Centre for Sustainable Energy

Low carbon heating

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Who are we?

- Energy charity based in Bristol
- Focused on ending the suffering caused by cold homes and combating the climate crisis
- We support people in fuel poverty through our advice line and retrofit team
- We support community organisations on energy, fuel poverty, retrofit and local and central government with decarbonisation and energy plans
- We are supporting the SiB ERF application process with technical buildings advice

Centre for Sustainable Energy

Subjects covered today

Understanding heat pumps – how they work

Different types of heat pumps

Solar thermal hot water

Direct electric heating

Heating systems

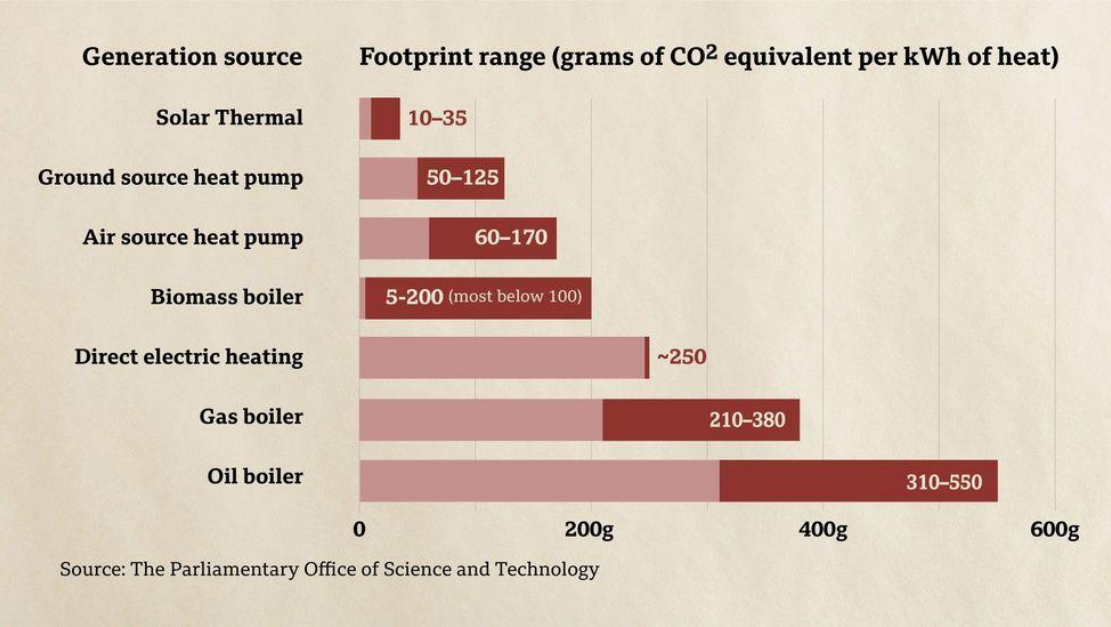
Heating key considerations

Building users should build a picture of the current situation…

- How is the building's heating managed and used?
- What activities are taking place through the week?
- When does the building feel comfortable? uncomfortable? and for whom?
- How energy efficient is the building?
- What is the indoor air quality like?

Then looking forward…

- What are their priorities?
- What is their budget (+ funding?)?
- What is needed?
- What is feasible?



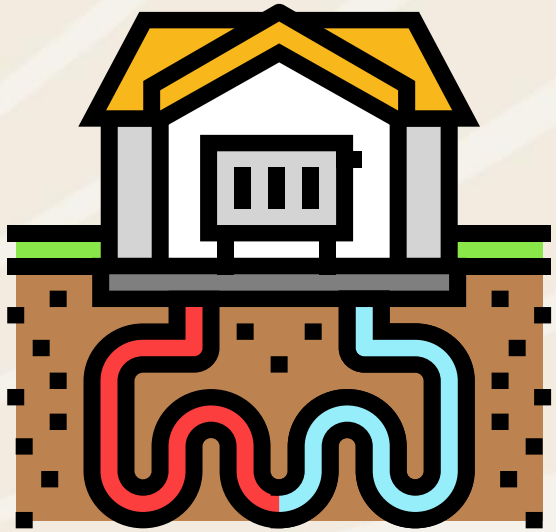
Understanding heat pumps

Heat pumps

Most common low carbon heating source.

