



Farm Management

Handout I

Energy Smart Farming

CASE STUDY:

Energy-smart farming – April 2010: Story by Liza Burger

The national energy regulator, Nersa, announced in February that Eskom would be allowed to increase electricity tariffs by 24.8%, 25.8% and 25.9% over the next three years.

While this is not the original 35% hike Eskom applied for, it is still a hefty burden on milk producers, whose input costs are high to start with. Last year, Eskom increased its tariffs by 31%. That, together with the latest tariff increases, will move South Africa from its position as one of the cheapest energy suppliers in the world a few years ago, to one of the top ten most energy-expensive countries.

The effect this will have on the bottom line will be significant, as modern dairies are mechanized and often reliant on electronic measuring and monitoring technology. Cooling tanks cannot be done away with and warm water for washing milking equipment and tanks, remains a necessity.

Alternative and effective

Cutting costs means cutting on Eskom power usage by combining more efficient electricity usage and implementing alternative energy sources.

More effective electricity consumption should be the first step in exercising better control over your electricity bill. Coordinating activities that use high voltage during Eskom's off-peak periods, is a good start. This lessens the load on the national grid and is slightly cheaper than peak-time electricity.

While there are quite a number of very clever and effective ways to become independent from the main power grid, it is not always immediately practical or affordable in the South African context. Although plans are in place and exist on paper, it is not yet possible for most people with alternative energy sources, to feed their surplus power into the country's main power grid.

But future plans envisage that the power you generate, but don't use, can be sold to the utility company (in our case Eskom). This means that alternative energy does not only save you money and is better for the environment but has the potential to make money!

Switch to sun power

Locally the most affordable, practical and immediately available alternative source of energy, is sun power. Solar panels can be used to supply electricity for water pumps, charging batteries or for lighting. However, photovoltaic solar panels are expensive, have a lifespan of approximately ten years, and can be vulnerable to hail and theft. They also need to be cleaned regularly, as dust reduces efficiency.

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However, solar power used for heating water is currently one of the most affordable and practical starting points when it comes to using clean and sustainable alternative energy sources.

Cobus Roux of the solar heating and energy company, Home Comfort, says the normal range of geyser capacity (100, 150, 200 and 300 litres) also apply to solar geysers and, for larger capacities; a purpose-designed system can be installed.

“Solar power is ideal for cooling and lighting applications but has a substantially higher start-up cost per kW.”

“Solar water heating, in comparison, has a substantially lower cost per kW produced, but is limited to heating applications. Solar heating is a great starting point, as any heat-producing process consumes a large volume of energy,” says Roux.

Let Eskom pay you back

Many jokes have been made about Eskom, but the reality is no joke: South Africa’s capacity to deliver reliable power to the national grid, is failing and will continue to do so unless some drastic steps are taken.

In a bid to lessen the stress on the power supply, Eskom is actually paying its customers rebates to find an alternative source of energy! So how does the rebate system work?

“To reduce the growing demand for electricity, Eskom has started energy efficiency and alternative energy programmes that promote energy savings on a large scale.

“The programme is structured around a rebate which reduces the selling price of and SABS-approved solar water heating system. The reduction in price is based primarily on the performance of the solar water heater and its associated electricity saving potential.

Only registered products complying with the Eskom DSM criteria, qualify for the rebate. Solar heating systems must include:

- A high-pressure system 100kPa and higher.
- A timer to optimize energy savings and regulate everyday usage. Alternatively, a load management device to control the usage in crisis situations.
- The system must be appropriate for the intended use and area, in terms of size, frost protection and water quality compatibility.
- It must have a comprehensive guarantee of at least five years.
- The system must have the South African Bureau of Standards (SABS) mark and comply with the South African National Standards (SANS) for thermal and mechanical performance and safety.

- The supplier of the system must be registered with Sustainable Energy Society of South Africa's (SESSA) solar water heating division.
- Installation must be done by a registered installer and the customer will only be able to claim the rebate once the facilitating auditors receive a final invoice from their supplier. "Customers who qualify receive a rebate directly from Deloitte, the facilitating auditors of the programme." According to information supplied by Eskom Demand Side Management (DSM).

The Eskom supplied list indicates the relevant suppliers, contact details, system specifications, indicative retail price, the expected installation charge and qualifying rebate.

Look for the best

"Both SABS and Eskom approval are only an indication that a system complies with basic requirements. Best is to look for a reputable supplier with long track record, in conjunction with a long warranty period, and relevant references," advises Roux.

Extras to be on the lookout for are an extended warranty period of ten years (or even longer) and hail-resistant models.

