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BENEFITS OF STANDALONE POWER SUPPLY SYSTEM

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Abstract

This text will present the benefits associated with the installation of Standalone power supply system. SAPS system allows households, farms or lodges, whether remote or urban, to generate their own electricity. They are based on generally renewable energy system or diesel generating sets. A case study with the cost comparisons is also shown in this paper.

Key-Words: SAPS (Stand Alone Power System), renewable energy, Gen-set(Generator set), Wind turbine , solar Electric, micro hydro, voltage regulator & controller, energy usage.

Introduction

A Stand Alone Power Supply (SAPS) system can provide you with electricity independent of the local electricity network. A SAPS system allows households, farms or lodges, whether remote or urban, to generate their own electricity. These SAPS systems are usually based on a renewable energy resource and/or a diesel generating set. A SAPS system can be used to avoid electricity connection costs or by people who wish to be independent of the mains electricity network or 'grid'. The many residents Peoples are using SAPS systems. So, if you are not currently connected to the local electricity distribution network, or you want to disconnect, a SAPS system may be for you. The type of system installed depends on your specific energy requirements and the renewable energy resources available in your area. There is many different SAPS system configurations- Solar, wind, micro-hydro or diesel engine generation sets; it can provide independent electricity supplies.

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Preferring saps system

The alternative to a SAPS system is to connect to the grid. The cost of connecting to the grid mainly depends on the distance involved - an electricity lines company will charge you about $17,000 to $22,000 per kilometre of line required to connect. It pays to get a quote from a local lines company. This grid connection cost issue is why most SAPS systems are installed in rural areas. There will also be ongoing electricity charges if you connect to the grid still have to pay for the electricity use).

Options considered

Hybrid SAPS system

A combination of the systems below is often used, such as wind, solar electric and possibly a small petrol or diesel generating set (gen-set) providing backup electricity.

Micro-hydro

Requires a reliable water supply with sufficient fall (head) and flow. Where a suitable water resource is available, micro-hydro schemes provide an excellent basis for a SAPS system. They generally deliver a continuous supply of electricity without regularly needing backup power. However they need to be carefully designed to cope with flooding and silting.

Wind

The site for a wind turbine must be chosen carefully. Need to avoid turbulence from trees and buildings, while minimising the length of cabling for connecting the turbine. Wind is not always available, so batteries and backup power (eg. a gen-set) are normally required.

Solar electric

Solar electric panels are almost zero maintenance. However, because the sun doesn't always shine brightly batteries and backup power is required from a gen-set (batteries will require some maintenance). While solar power can be used in most areas, it is often more expensive than power from micro hydro or wind turbine systems.

Gen-set

A diesel or petrol powered gen set can be used on its own to provide power, but it's generally used only as backup power in a hybrid SAPS system. Whatever system we use, we'll need to know how to best manage our SAPS system to ensure the longevity of system components.

Cost of SAPS

The cost of a SAPS system is highly variable. It depends on your electricity requirements and the renewable energy resources available in your area. A SAPS system for one person with a flexible lifestyle and low electricity use could be installed for less than $5,000. A typical system for a couple could be up to $20,000. Higher capacity systems can cost over $30,000. The advantage of a SAPS is that it is modular and can be added to as finances permit (though some allowance must be made for future capacity, as well as any electricity shortfall in the interim).Remember that maintenance will also be required. While cost is important, it isn't always the main issue. There may be considerable satisfaction from being independent of the grid and from meeting our electricity needs in a sustainable manner. Some people in urban areas still decide to use SAPS Systems.

Integrated design

The cost of a SAPS system is largely related to the peak load it supplies (the peak load occurs when most, or the largest, appliances are running at the same time).

Therefore it's important to reduce your peak electricity requirement to keep your SAPS system costs down. There are many ways to reduce peak electrical load, and some are best achieved when building a new home (eg. Maximising the use of natural lighting or using solar hot water heating). However, large reductions in peak demand can still be made in an existing home. Peak electricity demand can be reduced by applying energy efficiency and management techniques and by choosing energy sources other than electricity for energy-intensive activities (eg. heating and cooking). we can gain significant benefits simply by thinking carefully about when we use various appliances. For example, don't use the washing machine at the same time as you're doing the ironing. Both are energy intensive activities. It's important to think of how to best meet your overall energy requirements and not just consider electricity alone. Remember to contact our Council to find out if we need to apply for consent under the Resource Management Act for our system (particularly for wind and micro-hydro systems).

Case Study

A new home was being built 8 km from the centre of DULHE North, though the site was not connected to the local electricity network. A local electricity lines company quoted the new homeowner $45,400 to install the lines and poles necessary to connect the house to the electricity network. In addition to this connection cost, there would be ongoing monthly power bills. The homeowner investigated various options, and finally decided to install a SAPS system for a total cost of $23,730. The cost breakdown is as follows:

Solar electric panels	320W total $3,330
Inverter/charger	$5,563 (expensive, but it contains some excellent features)
Petrol generator	$1,320
Wind turbine	1000 Watts $4,536
Tower kit for wind turbine	$1,650
Batteries	785 amp hour total $5,176
Installation	$2,155
Total	$23,730

While this SAPS system is only half the cost of the connection to the local electricity network in this case, it is quite a large system for the sole home owner. However, the system provides more than adequate power, and also allows for increasing power use in future if required.

Issues considered

Before designing a SAPS system it is most important to reduce our electricity needs. This can be done by using energy efficiency and management ideas and by considering different sources of energy for energy intensive activities. This is necessary because of the relatively high costs for deep cycle batteries, solar electric panels and inverters. The following alternatives are worth considering reducing our peak electricity demand

Cooking – Use either bottled gas or a wood-fired stove.

