

innovate

2014

SUSTAINING AN
INNOVATIVE AND
GLOBALLY COM-
PETITIVE FRESH
FRUIT INDUSTRY



POST-HARVEST
INNOVATION PROGRAMME



The sunny side of saving

A new computer-based tool is helping cold store and pack house owners to look at their electricity bills through solar-tinted glasses.



Energy audits at 29 facilities have indicated that solar energy can, on average, shave 27% off a pack house or cold store's electricity bill.

THEY DON'T CALL IT 'SUNNY SOUTH AFRICA' for no reason. Most parts of the country enjoy an average of 2 500 hours of sunshine per year, giving us one of the best solar resources in the world. Yet, the uptake of renewable energy, including solar, has been slow.

For several decades, South Africa had the cheapest electricity in the world. This, coupled with a general ignorance about climate change and the need to conserve the environment, had us turning a blind eye to the infinite source of energy at our disposal.

In 2008, however, widespread rolling power outages gave South Africans the wake-up call they needed. It became glaringly obvious that the national energy supply was under pressure and that the days of cheap and abundant electricity were over.

The fresh fruit industry is not shielded from energy pressures. Electricity supplied by the national utility is becoming increasingly expensive and carries a heavy carbon emission burden. The industry faces a possible carbon tax at home and pressure abroad as consumers in export markets demand fruit that is as free of CO₂ emissions as possible.

Although agriculture will not be taxed directly, it is possible that Eskom may add a tax factor into its cost/kWh. This means that carbon will be an input cost.

CASE STUDY

Arbeidsvreugd Fruit Packers (Pty) Ltd, Villiersdorp.
System size: 450kWp (kilowatt peak)
Electricity generated: ± 743 000kWh per year
CO₂ avoided: ± 733 tons per year
Savings: ± R600 000 in the first year
Total savings over 25 years: ± R38 million
Payback period: ± six years

According to Government's latest carbon tax table, businesses can offset up to 10% of electricity-related carbon costs in their annual tax returns.

Understanding that the energy challenge needs to be addressed, the Post-Harvest Innovation Programme initiated a project to raise awareness in the fresh fruit industry about the potential of solar energy to bring down energy costs.

While the sun gives its energy for free, the infrastructure to harness it involves a significant investment. Knowing which solution to install requires specialised information – which usually comes at a considerable cost. Clemens Brandt from RED Engineering was therefore tasked to develop a tool that would empower producers to evaluate the viability of implementing solar energy at pack houses or cold stores and for household or other business uses.

A TOOL FOR ALL

Mr Brandt and his team's solution is a web-based tool that can be used to conduct a free, on-line analysis of the potential cost and savings of a solar power solution. "We've also untangled all the intricacies involved in integrating Eskom electricity with a solar system – from household to industrial scale," says Mr Brandt.

The process couldn't be simpler. Apart from electrical consumption data for a 12-month cycle, the model requires the user to punch in the location of the facility, the area available for solar panels, the angle of the roof and the direction it is facing, current electricity cost structures, maximum electricity demand, cost per unit and total cost.

In response, the model generates a report that provides the user with all the information necessary to make an informed decision about an investment in a solar photovoltaic (PV) system. It makes recommendations in terms of the size and technical



PROJECT TITLE

The development of a solar power viability model for the implementation of solar electricity generation at pack houses and cold stores

PRINCIPAL INVESTIGATOR

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DURATION

One year

PHI-2 CONTRIBUTION

R240 000

LEAD INSTITUTION

RED Engineering (Pty) Ltd

BENEFICIARY

The entire fresh fruit industry

FOCUS AREA

Energy efficiency in the supply chain



1 Clemens Brandt.



Solar energy is safe, environmentally friendly and the most readily accessible energy source in South Africa.

Each kWh of Eskom electricity equates to approximately 1kg of CO₂ emissions.

The PV system has an assumed lifetime of 25 years.

The solar power decision-making model is available to all pack houses and cold stores, at no cost.



characteristics of the PV system most suitable to meet the energy needs of the facility, based on the data profile, and supplies costing calculations.

Finally, the model analyses and calculates the approximate investment cost based on current product prices, rates, the projected electricity expenditure, the seasonality of the client's industry and the seasonality of solar power levels. Armed with all this information, the producer can make a decision to invest or not and is equipped to negotiate with his PV system supplier of choice.

"The fruit industry's electricity profile is unique, given the seasonal nature of its energy demand," says Mr Brandt. "Add to that the fact that solar energy supply is also seasonal, and one can see why the PV decision is not a simple one and why a solar solution has to be integrated with the Eskom supply."

