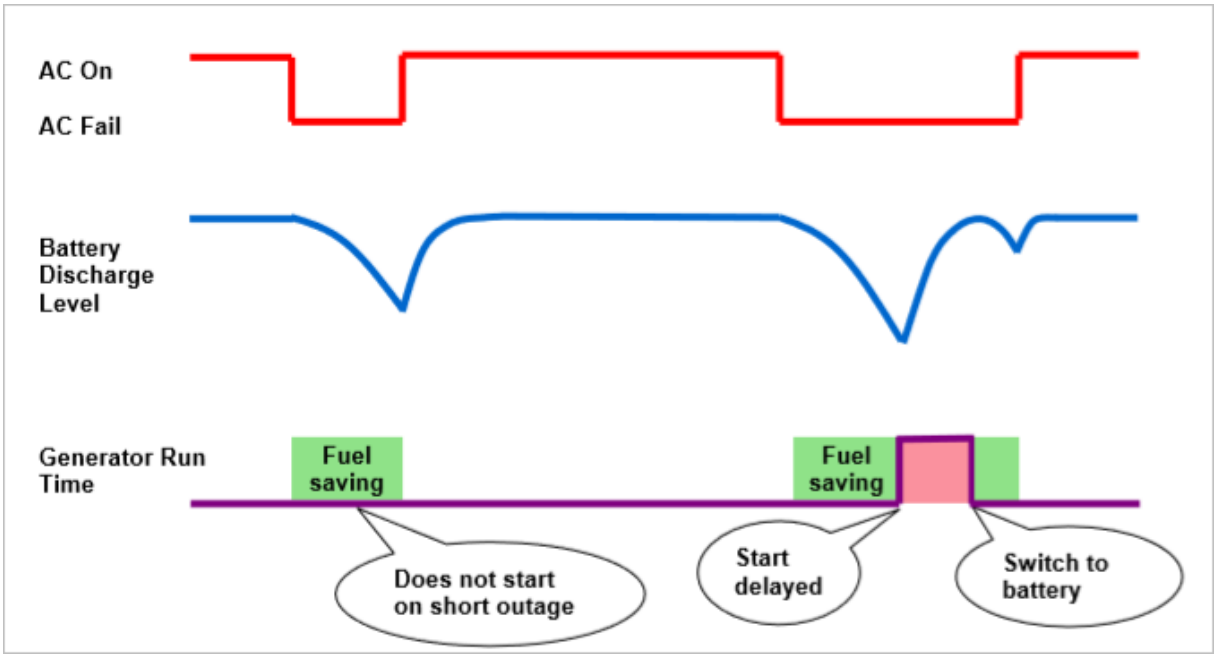
4. Optimization

Depth of discharge
Adjust the depth of discharge to balance battery life against the time running on batteries. The deeper the discharge, the longer the system runs on battery and the larger the fuel saving.

Monitoring
Using remote management, the network operator or service organization can prove the hybrid cost savings, ensure operation remains optimal, manage the response to faults, and support battery warranty claims. This information should be available remotely:

5. Grid-tied applications

Hybrid technology can provide even larger savings if AC mains supply is available. Then the batteries can be used to “ride through” an AC failure, without any need to start the engine. The engine only needs to start for longer AC failures.



Fuel savings will depend on the frequency and duration of AC outages. In theory, if all outages are less than the battery backup time, then fuel saving is 100%. Of course, this is unlikely to be achieved. But savings of more than 50% are likely.