SIECKMANN ENGINEERING
SOLAR ENERGY DESIGN

Achieving a Carbon Neutral Solution

Increasing Eco-compliance pressure is being applied to South African farmers who export products to UK/European companies. This pressure is being brought to bear by the well regulated UK/European agencies, and is in turn filtering down to all local and international suppliers to organisations such as UK based Tesco, (our equivalent of Pick & Pay), who are applying stringent measurement criteria on the carbon footprint of their suppliers and products. In some cases export contracts have been cancelled as the South African supplier did not meet the required UK carbon footprint standard.

South African international tourist destination resorts and game farm operations are coming under a similar spotlight and need to become "Eco-compliant" and demonstrate eco-sensitivity if they are to be offered to the international tourism market by international tourism agencies.

Whilst few will argue with the need to become eco-friendly, given the devastating effects of carbon emissions on the environment, the reality is that the world is in an economic slump , and these objectives will have to be achieved without further burdening any economic recovery, as everyone seeks to reduce operating costs.

Low oil prices rapidly fueled our dependence on fossil fuels, which are today the biggest contributor to carbon emissions. The reality is that today fuel and electricity costs are rapidly rising with diesel prices increasing by 5% every 4 months and with Eskom needing an effective 200% increase in tariff by 2013!

The challenge is not only to preserve the limited supply of increasingly more expensive fossil fuel, but MOVE AWAY from our total dependence towards a cleaner, more cost effective low carbon emission power source. The solution to these combined issues no longer lies somewhere in the future but is able to be successfully addressed today by farmers/producers/resorts utilising electric vehicles not only to demonstrate carbon compliance but also reduce monthly operational costs.

For our Melex electric utility this equates to R725 per month vs a petrol quad bike at R1674 per month or a diesel bakkie at R2230 per month (see our cost of operation and ownership vehicle comparison on www.electrovehicles.co.za/agriculture). We believe that the commercial and industrial ELECTRIC VEHICLE has developed and matured to a point that it is a reliable, cost effective and eco-friendly alternative to the traditional petrol or diesel farm or resort utility vehicle.

Although an electric vehicle does not burn fossil fuels directly, the electricity provided in South Africa by Eskom to recharge the batteries is generated by coal-powered power stations as well as nuclear. Coal-fired electricity generation has a typically high output rate of CO_2 per kilowatt hour and in the case of Eskom generation in SA equates to approx 0.72 kgs CO2 per kilowatt hour averaged across the country.

Table 1: CO2 released per kWh

Carbon dioxide released per kWh of electricity generated For fossil fuelled power stations Approximate values	
Natural gas	= 0.45kg
Oil	= 0.5kg
Black coal	= 0.8kg
Brown coal	= 1.2kg

Becoming **carbon neutral**, or having a **net zero carbon footprint**, refers to achieving net zero carbon emissions by balancing a measured amount of carbon released with an equivalent amount offset.

Whilst the introduction of the Electric Vehicle will reduce the operating costs of farm/resort vehicles it does not completely eliminate the carbon emissions generated by the production of electricity. Serious consideration must be given to cost effective solar power generation (up to now not successful) in sufficient quantity to supplement the power requirements for the the farm or resort – achieving a carbon neutral solution !!!

In order to provide this solution to our customers **Sieckmann Engineering** (www.sieckmann.biz) in combination with **Melex Electrovehicles** (www.electrovehicles.co.za) have successfully designed and tested the process of recharging our electric vehicles by means of renewable sources, and have implemented a full real-world working test-bed at Wildgarten Flowers Farm in Stanford.

Our tests show that carbon neutrality can be achieved by installing a solar array of 1.7KW in order to produce the 8kWh daily average recharge requirement of a Melex electric vehicle. In addition any excess energy can be fed into an existing private mini-grid, or with consent from the energy provider, into the national grid. This same system can also be used as the building blocks for becoming entirely self sufficient for power requirements and becoming totally “off the grid” !