Four types of heat pump:

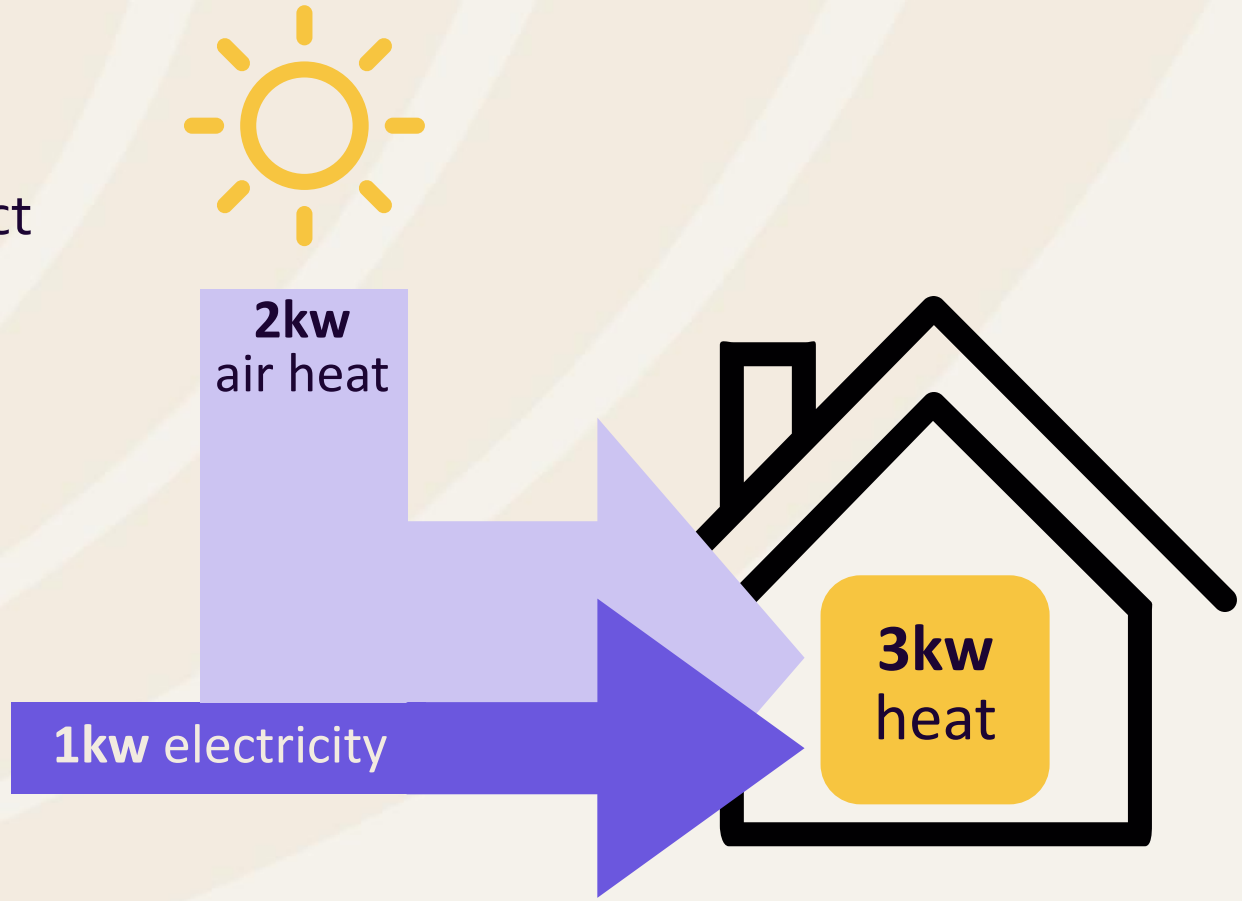
- Air source - air to water
- Air source - air to air
- Ground source
- Water source



