

Space Heating Options for the Home – A Comparison Table

This is an expanded and more comprehensive version of the table that appears in Section 5.3 of the booklet *Sustainability: Concepts and Action* published by the Blue Mountains Conservation Society <http://www.bluemountains.org.au/>. This booklet is available in electronic form at: <http://www.bluemountains.org.au/>

The following table sets out the environmental cost (from lowest to highest) to provide 1000 kWh of heat to your home using a variety of heating methods. The environmental impact is shown in kilograms of CO₂-equivalent greenhouse gases produced. Note, even though the Green Power options using Wind/Solar/Hydro do not produce CO₂ during operation they do have to be built in the first place and require ongoing maintenance. Hence a small infrastructure emissions cost is applied to make the point that even the greenest options have an impact, even if very small.

<i>Heating Appliance</i>	<i>Energy Source</i>	<i>Renewable?</i>	<i>Capital Cost of Heating Equipment</i>	<i>Capacity to provide a large amount of heat quickly</i>	<i>CO₂-e Emissions Per 1000kWh heat delivered</i>
Reverse Cycle Air Conditioner (Heat Pump) with rated efficiency of 300% Mild Climate	100% Green Power accredited electricity from Wind, Solar, or Hydro.	YES (but <u>only</u> with Green Power)	High	Medium	35 kg (95 kg if refrigerant leakage occurs as per note below)
Slow combustion wood heater (65 % efficiency) <i>Not recommended for dense built-up urban areas.</i>	Local dry well-seasoned wood	YES (but only provided more replacement trees are planted than burnt)	Medium / High	High	80 kg (102 kg if transported as per note below)
Electric bar, column, or fan heater	100% Green Power accredited electricity from Wind, Solar, or Hydro.	YES (but <u>only</u> with Green Power)	Low	Low	105 kg
Reverse Cycle Air Conditioner (Heat Pump) with rated efficiency of 300% Cold Climate	100% Green Power accredited electricity from Wind, Solar, or Hydro.	YES (but <u>only</u> with Green Power)	High	Low-Medium	53 kg (113 kg if refrigerant leakage occurs as per note below)

Modern Gas heater with flue (70% efficiency)	Natural Gas	NO	Medium / High	High	367 kg
Reverse Cycle Air Conditioner (Heat Pump) with rated efficiency of 300% Mild Climate	Electricity from Coal Fired Power Station	NO	High	Medium	352 kg (412 kg if refrigerant leakage occurs as per note below)
Reverse Cycle Air Conditioner (Heat Pump) with rated efficiency of 300% Cold Climate	Electricity from Coal Fired Power Station	NO	High	Low-Medium	528 kg (588 kg if refrigerant leakage occurs as per note below)
Electric bar, column, or fan heater	Electricity from Coal Fired Power Station	NO	Low	Low	1,055 kg (i.e. more than a tonne!)

The above figures are based on NSW full fuel-cycle emission factors. Additional notes:

- The figures for wood are for on-site sourced wood. Transporting the wood would obviously add to its embodied energy and greenhouse impact. For instance if a ute has to do a 200 km round trip to deliver you a tonne of wood then you have to add the impact of around 24 litres of petrol for that particular tonne of wood, that's roughly 67 kg of CO₂-e per tonne of wood! At 65% efficiency you need approx 1/3 tonne to deliver 1000 kWh as in the example above so we need to add about 22 kg of CO₂-e if transported.
- To avoid excessive production of other pollutants the wood should be burnt cleanly without cutting air flow (i.e. not choked off)
- The refrigerants used in the heat exchangers of air conditioners have a very high global warming potential (many 100s of times that of CO₂), therefore potential leakages should be considered. Thus, in addition to the CO₂-e arising from power consumption the above figures include an additional 60 kg of CO₂-e per 1000 kWh of heat delivered to cover likely refrigerant emissions. Calculation is based on 7.5 kW Split system that is professionally maintained and decommissioned, with 10 year life delivering 27000 kWh of heat, using an HFC based refrigerant (R410A) leaking at a rate of 5% per annum.
- **The use of the air-conditioner for cooling in summer is NOT being recommended. See information on Air Conditioners in Supplementary Notes section of booklet Sustainability: Concepts and Action.**
- Heat Pump efficiency drops significantly when outside temp falls below 7° C (The Cold Climate option assumes a drop from the rated 300% to an effective 200%) In cold climates a Heat Pump would normally be supplemented or replaced on very cold nights either by a wood heater or a gas heater, both of which can provide large amounts of heat quickly.
- The use of small NON-flued gas heaters is NOT recommended. In enclosed spaces these can result in a build up of combustion products - that is indoor pollution, probably not what you want for your family!