The lithium homestead
Modern batteries in the bush

Rollo Sherriff, of Replenishable Energy in QLD, recently installed a large lithium battery based system in the bush. He describes this impressive system.

As lithium batteries become cheaper they are starting to appear in renewable energy systems. With their theoretically longer lifespan and ability to handle much deeper discharges than lead-acid batteries, they have become economically viable to use in many systems.

Being a tad cutting edge, you would expect to see them in early adopter's systems or in urban environments, where high-maintenance lead-acid cells are not ideal. However, they are also appearing in rural systems in some of the most unlikely places.

The system described here by the installer, Rollo Sherriff of Replenishable Energy, is on an outback station in QLD!

Outback solar

Barwidgi station, also known previously as 'Bullock Creek station' is situated 80km north west of Mount Garnet. It is quite large, covering 74,100 ha (183,027 acres).

Prior to the installation, the station owner Royce Goudie and Station Manager Alan were running the two homesteads and machinery shed on diesel generators. These operated for approximately 20 hours each day, with an annual fuel bill of between $20,000 and $25,000.

Barwidgi Station's electricity consumption is around 35 kWh a day, sometimes peaking at over 45 kWh a day. To provide this energy from sources other than the diesel generators required a bit of careful design.

The off-grid system was designed and built by John Inglis, the owner of Positronic Solar, Data and Electrical in Brendale, QLD. We installed it in mid December 2012.

This system is quite unique and different to most off-grid systems in that it incorporates a combination grid and off-grid components, including the use of a large, oversized array of grid-interactive type solar panels coupled to a pair of grid-connect inverters. This configuration can provide additional power of up to 6 kW once the batteries banks are fully charged.

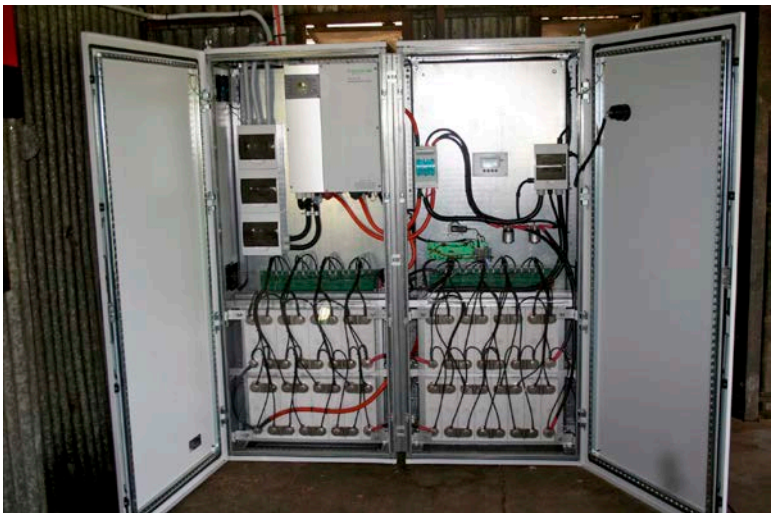
The energy produced during the day is not subject to typical power demand inefficiencies when used directly by the appliances. Charging batteries and then drawing power from the batteries via the

↑ The solar array is quite large, coming in at 14kW. Oversizing arrays is becoming more common due to the low cost of PV panels. Having an oversized array means that the array produces the full inverter capacity for longer each day, although the extra capacity above the inverter rating isn't utilised.

System specs

- Solar array: 14 kW, consisting of 56 ET250 monocrystalline panels
- Grid-connect inverters: two SMA 3000TL-21 inverters, total 6 kW. These feed into a Schneider Electric Xantrex XW Hybrid 6 kW inverter charger.
- Battery bank: two banks of 48 V, 300 Ah HighPower lithium iron phosphate batteries (sixteen 3.2 V cells in each bank). These are controlled by a custom BMS (battery management system).

↑ The two SMA grid-interactive inverters at left, with the battery and equipment enclosure at right



↑ Inside the battery and equipment enclosure. As you can see, the batteries are quite small for the capacity available.

Xantrex XW hybrid inverter charger could produce up to 15% power loses. Instead, this AC coupled system avoids those losses for a lot of the energy used.

Once the batteries are near fully charged, the system user is able to fully utilise the addition power for any other purpose, or luxury, such as doing the washing, the transfer of water (running pressure pumps) and even air conditioning. This allows the good use of energy that would otherwise be wasted.

The system is also connected to the generator via the Xantrex inverter. It is set to run at 30% battery capacity.

Since installation the generator has kicked in only once after three days and 500 mm of rain, and then only ran for four hours. This was in the third week of January during ex-tropical cyclone Oswald.

The battery system supplied has approximately 24 kWh of usable energy storage, at 80% depth of discharge. At this level of DoD it is rated for at least 3000 cycles, with 80% battery capacity still available.

→ The custom battery management system—all lithium battery banks require the use of a BMS.

The total system cost including GST was $63,000. After STC rebates of $18,500 it cost $44,500, supplied, installed and commissioned. Against the previous cost of running the diesel gensets, this equates to just a two year payback period. ✱