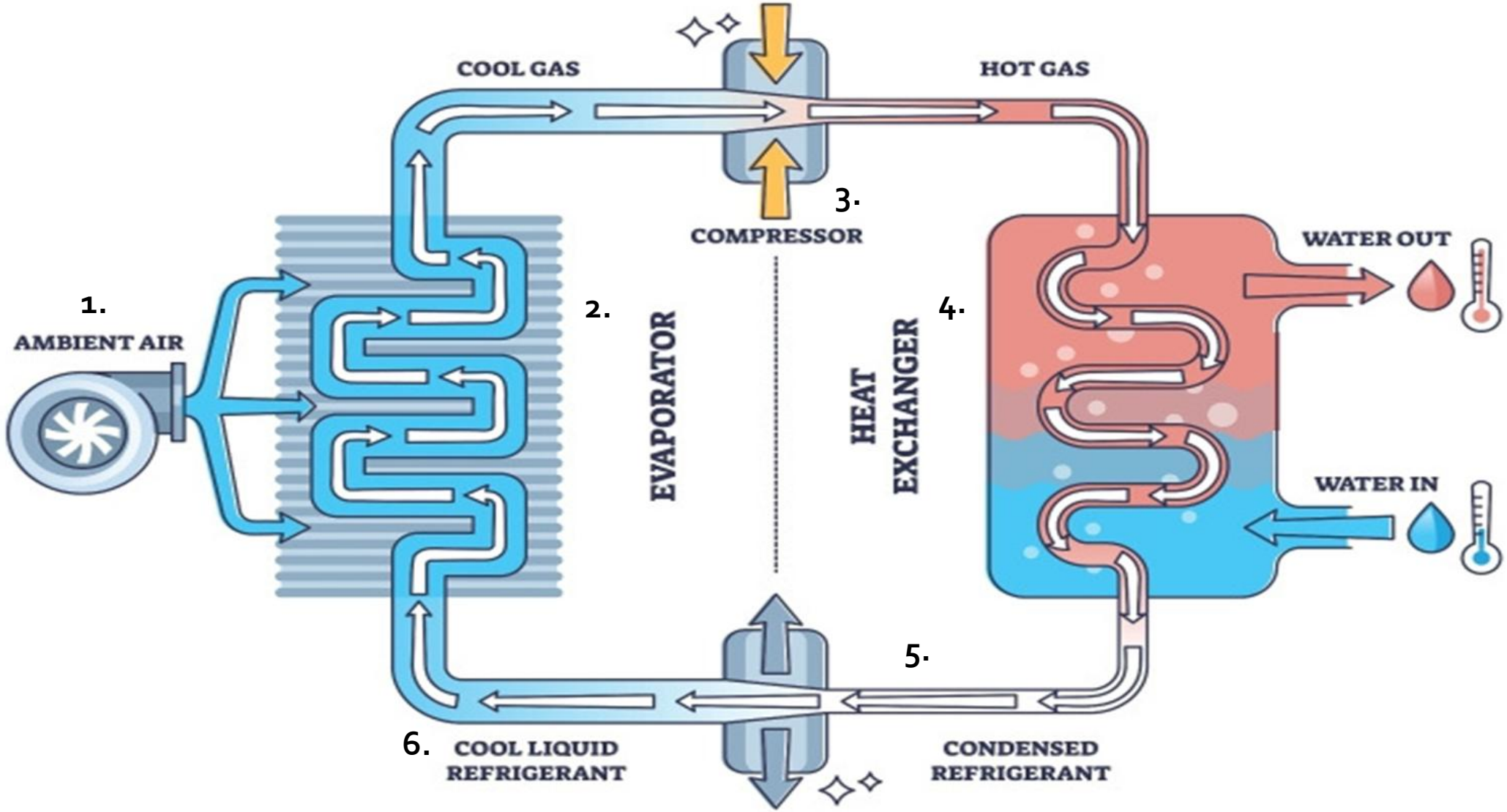
Understanding heat pumps

Heat pumps are **'low carbon'** because they produce **3-4** units of heat for every unit of electricity they use, so are much lower impact

- A Coefficient of Performance, or CoP, is used to measure their efficiency.
- The CoP represents the ratio of heat output to electricity input.
- A CoP of 3 means 1 units of electricity converts into 3 units of heat out.
- Depending on tariff can still be cheaper than gas even though electricity is more expensive
- 1 kW gas produces less than 1 kW heat



Heat pumps – how they work



Types of heat pumps

Air-to-water heat pumps (ASHP)

- Uses **wet** central heating.
- More **efficient at low flow temperatures but** can go higher.
  - Ideally 35-50C.
- Behaviour shift.
  - More efficient if **left on constantly.**
  - Intelligent control. (weather compensation)
- **Hot water cylinder** needed.
- Reduce building heat loss first

