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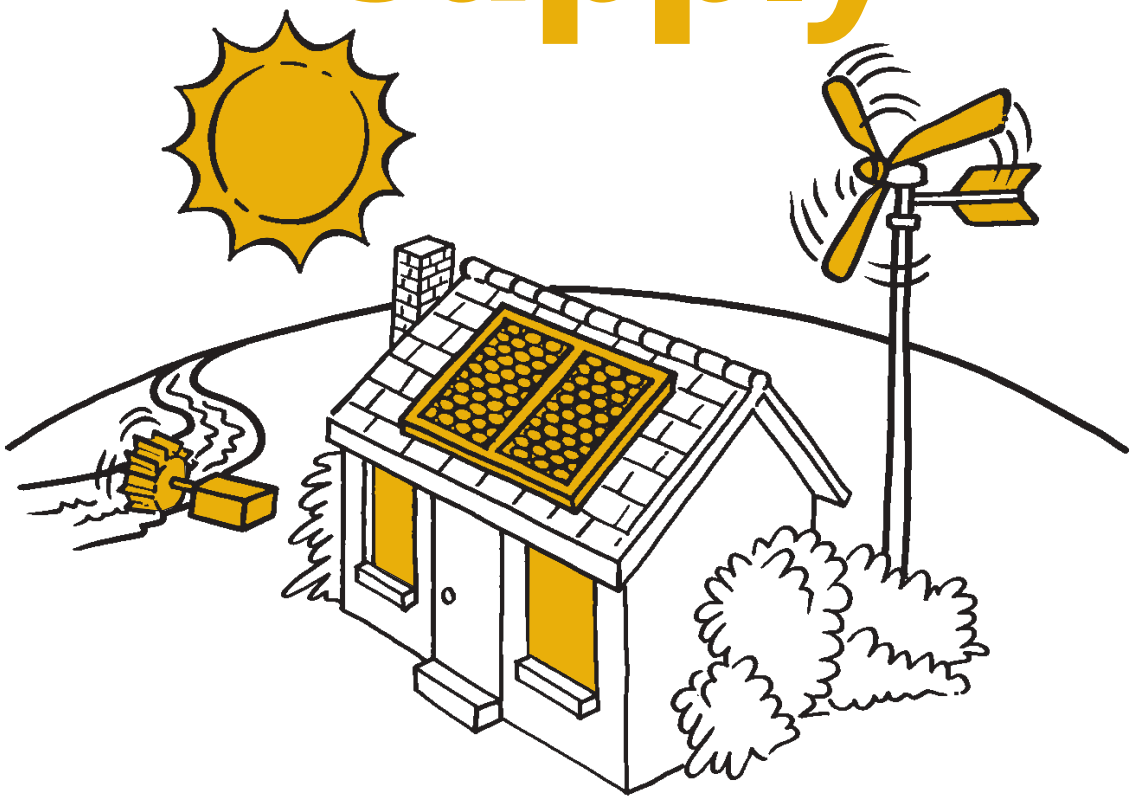
Remote Area Power Supply



Solar, wind and micro-hydro power now provide a cost effective alternative for areas with high electricity connection fees. Today, these systems are able to deliver normal, 240V reliable electricity for everyday appliances.

Clean, reliable electricity from renewable energy!

Here is a simple guide to the installation, workings and typical costs of Remote Area Power Supply systems.

About Remote Area Power Supply systems

The term **Remote Area Power Supply (RAPS)** is often misleading, as many RAPS are located near urban centres. The key to whether a RAPS is economical in your location is the comparative cost of connection to the state electricity system or grid.

Your new home, holiday home or caravan can be supplied with electricity from a number of generating sources other than mains power. The more common alternatives include:

- photovoltaic (PV) modules (solar electricity);
- wind turbines;
- micro-hydro (water) generators;
- petrol or diesel generators; or
- a combination of two or more of the above which is referred to as a 'hybrid system'.