In order to achieve the carbon neutral solution for running the electric vehicle the following items and costs are included below:

Table 2: Capital Costs to achieve Average CO_2 Neutrality for a Melex Electric Vehicle (11.10.2009)

Rating	Item Description	Amount
1700 W	PV Array (Watts)	R 51,000.00
1700 W	Grid Inverter	R 13,000.00
2200 W	Battery Inverter	R 25,000.00
2	Batteries	R 2,000.00
	Installation	R 20,000.00
	Total Investment	**R 111,000.00**

The following calculations illustrate the return on investment **at today's energy charge.**

Table 3: The following figures are based on real values at Wildgarten Farm at Stanford, South Africa

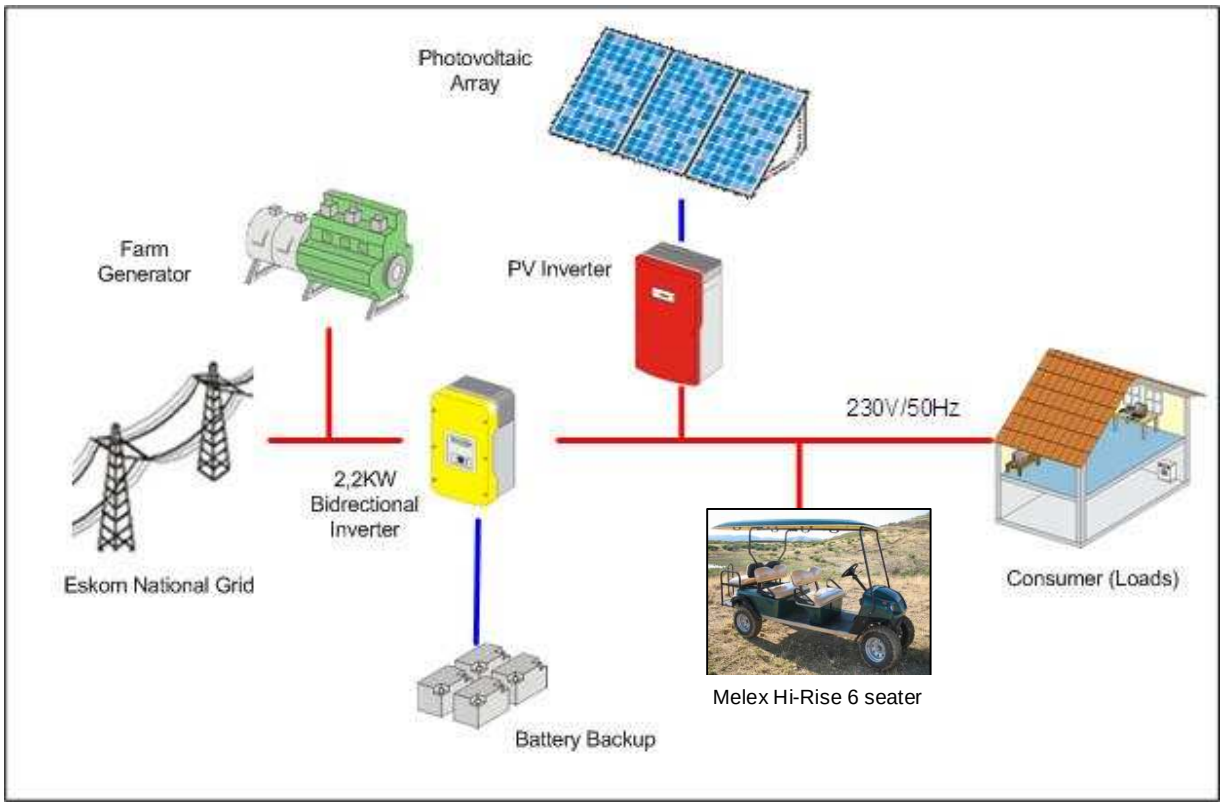
Item Description	Values	Rate
Load / day (Melex Vehicle)	8	kWh
Load / month (Melex Vehicle)	240	kWh
Rural Energy Charge / kWh	R 1.00	Per kWh
Energy charge (Stanford Farm)	R 240.00	pm
Eskom Rental (Stanford Farm)	R 840.00	pm
Total Monthly Eskom costs	**R 1'080.00**	pm

ROI by installing Carbon Neutral System (at current Eskom rates) **8.56 Years**

ROI by installing Carbon Neutral System (at projected Eskom rates) **4 Years**

SIECKMANN ENGINEERING
SOLAR ENERGY DESIGN

Functional Diagram Carbon-Neutral System



Summary

Through the implementation of electric vehicles and renewable energy generation, farms and resorts are able to successfully reduce their overall carbon footprint, with solar power generation in sufficient quantity not only to meet the recharge power requirements of the electric vehicle but also to assist in providing surplus electricity generated to the farm or resort – achieving a carbon neutral solution !!!

Melex Hi-Rise Farm Utility