Seb Stops a Gen

The largest cattle farm in Zimbabwe sits a long way from the national electric grid, in the hot and dry south of the country. Until last week, the farm was totally reliant on diesel generators for power. Powering lights, refrigeration, pumping and a full workshop was expensive and troublesome for the owners. And yet they were located in one of the sunniest zones in Africa. So when Sebastian Smythe from Solar Energy Projects in Harare made a proposal for an AC-coupled solar system to replace the generator, it seemed like a no-brainer. They accepted, and Seb went to work.

Solar Energy Projects replaced the 18kW single phase generator with a 25 kW rack-mounted PV array. Most of the solar array feeds two 8kW Fronius Primo PV inverters which are AC coupled to the outputs of two Schneider XW+8548E inverter/chargers. The XW+ inverters manage the energy storage, which is provided by 24 pieces of Rolls 2KS-33PS flooded lead acid batteries of 1765 ah. Most of the loads are during the daytime, so this AC-coupled arrangement makes sense. The power gets sent directly to the loads from the PV inverter, without going through the battery. Any excess power is used to charge the battery. When the sun fades, the XW+ inverter is there to pick up the slack and provide power from battery.

Seb was a bit nervous, because this was his first time installing an AC-coupled system. His many years of experience made it difficult to actually connect the output of one inverter to the output of another inverter. (For many of us, this seems counter-intuitive and we can only imagine the smoke and sparks that would result!) But the XW+ inverter mimics the power grid and "tickles" the PV inverter into action – and then regulates its output by subtly shifting the frequency on the mini-grid it has created.

Since heat is a major issue for the batteries at this site, Seb installed them on the south side (remember this is the southern hemisphere) of a concrete block building with breeze block in the walls. The batteries are about 100 cm apart to increase ventilation, and of course, he has installed the battery temperature sensors that were included in the XW+ box. In order to insure that the batteries get fully charged, Seb has wired part of the array through several XW-MPPT-60 charge controllers, so that part of the system is DC coupled. This part of the of array is dedicated solely to battery charging, and is Seb's insurance

against battery damage from deficit cycling or partial state of charge.

Seb chose the rugged Schneider XW+ inverter because many of the loads on the farm require a large starting current. There are inductive loads like water pumps, grinding machines and refrigerator motors with a high power draw on start up. The transformer-type design in the XW+ inverter helps it tolerate the surges required to start these loads without damage.

Both the XW+ and the Fronius have their own remote monitoring systems, but both require internet access. Even a slow data connection to the site, like a GSM modem, allows remote monitoring anywhere around the world. So the owners can see how much power is being created and how much energy is left in the batteries. They could also tell if the generator was running, but they (and Seb) hope to never hear the sound of a generator again.