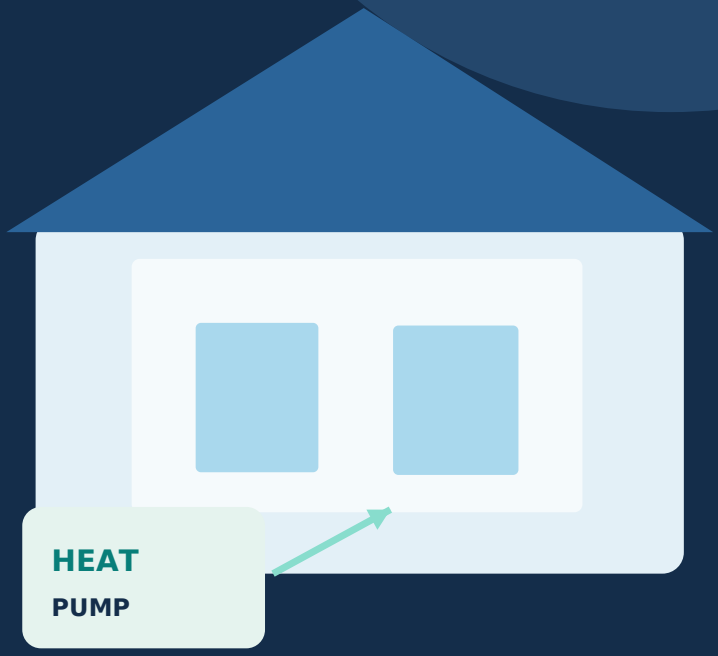
PlaceNest / LEARN

HEATING & COOLING

MADE SIMPLE

How to choose, size and run a comfortable, efficient home - with a real Australian case study.



INSIDE THE GUIDE

Reverse-cycle systems • Heat-load calculations • Zoning

Ceilings and glazing • Running costs • Buying checklist

AUSTRALIA • OCTOBER 2026

Educational guidance - professional sizing is essential

Comfort starts with the building

A well-designed house can need less heating and cooling than a poorly insulated smaller home.



Winter: keep heat in

Heat escapes through walls, roofs, windows, floors and air leaks. Insulation, good glazing and draught sealing reduce the heating needed.

Summer: keep heat out

Sunlight through windows, hot roofs, outside air and internal appliances add heat. Shading and ventilation strategies reduce cooling demand.

The role of an air conditioner

A reverse-cycle heat pump moves heat. In winter it brings heat indoors; in summer it moves indoor heat outdoors. The equipment should match the house and the rooms you actually use.

Bigger is not automatically better. Both undersizing and oversizing can reduce comfort, efficiency or value.

Which heating and cooling system?

There is no single best choice for every house, apartment or climate.

Single-room split system

Useful for a room or open-plan area. Independent control can be efficient when only part of a home is occupied.

Multi-split system

Multiple indoor units served by one outdoor unit. Can offer room control but requires careful diversity and pipework design.

Ducted reverse-cycle

Distributes conditioned air through ducts and outlets. Convenient for larger houses; duct insulation, leakage, returns and zoning matter.

Other solutions

Ceiling fans, passive shading, insulation and draught sealing reduce loads. Some homes use hydronic, evaporative or other systems.

A heat pump may deliver several units of heating for each unit of electricity consumed. Actual performance changes with outdoor temperature, load and equipment.

How professionals calculate heat load

An installer should measure the building and calculate winter heating and summer cooling separately.

01

Measure rooms

Floor area, height and conditioned volume

02

Inspect envelope

Wall, roof, floor and insulation properties

03

Assess glazing

Window area, U-value, solar gain and shading

04

Check climate

Outdoor design temperatures and exposure

05

Add other gains

People, lighting, appliances and ventilation

06

Select equipment

Room loads, diversity, ducts and cold-weather output

AIRAH DA09 provides professional load-estimation methods. Simple square-metre rules are screening tools, not substitutes for a room-by-room design.

The two calculations to understand

These simplified equations illustrate part of the engineering process, not a complete design.

1 HEAT THROUGH A BUILDING ELEMENT

Heat transfer (W) = U × Area × Temperature difference

Illustration: a 12 m² window with U = 2.8 W/m²K and 20°C inside versus 0°C outside:

2.8 × 12 × 20 = 672 W of heat loss

2 HEATING ENERGY AND ELECTRICITY

Electrical input ≈ Heating output ÷ COP

Illustration: delivering 9 kW of heat at an instantaneous COP of 3.0 requires about 3 kW of electricity at that operating point.

9 kW ÷ 3.0 = 3 kW input (illustrative)

A complete cooling calculation also includes solar gains through glazing, air leakage, people and appliances, moisture, thermal mass and system/duct effects.

Why height and glazing change the answer

Two homes with the same floor area can have very different heating and cooling needs.

SAME 30 m² FLOOR AREA - DIFFERENT ROOM VOLUME



Higher ceilings increase room volume and can affect stratification, airflow and the area of exposed walls. Volume alone does not determine peak load.

Double glazing

Can reduce conductive heat transfer relative to less efficient windows. Actual U-values, frame design and solar heat gain matter.

Window orientation

East and west windows may admit strong summer sun. Shading, glazing performance and orientation can dominate cooling loads.

A 7-star NatHERS rating describes modelled thermal performance; it does not prescribe the required air-conditioner capacity.

A modern two-storey Googong home

This anonymised case is based on homeowner-supplied building details and contract records.

