

AT A GLANCE

Best suited to:

Businesses with significant energy use for heating

Main benefit:

Improved efficiency and reduced fuel handling costs

Main barriers:

Identifying the system that best matches energy loads

Good first step:

Maximising efficiency and building on existing systems





OVERVIEW

Heating is a major source of energy use in rural and regional areas. It includes space heating in homes and sheds, water heating for cleaning in food service and dairies, and process heat used in activities such as drying, pasteurisation, and cooking. Heat is produced in a range of ways, including gas and LPG burners and boilers, diesel boilers, and electric resistance heating.

There are a number of electric alternatives that can provide heating more efficiently and cleanly. Technologies that support efficient electric systems powered by renewables include:

- Heat pumps, including air-source and ground-source. (Heat pumps are the technology that drive devices such as reverse cycle air conditioners.)
- Solar thermal or solar hot water systems.
- Electric heating for cooking.
- Heat recovery from existing systems, such as refrigeration and compressors.
- Hybrid approaches that combine new electric technologies with existing equipment.

These systems are generally implemented by:

- Purchasing new equipment such as heat pumps or solar hot water systems, and heat exchangers when purchasing new compressors or refrigeration systems.
- Retrofitting heat exchangers to existing compressors or refrigeration systems. Useful heat is often already being produced as a by-product of other processes, such as refrigeration and air compressors, but this heat is often wasted. Capturing and reusing heat can be simple and cost-effective.



SUITABLE BUSINESS TYPES

Regional businesses with significant heating needs that could be electrified include:

- Accommodation such as hotels.
- Health sites such as hospitals.
- Catering and food service businesses including restaurants, pubs, and clubs.
- Manufacturing applications such as steam flaking in feed mills, parts washing in workshops,

and cooking, cleaning, and sterilisation in food processing, such as meat processing and in dairies.

- Intensive animal production systems, including piggeries, poultry farms, and dairies.
- Horticulture and nurseries with on-site propagation or processing.



BENEFITS

There are a number of potential benefits associated with electrifying heating and using more efficient systems, including:

- Electrified systems are generally easier to control and automate, allowing more consistent temperatures and alignment with operations.
- Changing from gas to electrified heating systems can reduce fuel handling time and logistics.
- Heat pumps can deliver three to five units of heat for every unit of electricity consumed. The efficiency of air source heat pumps can be improved by locating the unit close to a source of waste heat, such as the exhaust from a dryer.
- Strong opportunity to integrate with solar energy. Many heating loads, particularly water heating, can be shifted to daytime hours when solar generation is highest.
- Heat recovery is cost effective, as it provides heat that has been produced as a by-product of another process. Heat recovery systems are often relatively low cost compared to the savings they can deliver, particularly where they can be integrated into existing equipment. Thermal storage, such as hot water tanks, provide a simple and low-cost way to store this energy for later use.
- The system will largely run itself day to day, but monitoring energy use and performance can help make sure savings and benefits are being realised.



CHALLENGES

Some of the challenges to consider include:

- The upfront cost of implementation.
- Technical advice may be required for retrofitting heat recovery systems into existing infrastructure.

- Electrifying heating increases the electrical load, which may require upgrades to switchboards or connections. In rural areas, this can be a constraint if network capacity is limited.
- Some processes may require higher temperatures than standard heat pumps can provide, and some systems may require heating on demand which heat pumps or solar systems may not be able to provide.
- Cooler climates may require high-efficiency heat pumps.
- Unless paired with a renewable energy generation system, there could be increased exposure to rising electricity prices, as the extra load may increase energy consumption and push usage into a higher pricing tier.
- Solar thermal systems may need backup for longer cloudy or rainy periods.



TECHNICAL CONSIDERATIONS

Air-source heat pumps

- Performance depends on outdoor temperature, with efficiency lower in very cold conditions.
- Requires adequate airflow and suitable outdoor unit placement to manage noise, airflow, and maintenance access. Dusty areas may reduce efficiency.
- Can be combined with thermal storage or controlled to operate during solar generation or off-peak tariff periods.