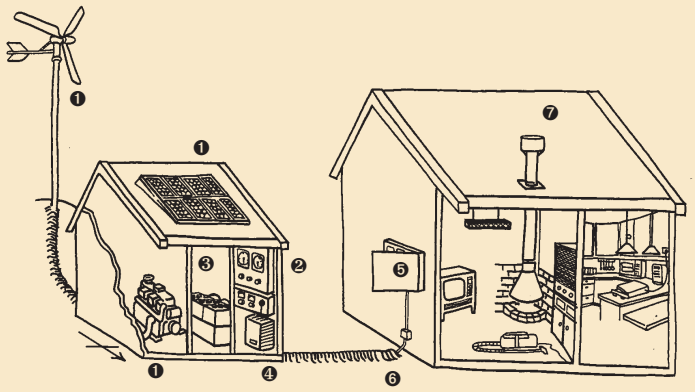
System Size

RAPS systems must be designed and sized around your own specific needs for electricity. An undersized RAPS system will leave you less than satisfied, whilst an oversized system will involve unnecessary expense.

In establishing the size requirements of a RAPS system, you first need to analyse your household's electricity load requirements. This is done by finding the wattage of each appliance and estimating the time that each appliance is used. Multiplying these two figures will give you the energy used by the appliance over that time. Totalling this for all appliances will give you an indication of the electricity load requirements of your household. ***(An example is given in the table over.)*** It is important that this be done accurately for every appliance, your RAPS supplier or the Energy Smart information Centre can help you with this. To reduce the size, and hence cost of the total system, energy conservation measures will have great benefit in reducing both storage and generation requirements.

Components and Features of RAPS Systems

All RAPS systems consist of several basic components and key features which are briefly described and shown here.



❶ Generation equipment. PV modules, a wind turbine, a micro-hydro generator or a petrol or diesel generator can provide electricity either on their own or in combination .

❷ Control and regulation equipment. Regulators, controllers, meters and circuit breakers may be required to control such things as battery charging, or to prevent reverse current flow through PVs or wind generators.

❸ Energy storage. Deep cycle batteries are most commonly used to store energy so that a reliable source of electricity is always available.

❹ Inverters. These convert DC electricity into AC electricity so that common household appliances can be used. Various types of inverters are available - square wave, modified square wave or sine wave.

❺ System voltage. The common recommended voltages include 12 V, 24 V, 48 V and 110 V DC, and 240 V AC.

❻ Wiring and electrical accessories. A well designed system should include wiring of a gauge heavy enough to keep voltage drops and energy losses to a minimum. Adequate fusing, earthing and other protection measures should be incorporated in the system.

❼ Home design, lights and appliances. The design of any new home should incorporate energy efficient design features. Additionally, high efficiency lights and appliances should be chosen to keep the load on the RAPS system to a minimum, helping to reduce system costs.

Variations in daily and seasonal conditions, as well as site conditions, will determine your choice in generating equipment. It is recommended that you obtain quotes from a number of suppliers and compare components and warranties before purchasing a system.

APPLIANCE	DAILY NUMBER OF HOURS USED (h)	POWER REQUIRED (Watts)	POWER RATING (kWh)
Kitchen			
fluorescent light	3.00	20	60
microwave	0.25	1700	425
toaster	0.08	600	48
Living room			
TV	4.00	200	800
light	4.00	60	240
stereo	2.50	60	150
Total			**1723**

Sample household electricity load

System Design and Safety

Installation of a RAPS system should be under the supervision of an accredited electrical contractor. The Sustainable Energy Industry Association of Australia (SEIA) has accredited designers and installers who can install RAPS systems according to the appropriate Australian Standards. It is vital that all safety regulations and instructions are followed.

Minimising the Size & Cost of Your System

The design of the home itself is the critical starting point for reducing energy needs. Attention to features such as building orientation, insulation, shading, windows and building materials will result in an Energy Smart design.

This will directly influence the size and cost of your RAPS system. The Energy Smart Information Centre has several brochures which provide detailed home energy saving advice for both new and existing homes.

The following general rules will also help you to reduce the size and hence capital cost of your RAPS system.

Avoid electrical appliances where bulk heating or cooling is involved, such as in cooking, hot water heating, space heating, clothes dryers or air-conditioning. These functions use a lot of energy.

Refrigerators and freezers also have high energy use, so energy efficient LPG models should be considered.

