

Heat Pump Systems

How do heat pump systems work?

All types of heat pump systems function similarly. Low grade heat is collected from the ground, water or air, and compressed by the heat pump to a higher temperature heat, suitable for space heating and domestic hot water pre-heating.

How can a heat pump system heat my home?

With a ground or water source heatpump, the heat is best distributed using an underfloor heating system or fan-coil radiators.

Air source collectors can directly heat the air in a ducted air heating/ventilation system. It can also heat water using an integrated air to water heat exchanger for underfloor or fan-coil heating.

Heat pump systems are generally not suitable for direct replacement of conventional radiator based heating systems as these require water temperatures of 80-90°C; higher than most heat pumps can efficiently generate.

What is the COP?

The efficiency of a heat pump is usually expressed as the Coefficient of Performance (COP). This relates to the amount of heat energy provided for each unit of electricity used to run the pump.

$$\text{CoP} = \frac{\text{Heat output}}{\text{Electricity consumption}} = \frac{4}{1} = 4$$

A heat pump should provide between 3 and 5 kWh of heat for each kWh of electricity consumed. The measurement of CoP should comply with European Quality Standard EN255.

Types of Collectors

There are 4 main types of heat pump collector:

Ground Source Horizontal collectors

Ground Source Horizontal collectors are currently the most common collector type for heat pump systems. The pipes are buried in the soil at a depth of between 1 - 2m.

A direct expansion (DX) system requires an area of approximately 25m² per kW installed.



Where overlapping coils known as Slinky pipes are used, an area of 10m x 0.3m per kW installed is necessary.

Ground Source vertical collectors

Vertical collectors are used where land area is limited. They are inserted as U-tubes into pre-drilled boreholes generally 100 - 150mm diameter, 5m apart and between 15 - 120m deep. About 30m of pipe is necessary per kW installed



Vertical collectors are more expensive than horizontal ones but have higher efficiency and require less overall pipe length and pumping energy.

Water (Well) to Water

A Water to Water collector uses ground water from a conventional well as a heat source. A well must be able to deliver about 6 litres of fresh water per minute per kW installed.

Water source systems can offer better efficiency and lower installation cost than ground source systems but are limited to where a suitable ground water source is available.

Air Source



Air source heat pumps recover heat from outside air, notably the moisture in the air, rather than from the ground or water.

They are also ideal as part of a ventilation with heat recovery system.

While slightly less efficient than ground or water source collectors when taking air from outside, air source heat pumps have the advantage of being cheaper and more straightforward to install and have a faster response time.

What other components are needed?

Most systems require a buffer tank (60-150L) to optimise running time and reduce wear on the compressor by preventing rapid on/off cycling.



Heat pumps can efficiently heat water to about 40°C. To bring DHW up to 65°C, the normal temperature for DHW storage, most heat pump systems incorporate an immersion heater. However, some advanced systems can now achieve temperatures of 65°C with minimal CoP reduction.

Maintenance and operation

Heat pump systems have relatively few mechanical components resulting in little maintenance requirements. Servicing is recommended one a year as per conventional boiler systems.

The life expectancy of a typical heat pump is around 20 years while a collector system can have a lifetime of many times this.

Renewable Energy & Energy Efficiency

Renewable energy combined with energy efficiency offers a viable method of minimising energy costs and counteracting the causes of climate change.

Different types of renewable energy technologies offer different benefits but they all use non-polluting and effectively limitless energy sources.

Energy efficient features can be easily incorporated into the building design and construction at minimal additional cost.

Domestic Renewable Energy Grants

Sustainable Energy Ireland, through the Greener Homes Scheme now provides grants to homeowners for renewable energy domestic heating systems.

Heating systems	Typical Lower Price	Typical Higher Price	Grant Available
Solar Thermal Space and or Hot Water Heating	€800 / m ²	€1,300 / m ²	€300/m ² max. 12m ²
Heat Pump - Horizontal Ground	€13,000	€15,000	€4,300
Heat Pump - Vertical Ground	€18,000	€21,000	€6,500
Heat Pump - Water to Water	€12,000	€14,000	€4,300
Heat Pump - Air Source	€12,000	€13,000	€4,000
Wood Chip or Pellet Stove	€2,000	€5,000	€1,100
Wood Chip or Pellet Stove with Integral Boiler	€4,000	€8,000	€1,800
Wood Chip or Pellet Boiler	€9,000	€16,000	€4,200

Website: www.sei.ie/greenerhomes : tel: 1850 734 734

Your local energy agency

“The Limerick Clare Energy Agency aims to provide energy solutions for sustainable development in the region. The agency will provide energy services to all economic sectors and the general public, promoting and facilitating efficiency sustainability in the production and consumption of energy”.



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Carlow Kilkenny Energy Agency
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Heat Pump Systems Renewable energy heating systems



- Horizontal Ground Collector
- Vertical Ground Collector
- Water (Well) to Water
- Air source



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