Ground-source heat pumps

- Require sufficient land area or suitable geology for ground loops or boreholes.
- More stable performance than air-source systems because ground temperatures fluctuate less than air temperatures.
- Higher installation complexity means careful design and site assessment are important.
- Typically suited to larger or long-life installations in regions with suitable temperatures, where higher upfront costs can be justified by long-term efficiency gains.

Heat recovery systems

- Most effective where there is a consistent source of waste heat and simultaneous demand for hot water or heating.

- System sizing and controls are important to avoid over capitalisation.
- Retrofitting will require integration with existing refrigeration, compressor, or process systems.
- Often provide relatively short payback periods where large amounts of waste heat are currently generated and can be used on-site.

Solar thermal systems

- Performance depends on solar availability, orientation, shading, and storage capacity.
- Storage sizing is important to balance daytime heat collection with overnight or peak demand use.
- Backup heating is generally required for long cloudy periods or high-demand events.
- Pipe insulation, freeze protection, and maintenance of pumps and collectors are important technical considerations, particularly in harsher climates.
- Solar thermal is often not as cost effective as solar panels and heat pumps combined. It is important to assess/compare the cost benefits carefully.



IMPLEMENTATION CONSIDERATIONS

Suitable power supply

- Electrified heating systems increase electricity use and can add to peak demand, so available electrical capacity should be assessed early. This is particularly important for rural sites or properties located at the end of the power lines.
- Pairing systems with solar, thermal storage or batteries can help reduce peak demand and improve operating costs.

Suppliers or service providers

- Heat pumps are often a relatively simple replacement for domestic or small-scale hot water systems, but larger applications such as pools, nurseries or horticulture usually require specialist design and commissioning.
- Most systems require specialist installation by Heating, Ventilation, and Air Conditioning (HVAC) contractors, mechanical engineers, or experienced electricians, particularly for heat recovery or industrial applications.



DECISION FACTORS

When this option may make sense

- There is a consistent demand for heat or hot water.
- Sites using LPG, diesel or gas are often strong candidates for electrification, particularly where fuel costs are high or fuel supply is difficult.
- You have existing refrigeration, cooling or compressed air systems, which may offer heat recovery opportunities.
- Solar generation can improve the economics by allowing heat generated during the day to be stored for later use.

When it may not be suitable

- Sites with low or irregular heating demand may find it harder to obtain a reasonable payback period.
- Applications requiring high temperatures or with limited electrical capacity may need more detailed assessment.

Key decision criteria

Some factors to consider when deciding whether heating and storage is right for you:

- Understanding the timing, size and profile of heating demand is critical when selecting the most suitable system.
- The presence of existing systems that generate waste heat, such as refrigeration, cooling, or compressed air systems, means there is a good chance that useful heat is being lost and could be captured.
- The availability of solar energy can assist where heating loads can be shifted to daylight hours, including by pairing it with thermal storage.
- Costs vary widely depending on the technology and scale. Small air-source heat pumps for homes or small businesses may cost a few thousand dollars, while larger commercial systems can range from tens of thousands to over \$100,000.
- Ground-source systems are typically more expensive and require bore installation or underground pipe loops and need only be considered where the climate is unfavourable for air-source heat pumps.



SPOTLIGHT.

FINANCIAL INCENTIVES FOR CHANGE

Governments across Australia have recognised the benefits of helping to deliver cost-effective energy savings for households and businesses by providing financial incentives to install energy-efficient equipment and appliances, including those related to heating. Various schemes also incentivise energy retailers and large energy users to reduce their use of fossil fuels.

The greenhouse gas emissions reductions associated with shifting to heat pump hot water systems and solar water systems mean there are a number of financial incentives available for moving away from gas and other fossil fuel-based technologies. These could include incentives under:

- Clean Energy Regulator **Small Scale Technology Certificates (STCs)**.
- NSW Government **Energy Saving Scheme**.
- Victorian Government **Energy Upgrades Program**.

Queensland based businesses can access **ecoBiz**, a free sustainability program run by the Business Chamber Queensland, that helps Queensland businesses cut costs, reduce carbon emissions and resource use, and better manage climate change risks.



RE-ALLIANCE

www.re-alliance.org.au/electrification