The tool that Mr Brandt and his team developed can be used by all South Africans to do an independent analysis of their electricity consumption data – at no cost. The results of the analyses are meant to serve as a basis for further discussion and analysis before the homeowner or business owner comes to a final decision regarding the switch to solar energy. "Even though RED Engineering is the author and initiator of the analysis system, users are free to approach any player in the industry to help them make a final decision," says Mr Brandt. "Our aim is to help users achieve the optimum balance between solar power and Eskom-supplied electricity and to reduce energy cost and carbon emissions over the long term." 🍏

HOW DOES SOLAR ENERGY WORK?

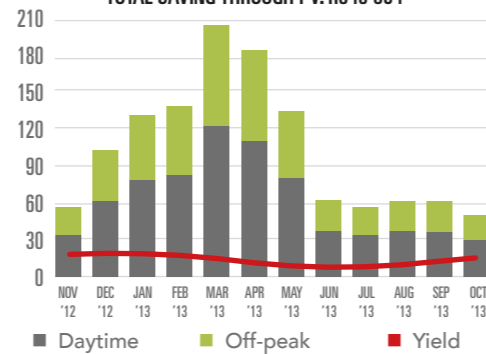
Solar panels collect solar energy, or sunlight, and convert the radiant heat into energy to produce electricity.

A solar power system consists of solar panels, inverters, optional batteries and a charge controller. Solar panels are connected assemblies of several photovoltaic cells. Each individual cell is coated with a positive and negative layer to create an electric field.

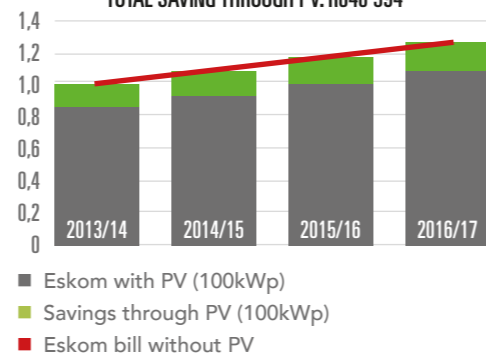
As photons from the sun, or sunlight energy particles, enter a cell, they allow the electrons in the cell to become free. The free electrons flow through a wire connected to the photovoltaic cell and becomes electricity.

Source: livinggreenmag.com

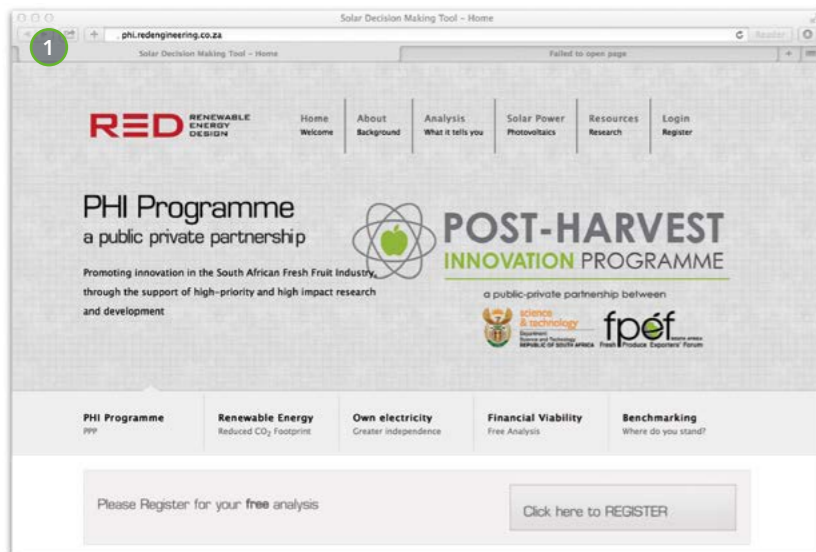
MONTHLY USAGE & YIELD ('000 kWh usage)
TOTAL SAVING THROUGH PV: R648 594



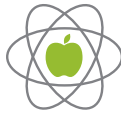
ANNUAL ELECTRICITY EXPENDITURE (Rm)
TOTAL SAVING THROUGH PV: R648 594



To investigate the viability of solar energy for your pack house or cold store, visit <http://phi.redengineering.co.za>



- 1 The PHI/RED Engineering website that hosts the solar energy decision-making tool.
- 2 Inverters convert DC current from the photovoltaic panels to AC current for grid use.
- 3 The 450kWp photovoltaic installation in Villiersdorp. The 1 876 panels produce more than 3 000kWh of electricity on a sunny summers day.



POST-HARVEST
INNOVATION PROGRAMME

a public-private partnership between



science
& technology
Department:
Science and Technology
REPUBLIC OF SOUTH AFRICA



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