Be aware also of the continuous energy requirements of clocks, including those on videos and microwave ovens. Wherever possible use battery operated clocks or disconnect appliances when not in use.

Consider alternatives such as the following:

- **Heating** — passive solar heating, LPG or solid fuel heaters;
- **Hot water** — solar, heat pump, LPG, or solid fuel hot water services;
- **Clothes drying** — clothes lines;
- **Cooking** — LPG or solid fuel stoves; and, microwave ovens (but be aware that microwave ovens only operate at full power when linked with a sine wave inverter and that the power used is approximately twice the power output rating).

Examples of RAPS systems

Described over page are some typical home systems. Costs vary greatly from system to system depending on energy requirements and should be used as a guide only. Alternatives within the larger examples are given to show that the generation equipment can vary. You should talk to a RAPS supplier to obtain assistance in sizing your system and to learn about different generating options.

A typical RAPS system with generation equipment

System 1 - Approximate output 200 Wh/day.

This system would run a few low-wattage direct current (DC) lights and appliances for short periods and so should be suitable for a weekender house or caravan.

1 PV module in the range of 75 W peak output, with regulator.
12 Volt battery suitable for solar charging.

Approximate cost : $1,000 (excluding wiring, metering and installation).

System 2 - Approximate output 2400 Wh/day.

This system could run the lighting and small appliance load of a low energy use home.

6 - 10 PV modules of 75 W peak output, or greater.
Panel mounting kit.
Regulator and control board.
12 V or 24 V battery bank.
Inverter with a rated output around 600 W continuous.

Approximate cost from $10,000 - $15,000 depending on size of batteries and inverter

Note: This type of system is only appropriate for a household with low-power appliances. If you wish to run appliances like a washing machine, fridge or vacuum cleaner then a bigger inverter, say 2500 watts, will be required (as well as additional panels, batteries etc.) A wind generator rated at around 400 - 500 W could be incorporated into the system, or even replace the solar panels if the average wind speed was sufficient.

System 3 - Approximate output 4000 Wh/day, and over.

This system could provide power for a well designed energy efficient house. A generator would be needed on a system of this size together with a battery charger or combined inverter/charger, to provide back-up power in winter. An interactive inverter could also be used in conjunction with an auto-start generator.

12 to 20+ PV modules each having a peak output of 75 W or greater. *
Panel mounting kits.
Regulator and control board.
24 V, 48 V or higher, battery bank.
Inverter rated at 1500 W or larger, or an inverter/charger or an interactive inverter.
**The number of PV modules will vary depending on the system design.*

Approximate cost from $18,000 upwards, depending on the number of PV modules, the type of inverter, batteries, generator, etc.

Note: A petrol or gas generator is cheaper to purchase than a diesel generator, but a diesel will have a much longer life and is generally cheaper to run.

A wind generator rated at around 1000 W or greater could be incorporated into the system, or even replace the solar panels if the average wind speed was sufficient.

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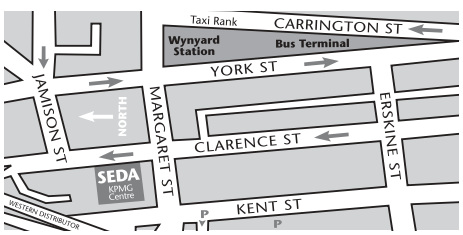
Further Information

For more detailed information on designing and sizing a RAPS system, or SEIA (Aust) accredited suppliers contact the Sustainable Energy Industry Association of Australia SEIA (Aust) on 02 6270 5888.

Rebates are often available for renewable energy power systems. For up to date information on government assistance packages contact the Energy Smart Information Centre on 1300 138 122.

The Energy Smart Information Centre is a free advisory service provided by the NSW Government. Energy experts can provide information on a wide range of topics including Energy Smart design for new homes and renovations, appliance selection, solar and wind power systems, choosing heating and cooling systems, insulation, lighting and water saving devices.



Trains: Wynyard Station is 3 mins walk away.
Buses: York & Carrington Sts adjacent to Wynyard Park.

Travel to SEDA by public transport to save greenhouse gas emissions.

SEDA
www.seda.nsw.gov.au

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