Water heating – Install solar water heating and/or a wetback in a wood burner, or wood-fired stove. Alternatively, use a gas hot water cylinder.

Space heating – Use passive solar design concepts to maximise useful heating from the sun without over heating (insulate well). Install a modern wood burner.

Refrigeration – Use an energy efficient refrigerator in a cool well ventilated room. Alternatively, you may want consider purchasing a

gas powered refrigerator if you expect to use gas for other purposes too.

Lighting – Maximise the use of natural lighting during daylight hours and use energy efficient fluorescent lighting. Many modern household appliances use a small amount of power when in standby mode (eg. television, garage door opener, cordless phone, rechargeable electric drill). These stand-by loads, that can easily add up to 100 Watts of continuous power, can be similar to leaving a main ceiling light switched on permanently. Where practical, it's best to turn devices off at the wall when not in use, or when the internal batteries are fully charged.

Conclusion

It may not be cost effective to meet all our electrical requirements with solar and/or wind energy as the battery storage required may be large to cover those worst case cloudy and windless periods. An option is to compromise by meeting most of the load with these renewable energy sources and occasionally topping up the system using a petrol or diesel gen-set. This does not necessarily apply to micro-hydro systems. Micro-hydro can generally meet all electrical demand if the watercourse is adequate over the drier months (though there will be 'down time' due to maintenance). The key factors in designing our system are knowing how much electricity we need and the available resources in your immediate area. Our system designer will certainly want to know how much electricity your household uses.

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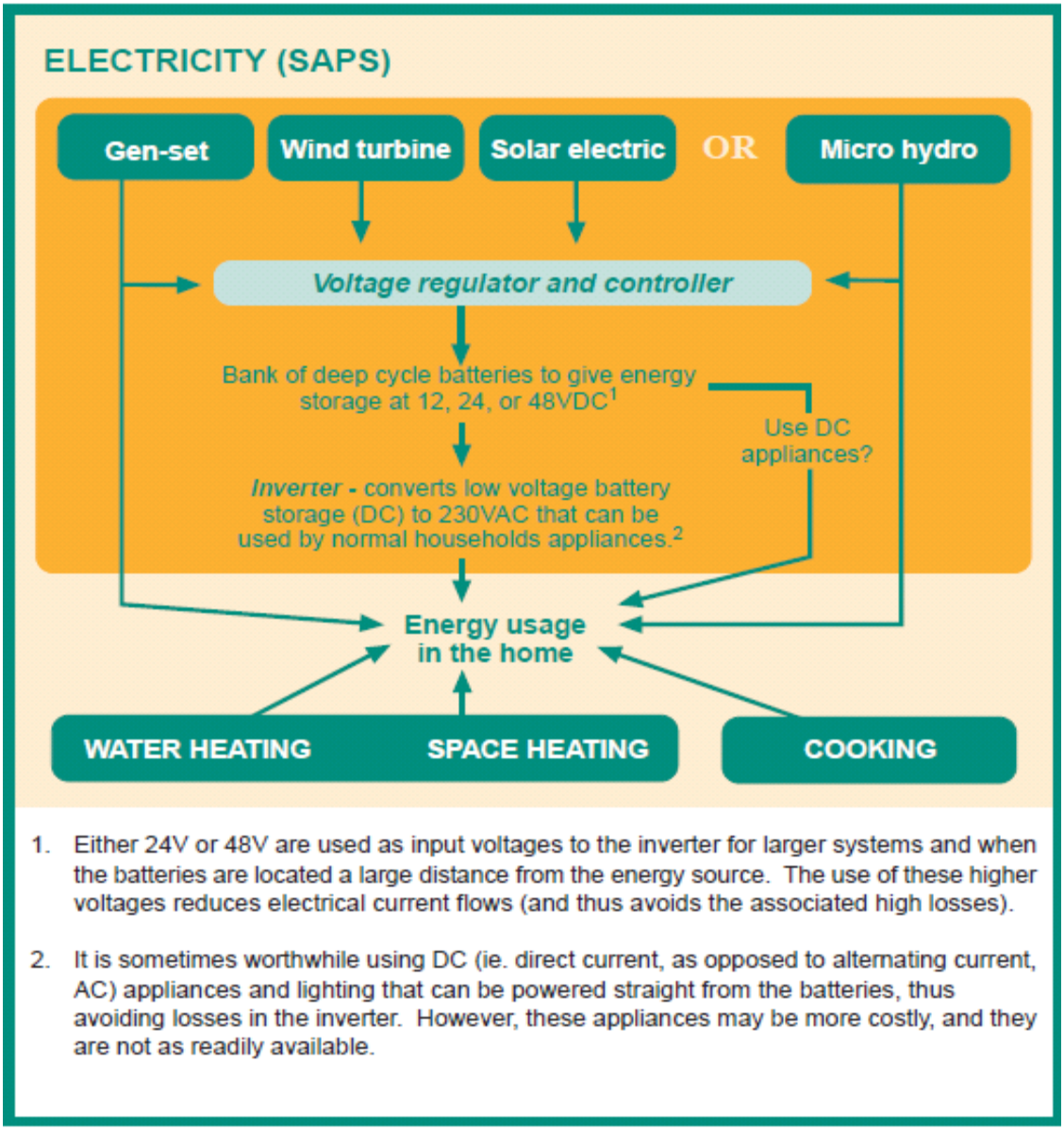

Fig. 1: Electricity (SAPS)