

ELECTRIFICATION OF STATIONARY EQUIPMENT

A PRACTICAL GUIDE

AT A GLANCE

Best suited to:

Businesses using gas for heating, cooling, hot water or cooking, or that rely on diesel-operated equipment

Main benefit:

Lower operating and maintenance costs

Main barriers:

Ensuring a reliable power source for critical operations

Good first step:

Determining how to source the necessary power supply

Image: Making the Switch





OVERVIEW

Electrification of stationary equipment involves replacing diesel or LPG-driven engines with electric motors or gas-powered equipment with electric equivalents. Equipment is typically powered by grid electricity, on-site solar (often paired with batteries), or a hybrid of both.

Electric motors are typically more efficient than internal combustion engines at converting energy into useful mechanical work such as pumping, driving machinery, refrigeration, and vehicle movement. Using electric motors results in lower energy costs and lower maintenance costs, as there are fewer moving parts and no oil changes.

Electrification of equipment means that systems can be paired with solar to provide power for daytime activities. Batteries can be added where activities, such as refrigeration, need to extend beyond daylight hours, or where grid reliability is an issue. With grid-connected systems, businesses have the potential to export excess energy generation for additional income or use off-peak electricity strategically.



SUITABLE BUSINESS TYPES

Businesses that could benefit from electrification of stationary equipment include:

- Homes and businesses with gas heating, hot water, or cooking appliances.
- Businesses with equipment powered by generators, or equipment that relies on stationary engines, such as workshop equipment.
- Businesses relying on refrigeration (e.g. cold storage) or ventilation systems.
- Businesses relying on diesel pumping and irrigation systems.
- Dairy milking and cooling systems, grain handling and drying, or feed systems.



BENEFITS

There are a number of potential benefits to electrifying stationary energy applications:

- Lower operating and maintenance costs compared to diesel equipment.
- Opportunity to integrate with renewable energy for greater energy independence and reduced exposure to fuel price volatility and supply disruptions.
- Environmental benefits including reduced noise, lower carbon emissions, and reduced localised pollution.
- Potential eligibility for government incentives or carbon certificates, e.g. Energy Saving Certificates in NSW for switching from diesel to electricity and solar.



CHALLENGES

Some of the challenges to consider include:

- Ensuring a reliable power source for critical operations where power supply is variable, or where there are grid capacity limitations (this could require network upgrades).
- Upfront capital cost for electric equipment, especially if infrastructure or network upgrades are required.
- Uncertainty around battery lifespan, replacement costs, and resale value.
- Lack of expertise regionally for repairs or maintaining some electric equipment.



TECHNICAL CONSIDERATIONS

Grid connected

- Whether single-phase or three-phase power is required and available.
- Understanding the available capacity in the local network. Grid augmentation or transformer

upgrades could be required if larger high-voltage lines are needed to import larger quantities of power.

- Whether there is stable voltage. Long rural lines can experience voltage drops, especially during motor startup.
- The costs of managing peak versus average demand. Utilities may charge based on peak demand, not just energy use, and there may be time of day load constraints.
- Whether the grid is sufficiently reliable for consistent power draw, particularly for high-use operations.

If grid power is limited, you may need to go off-grid or use a hybrid system consisting of solar, battery, and possibly a diesel backup generator.

Off-grid or hybrid

To correctly size your transformer, cables, battery and inverter, you'll need to consider:

- **Peak demand:** You need enough power or battery storage to match your peak demand. Off-grid or hybrid systems can work well when paired with solar and battery storage, or bioenergy production.
- **Motor startup current:** Motors draw a surge when starting up – pumps and compressors can draw 3–7 times their running load.
- **Duty cycles:** Match continuous loads (like refrigeration) and intermittent loads (like irrigation) to the energy supply available.



IMPLEMENTATION CONSIDERATIONS

Incremental application

If a site is already connected to the electricity network, electrification can happen incrementally. For example:

- Gas hot water and heating can be replaced with heat pumps and inverter air conditioners in stages.
- On a farm or business such as a dairy, gas hot water heating or a diesel pump can be replaced with an electric equivalent at different times.

Skills or training required

- Basic understanding of electric systems and charging management.
- Training for operators and mechanics in safe use and maintenance of electric equipment.
- Access to energy management and optimisation skills, particularly when integrating renewables.



DECISION FACTORS

When this option may make sense

- Your business has high fuel costs, especially if you have the potential to offset energy purchases with on-site renewable energy production.
- Solar power is already being exported regularly.
- Where electrification can also enable more efficient, smarter operation with timers, high efficiency variable speed drive systems and remote controls which can optimise water and energy use.
- There is existing excess grid capacity.
- Emissions reduction or sustainability targets are a priority.
- Diesel transfer pumps are used for water transfer.
- You are an irrigator who irrigates all year round or has storage dams allowing irrigation timing to be controlled. Irrigation pumps are particularly well suited to conversion because they are at fixed locations, often on predictable schedules, and already rely on mechanical drive systems that can be efficiently converted to electric.

When it may not be suitable

- Your business operates in remote locations with limited grid access and insufficient capital for off-grid systems.
- Equipment use is highly variable or runs for long durations.

Key decision criteria

Some factors to consider when deciding whether electrification of stationary equipment is right for you:

- What the most appropriate technology combination is for your business. This could include grid electricity, solar only, solar and battery, or hybrid (a mix of solar and grid and diesel backup).
- Whether the grid is strong enough to supply the load (or additional load) and, if not, the cost of upgrades versus off-grid or hybrid systems.
- Whether available electricity provides enough power for the task for long enough, or whether backup generation would be required.
- Whether electrification would require a new connection to the network. Electrical infrastructure (poles and wires) can be expensive. Prices increase if there are long cable runs, trenching costs, remote pumping sites, and distributed loads. Solar plus batteries can be cheaper than extending the grid.
- Whether there is access to service, support and expertise locally to fix and repair electric equipment and the lead times for new parts.
- The total cost of ownership (capital versus operating savings) and what financing could be available.
- Whether electric equipment is compatible with existing business systems and workflows.
- Equipment performance requirements (power, duty cycle) and whether these can be met through the available or proposed energy supply.
- Whether electrification aligns with long-term business goals, including sustainability and risk management.



CASE STUDY.

MAKING THE SWITCH

The Sustainable Restaurant Association, in collaboration with the Global Cooksafe Coalition and Hospitality Energy Saving & Sustainability, has released Making the Switch, a step-by-step guide to switching from gas to electric equipment in restaurants.

The Global Cooksafe Coalition looked at electrification in a gastropub, a Chinese takeaway restaurant, and an Indian restaurant in the United Kingdom, and adapted the findings to the Australian market. The research found that, on average, the three restaurants could save 43% on energy costs, cut energy use by 58%, and reduce carbon dioxide emissions by 26% by switching to electric. All three restaurants are expected to recoup the cost of new electrical equipment within three years.

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For more information see: cooksafecoalition.org/making-the-switch



www.re-alliance.org.au/electrification