Air-to-air heat pumps

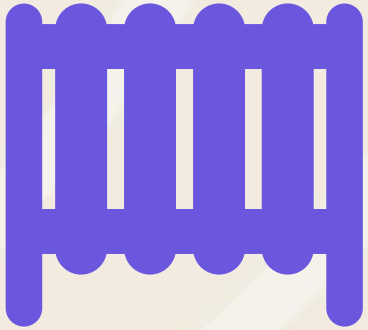
- **Directly heat indoor air.**
- Able to provide intermittent heating, so less of a behaviour shift from gas boilers
- Also provide **cooling during warm months.**
- Suitable for a variety of situations.
  - Often used in smaller buildings
- Duct and ductless.
- **Hot water usually not provided.**
- Can be cheaper than ASHP

Ground source heat pumps (GSHP)

- Absorb **heat from ground** via horizontal or vertical collectors.
- **More efficient** as ground is warmer than air.
  - But ASHPs are catching up!
- Higher **cost** and **space** demand.
- Typically for larger/ multiple properties.
- Behaviour shift

Do radiators for a heat pump system need to be bigger?

- Heat pumps are more efficient when they produce **lower flow temperatures**.
- Lower flow temps may* require **bigger radiators**.
- The CoP of a heat pump changes with the external temperature.
- What matters is the annual average or seasonal CoP (SCoP).



70°C

45°C

Heat pump suitability

- Replace your current heating system if it's approaching the end of its life
- Heat loss survey determines sizes of heat pump, radiator, pipework and placements.
- Buildings with high heat demand may require fabric upgrades such as insulation, windows and doors
- Need a hot water cylinder (for wet systems) and a suitable location for the outdoor unit.
- Ensure electrical connection can support the heat pump; contact the district network operator for potential upgrades.
- Efficiency is maximized when heat pumps are left on constantly, (not running constantly), this requires a shift in heating control habits.
- Time of use energy tariffs tailored for heat pump use can reduce running costs significantly.

Solar thermal
Direct electric heating
Heating systems

Solar Thermal

Function and Purpose

- Absorb sunlight and heat water.
- Two main types: flat plates / evacuated tubes.

Suitability and Considerations

- Suitable for significant hot water usage and hot water **cylinders**.
- Combi boilers must be able to accept pre-heated water directly.
- Requires roof space facing **south** with minimal shading.
- Not as advantageous as solar PV, especially considering solar diverters.
- Higher **maintenance** requirements than PV.
- **Planning considerations** for conservation areas and listed buildings.

Direct electric heating

Infrared

Function and Purpose:

- Emit heat through infrared radiation
- They quickly warm people and objects directly in front of them.
- Approx. 100% efficient

Suitability considerations:

- Infrared heaters excel in situations where convection heating is inefficient, such as poorly insulated large buildings.

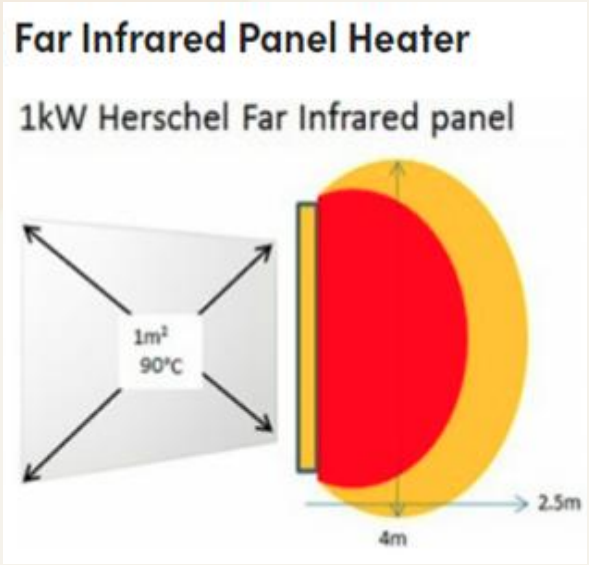
Plug in electric

Function and Purpose:

- Flexibly deliver heat
- Approx. 100% efficient

Suitability considerations:

- Easy to install
- Low maintenance



Heating system management

- Commissioning
- Client handover
- Documentation
- Monitoring and targeting
- Servicing
- CDM regulations
- Energy management processes and policies

A good heating system

- Provide comfortable temperatures for the particular use(s) of the building
- Be easy to use, maintain and eventually replace
- Be quiet and unobtrusive
- Operate reliably
- Use energy efficiently and as cleanly as possible without incurring excessive cost.

Centre for Sustainable Energy

We're a charity supporting people and organisations across the UK to tackle the climate emergency and end the suffering caused by cold homes.

cse.org.uk