



# Heating and cooling your home – a guide to reverse cycle systems

Heating a house makes up about 60% of the average Canberra household's energy use; having an energy efficient system helps you reduce energy costs and greenhouse gas emissions. This guide provides information on how reverse cycle heating and cooling systems work, their benefits, and helps you choose a system that's right for you.

## Understanding reverse cycle heating and cooling systems

The most efficient heating and cooling systems available on the market today are reverse cycle systems. A reverse cycle heating system can heat your house quickly and easily and will cost less to run than gas heating or other electric heating systems.

Reverse cycle systems are efficient as they extract heat energy from outside ambient air and transfer this energy into your home in the form of heating, rather than directly heating the air (like a resistance heater would). Although it does not seem like cold air has much heat energy, air at 0°C still has over 90% of the heat energy of air at 40°C and therefore has plenty of heat to extract. This is achieved with a heat pump, which uses a compressor, expansion valve and heat exchangers to absorb and transfer this heat energy into your house. When cooling is needed, the heating cycle simply works in reverse – giving the system its name of a 'reverse cycle system'.

This process results in efficiencies of between 250-600%. This efficiency is known as a co-efficient of performance (CoP) and is a useful indicator of how cost efficient a system will be to run. For example, a system with a CoP of 6 will use only half the energy of a system with a CoP of 3, but with the same heating output. The CoP of a system does vary depending on the outdoor air temperature, but good systems work even when it is -10°C in winter. Smaller systems tend to have better performance (CoP) than larger ones but won't have as good a heating output for heating larger areas.

## Why should I replace my current heating system with a reverse cycle system?

There are three main ways to heat your home: electric element heaters, gas heating and reverse cycle systems.

Electric element heaters are usually portable and cheap to buy but are extremely energy inefficient and are the most expensive way to heat your room. For this reason, portable units are not included as an eligible product under the Sustainable Household Scheme.

In the past, gas heating has been promoted as a cheap way to heat your home with reduced energy emissions, but this is no longer the case. With advances in reverse cycle heating technology and Canberra now being powered by 100% renewable electricity this has changed. Reverse cycles systems are very cost efficient and can rapidly heat your house in the same way a ducted gas system would and with no carbon dioxide emissions in the ACT. They also have the added benefit of being able to efficiently cool your house in summer. If room heating is your only gas appliance, or you are intending to transition all your gas appliances to electric, you can disconnect from gas altogether and save over \$350 annually on the gas supply charge.

The table below presents comparative costs for heating an average living area of 50m<sup>2</sup> for a year and shows that a reverse cycle system will save you money on your power bills and reduce your emissions.

Heater type	Efficiency	Energy Use (kWh)	Annual running cost	Annual kg CO <sup>2</sup>
Electric element	100%	5,205	\$1,462	0
Gas wall heater	85%	22,045 MJ <sup>1</sup> (equivalent to 6,124 kWh)	\$866	1,136
Average reverse-cycle	370%	1,407	\$395	0
Efficient reverse-cycle	600%	868	\$244	0

Table 1: Cost analysis between heating system types: Source: Actsmart Sustainable Home Advice Energy Guide at 2021/22 energy use estimates for a 2-star home. Energy prices based on \$0.26/kWh and \$0.03MJ.

## What should I consider when selecting a reverse cycle system?

There are three types of reverse-cycle systems available: split systems, ducted (whole of house) systems and multi-head units.

### Split systems

Split systems have one outside compressor unit and one indoor unit, usually mounted on the wall. They are suitable for single rooms or open plan living spaces, so several units would be needed for an entire house. These systems are very efficient and relatively cheap to install, so smaller units can be very suitable for individual rooms, while larger systems can service areas of up to 80m<sup>2</sup> and would be effective for apartments or living areas of smaller houses. A house with multiple split systems can also be effectively zoned, by only switching on systems as required to heat the areas you are occupying and save energy.

