

Energy Options for Remote Locations

Application: Diesel Powered Sites

Solar solutions offer independence from rising diesel prices and reduce operating and maintenance costs, especially in remote areas far from the utility grid

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Overview

- **Challenges when running on Diesel**
- **Introducing: Solar + Storage**
- **The 6 Core Benefits**
- **Reduced fuel use = reduced costs**
- **Improved fuel economy**
- **Power quality and efficiency**
- **Improved reliability**
- **Example business case**

Challenges when running on Diesel



- **Very high operating cost**

Energy Source	Cost of Energy / kWh
Diesel Genset	50c - \$1
Power Grid	15c - 35c
Solar Panels	8c - 18c

- ⊗ **Frequent servicing, spare parts and maintenance**
- ⊗ **Loss of power during breakdowns**
- ⊗ **Noise issues when running through the night**
- ⊗ **Power quality issues can reduce life of appliances**
- ⊗ **Exposure to variable price of diesel fuel over time**
- ⊗ **Running 'partially loaded' causes internal glazing and carbon buildup**

Introducing: Solar + Storage

- ✓ Diesel and solar work together, fuel use cut drastically
- ✓ Typical payback in around 4 years



The 6 Core Benefits

1. **Diesel usage slashed**
2. **Fuel economy increased**
3. **Equipment life extended**
4. **Generator servicing much less frequent**
5. **Power more reliable and higher quality**
6. **Silent operation**

Reduced fuel use = reduced costs

- **Solar panels will produce energy for free from the sun**
- **The solar power is used to power your business right away or stored in batteries for later use**
- **Solar + Storage can run your business quietly and cleanly with the generator switched OFF**
- **When the sun goes down and the batteries get low, Solar + Storage will automatically switch the generator back ON for support**



How does Solar + Storage save money?

Your monthly diesel bill is drastically reduced once solar power is your main energy source. The diesel generator is only switched on as needed.

During the design stage we size the system for the level of saving you require, as well as the number of 'quiet hours' required overnight.

Improved Fuel Economy

- Generators providing power 24/7 often operate at relatively low power levels
- Generators waste a lot of fuel when running at low power levels

Generator power level	Diesel burnt to produce 1kWh of energy	Cost of energy
100%	0.30 Litres	50c / kWh
75%	0.31 Litres	51c / kWh
50%	0.33 Litres	54c / kWh
25%	0.42 Litres	70c / kWh
10%	0.60 Litres +	\$1.00 + / kWh

Running at low power levels can also cause internal glazing and carbon build up within the engine. This further reduces fuel economy and engine life.

Can Solar + Storage improve fuel economy?

Yes. We determine an efficient range of power levels for the generator and program that into the Solar + Storage system. When the generator is running, the system will try to keep it within the efficient range.

The system does this by observing how much power your business is using, and then varying the amount of power used for battery charging. See the example below.

- The batteries have run low overnight and the generator is automatically switched on. This generator is rated at 40kW and will run efficiently down to around 20kW.
- The business is only drawing 8kW at that time, which would result in poor fuel economy and wear and tear on the generator
- Solar + Storage decides to keep the generator in the efficient range by drawing 20kW for battery charging
- The generator is then providing 28kW (8kW + 20kW) and fuel is being used efficiently
- Once the batteries are charged the generator is switched off and Solar + Storage takes over until the sun comes back up

This clever feature saves fuel, reduces wear and tear on the generator and reduces the need for servicing and spares.

Power quality and efficiency

- Australian appliances are designed for 230 Volts, 50 cycles per second
- Generators often 'drift' from the ideal settings and produce low quality power
- Appliances wear out faster and draw more energy when exposed to low quality power



Voltage spikes and surges are an example of poor quality generator power

Can Solar + Storage help?

Yes. Solar and battery inverters use on-board computers to produce near-perfect 230V sinewaves.

They can also 'clean up' the power quality from the generator when they are working together.

(Solar will also automatically attempt to correct the *power factor*)

Improved Reliability

- Service your generator without cutting power to your business
- In the event of generator breakdown, lower your energy use and run 100% from solar and batteries

Solar + Storage system features:

- Solar and Battery inverters by SMA Germany
- Solar panels by Tier 1 manufacturers
- Choice of flooded lead-acid or maintenance free Gel batteries
- Remote system monitoring (internet access required)
- Almost no moving parts (1 circulation fan in battery inverter)



Example three-phase battery system

Example business case

- **Site Particulars**

Site Type	Remote Roadhouse
Annual Diesel Use	48,000 Litres / \$80,000
Diesel Price	\$1.67 per Litre
Daily Energy Use	300-400 kWh

- **Example Solution**

Solar System Size	65 kW (250 panels)
Energy Storage	175 kWh
Annual Savings	\$60,000 k
Diesel Fuel Saved	33-39,000 Litres
Outright Purchase	\$250,000 ex GST
Example rent-to-own	\$45,000 for 7 years

- **Purchase outright with short payback:**

- \$250k / \$60k savings = 4.1 years

OR

- **Rent-to-own with positive cashflow:**

- Cost \$45k per year
- Savings \$60k per year
- Positive Cashflow \$15k year 1
- Once you own system, keep all savings

- **Better power quality with quiet operation and lower costs**