Take note that terms and conditions do apply and before any installation is considered, the Eskom supplier list should be consulted. Prices for systems and tariffs for installation vary significantly.

A typical 300-litre, flat plate, thermo-siphon, indirect solar water heating system can cost from as little as R20 000 (approximately R2 000 for installation) with a rebate of about R7 000, while a similar system can cost up to R30 000 (R5 000 for installation) with a rebate of around R12 000.

The cost of a solar water heater (including installation) is higher than electric or gas water heaters, but the savings on your electricity bill will compensate for this over-time. Once you have paid back your system through saving, your hot water is for free!

Log onto www.eskom.co.za/dsm for more information, e-mail solar@eskom.co.za or phone 011 800 4744 to make sure you are on the right track and that you do qualify for rebates.

Other alternatives

Wind turbines are effective in constantly windy areas, but expensive to buy, install and maintain. Back-up batteries are needed for those not-so windy days and wind turbines are not suited for all areas. Conservationists are also calling for stricter environmental impact studies, as the larger electricity wind mills seem to affect bird life adversely.

However, as an alternative source of energy for specific uses such as charging back-up batteries (incorporated into the farm's power grid) or powering water pumps, wind turbines can be of good

use on most farms. The windmill next to every dam on the South African landscape is proof that wind power has been the farmer's friend for more than 100 years.

Giant wind turbines, such as those near Klipheuwel in the Western Cape, are still being tested for proven efficacy and reliability within the South African context. Large wind farms are much more common in Europe and have been proven to be a popular and effective source of sustainable alternative energy.

Another golden oldie with a modern application, is the water wheel. It is an old concept, but combined with modern technology, this can be a real energy saver if you have fast-flowing water on your farm. However, with South Africa's notorious inconsistent weather patterns, recurrent droughts and criminal element, this option should be well-considered before spending a lot of money on it.

Clever adaptations to the stationary water wheel solve most of these problems. Mounted on floating pontoons, the revolving wheel can be moved as the level and flow of a stream or river changes. This is a great way to power water pumps.

Methane gas is used effectively, although not widely, as a source of energy in both the first and third world. Using the gas produced by digested manure and effluent, large farms (especially piggeries) elsewhere in the world can run whole farming operations from these methane plants.

A simplified version of this technology is used on some farms in rural Africa and these small-scale methane gas plants provide a steady source of cheap, gas-based energy.

However, running such a methane plant to be used on a modern commercial dairy farm, requires a large herd and effective manure management.

The farm needs a properly installed manure collection pit, a covered digester, a means to effectively harvest the methane gas, a generator that uses methane gas as energy source and the ability to turn this energy into a steady stream of electricity. It is an expensive exercise that needs strict management but will be one of the energy sources to watch on the agricultural front in the future.

Pure solar power from photovoltaic panels, enables you to harvest electricity from the sun and not just energy to heat water with. The installation and costs involved are much more comprehensive and some photovoltaic panels have a lifespan of only 5-10 years, depending on conditions.

The typical components of a solar power system are the photovoltaic module, batteries, inverters, controllers and physical structure, although exceptions to this rule do exist.

The batteries are needed to store electricity to provide energy on demand at night or on overcast days. Controllers manage the energy storage to the battery and deliver power.

To convert the DC power produced by the photovoltaic module into AC power, an inverter is required. A proper structure should be used to mount and install the PV modules for optimal sun exposure.

Interesting solar fact: The silicon from just one ton of sand, used in photovoltaic cells, could produce as much solar power as burning 500 000 tons of coal!

Additional power sources, such as a generator or the local power grid, can be connected to the system to supplement the power requirements as needed.

“Although there is still no Eskom rebate on solar power for electricity needs other than heating water, credits and funding are available for commercial systems which might apply in some cases to large dairy farms,” says Roux.

“Integrating solar power into a farm’s power grid is also possible. Although the initial capital outlay can be expected to be large, the long-term savings and independence from an Eskom-only power supply, is worth it.

“Standard application for a solar power system to supply into the same local distribution grid as Eskom, is possible and solar can be referred power source with Eskom as a back-up source.”

Budget call

Before switching to solar powered geysers or implementing alternative energy sources determine your budget to ease financial planning:

1. Install a meter that will indicate electricity use (national grid). Take measurement of typical electricity usage levels before implementing power-saving habits or installing alternative energy sources. Determine the cost per kW.
2. Determine the full cost of buying, installing and integrating the alternative energy system.
3. Calculate the amount of kW which the new energy source will “save” in monetary value per year.
4. Determine how long it will take before the new installation will deliver “free” energy.