## Multi-head systems

Multi-head systems have one large outside compressor unit connected to several smaller wall or floor mounted indoor units via piping through the ceiling instead of ducting. These indoor units can be installed in several rooms, so a multi-head system can service many areas of a house and potentially even the entirety of a smaller home. Multi-head units can heat a whole house or only specific parts of a house if needed. These systems are like a hybrid of normal split systems and ducted systems, where they can service multiple rooms almost as well as a ducted system but are cheaper to install.

## Ducted reverse cycle systems

Ducted reverse cycle systems have one large outside compressor and one heat exchanger unit (usually located in the ceiling or under the house) that splits into many insulated ducts that provide heating and cooling to multiple rooms. Ducted systems usually service the whole house and can provide rapid heating or cooling. Ducted systems can be slightly less efficient than split systems due to heat losses through the ducting but can service a whole house from a single installation and can more easily maintain an even temperature throughout the house.

The table below presents a comparison between these three types of systems.

	<b>Split system</b>	<b>Ducted system</b>	<b>Multi-head system</b>
<b>Efficiency (CoP) (Average/Excellent)</b>	3.7 / 6.4	3.5 / 5.0	3.7 / 5.1
<b>Best used in what situation?</b>	Heating one room or area only, so ideal for apartments and townhouses. Not practical to have one in every room of a large house, but suitable if not all the house needs heating/cooling	Whole of house, so ideal for larger houses and when rapid heating or cooling is required. Small units can be installed in townhouses, not suitable for apartments	Can be used in all sized houses, apartments, and townhouses. Halfway point between split systems and ducted systems
<b>Room zoning capability</b>	Excellent, as system heats one room only	Limited to good depending on system, often services living areas constantly when running	Very good, as can turn off multiple unused areas
<b>Inside unit style (see descriptions below)</b>	Wall hung Floor mounted Cassette style	Vents through ceiling or floor	Wall hung Floor mounted Cassette style
<b>Other</b>	Smaller systems have excellent efficiency. Look for 'H2' CoP2 which means the unit is well suited to Canberra's winters	Ducting can have significant heat loss if not well insulated (>R1.5). Ducting through the ceiling reduces your level of ceiling insulation	Can also use a small multi-head system for very large rooms that need multiply heating units

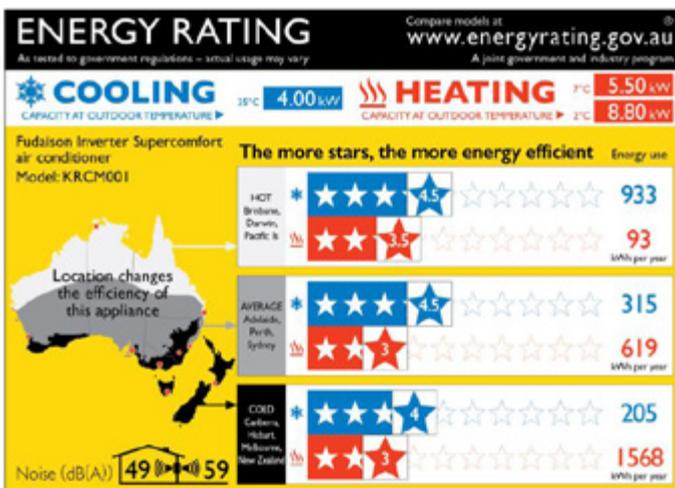
Table 2 Search the Minimum Energy Performance Specifications (MEPS) Registration Database at <https://www.energyrating.gov.au/consumers>

## Other things to consider

- All reverse cycle systems have an outside compressor unit of some kind. Engage with your supplier about where they would locate the compressor unit as it is important to consider the location with regards to:
  - Easy access for maintenance
  - Noise from the unit affecting neighbours
  - The ability for fresh air to contact the unit. Avoid enclosed courtyards and never enclose the compressor unit with slat fencing to hide it from view.
- If you are installing a split system only, ask your supplier if the system has a “H2” rating as this will work efficiently in the Canberra winter.
- Installing ducted or multi-head units in a large house may require an upgrade of your electricity supply to 3-phase power due to the significant power draw of these systems. There will be additional costs with this upgrade, but your installer will be able to confirm whether this is necessary.
- If you are replacing a ducted gas system with a ducted reverse cycle system, you cannot re-use the gas ducts as they are too narrow for a reverse cycle system and may also have age related issues.
- It is recommended that ducted systems have at least R1.5 insulation on the ducting, as this will minimise heat loss and lower running costs. Ensure that you mention this to your supplier as they may not provide this by default.
- In smaller houses (below 180sqm) or where only limited heating/cooling is required, split systems are more cost effective (\$2,000 - \$4,000 installed depending on system size), but in large houses (above 180sqm) ducted or multi-head systems (\$7,000 - \$15,000 installed) are a more suitable choice.

## Energy star rating labels

Energy star rating labels for reverse cycle systems have two main parts. The blue part of the label indicates the cooling efficiency, and the red part of the label indicates the heating efficiency, for different climates in the country.



The more stars the more energy-efficient a system is and the cheaper it is to run. When choosing a system aim to purchase the model with the highest energy rating that you can afford. To get the most meaningful comparison between systems use the energy efficiency rating of similar size/capacity/kW systems. New ducted reverse cycle systems with a cooling capacity less than 30kW will be required to have a Zoned Energy Rating. The higher the rating, the more efficient the system is based on where the system will be installed.

These labels also outline what the noise level of the inside and outside units are, so if this is a consideration make sure you choose a systems that suits your needs.

# How to apply for a loan under the Sustainable Household Scheme

Firstly, check you are eligible to participate in the Scheme by reviewing the [Scheme Guidelines](#). It's also a good idea to review the Scheme [terms and conditions](#). If you've decided an electric heating system is right for you, just follow these easy to steps to apply for your zero-interest loan:

- Get your quotes from suppliers accredited with our loans provider, Brighte. Information about accredited suppliers can be found on Brighte's [website](#). We suggest seeking more than one quote.
- Select your preferred quote and your chosen supplier will initiate the loan process with Brighte.

## Some important things to note

- You can bundle products from the list of eligible products available under the Scheme, with a maximum of \$15,000 available to each household.
- The product model number must appear on the Greenhouse and Energy Minimum Standards (GEMS) register and be able to operate in a 'Cold Zone' as per the Minimum Energy Performance standards (MEPs). To ensure high efficiency in the ACT climate it is strongly encouraged that systems have a minimum operating temperature of at least -20 degrees Celsius and should utilise a variable speed compressor.
- The product must also meet set coefficient of performance standards (COP) depending on its type and thermal capacity. These COP values are those achieved at the H1 temperature condition as per MEPs testing standards.
  - Ducted systems:
    - › COP of at least 3.7 for systems below 14kW thermal capacity
    - › COP of at least 3.3 for systems with thermal capacity above 14kW but less then 22kW
    - › COP of at least 3.1 for systems with above 22kW thermal capacity
  - Split systems
    - › COP of at least 4 for all single systems
    - › COP of at least 3.8 for multi-head split systems
- The product must be a reverse cycle system capable of both heating and cooling and should have cooling COP values comparable with its heating COP values.
- Installation of an electric reverse cycle heating and cooling system (ducted or split system) requires an ACT licenced electrician. If you are replacing a gas system you will also need an ACT licensed plumber.
- Any requirements to upgrade to 3-phase power can be included as part of your loan. Speak to your installer, as this may require additional approvals.
- If the install of your electric heating and cooling system means you no longer need a gas supply (if your heating/cooling is your only remaining gas appliance), you will be able to disconnect your gas supply, either through plugging the line or completely decommissioning the meter. The cost for residential gas network disconnection through ActewAGL is \$136.90 (as of September 2021) and can be included under the loan. Doing this will also save you about \$350 annually as you will no longer need to pay a gas connection charge, so disconnecting is recommended if you will no longer have any gas appliances.
- You must be upgrading an existing gas or inefficient electric system to get an interest free loan for heating and cooling system installations. New builds are not eligible.

## Need some free advice?

Contact the Actsmart team for general and free energy advice on 1300 141 777 or email [actsmartadvice@act.gov.au](mailto:actsmartadvice@act.gov.au).



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