RECORDED PROPERTY CHARACTERISTICS

Location	Googong, NSW - Canberra-region climate
House	Two storeys; approximately 310 m² overall build
NatHERS conditioned area	192.4 m² (assessment figure)
Assessment total area	244.0 m²; garage separately 35.9 m²
Ceiling heights	3.1 m main living; 2.6 m other ground areas
Windows / efficiency	Double glazing; reported 7-star rating
Equipment	Daikin 20 kW ducted inverter; four control zones

Why area figures differ

A whole-building area may include spaces not heated or cooled. The NatHERS conditioned area is not identical to total construction area.

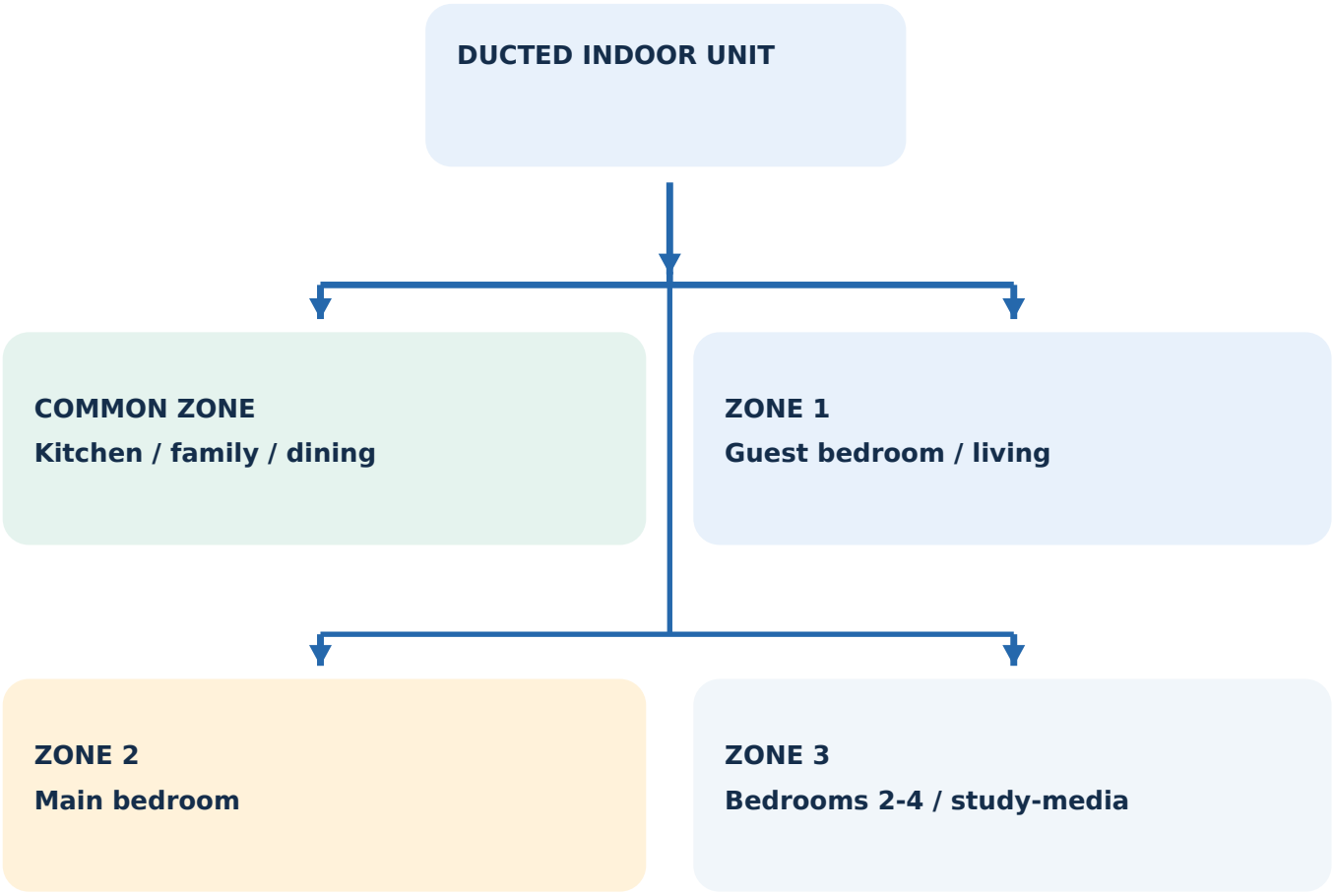
What is not established

No verified room-by-room peak load schedule, detailed duct design, exact model heating capacity or winter capacity curve was available.

This example illustrates a real specification. It is not a finding that a 20 kW system is correctly sized, undersized or oversized.

How four-zone ducted control works

Zoning directs airflow to selected spaces; it does not create four independent outdoor systems.



The key design checks

Confirm minimum airflow when few zones are open, supply and return paths, duct leakage and insulation, temperature-sensor positions, static pressure and whether controls permit the intended zone combinations.

A smart zoning controller can improve convenience, but it cannot compensate for incorrect equipment selection, insufficient airflow or poorly designed ducts.

Does 20 kW mean 20 kW of electricity?

No. Heating/cooling capacity and electrical input are different measurements.

ILLUSTRATIVE HEAT-PUMP OPERATING POINT

ELECTRICITY
5 kW input



HEAT DELIVERED
20 kW output

Illustrative COP = 20 ÷ 5 = 4.0

Capacity depends on mode

A model may have different rated heating and cooling outputs, minimum/maximum modulation and capacity at low outdoor temperatures.

What to verify

Ask for exact indoor/outdoor model numbers, rated heating and cooling capacity, electrical input, COP/EER and cold-weather performance data.

The Googong record identifies a 20 kW Daikin ducted specification. It does not establish that 20 kW is its rated heating output, electrical draw or calculated building peak load.

Estimate running cost without guessing

Use the actual electrical input, hours of operation and your electricity tariff.

ILLUSTRATIVE COST FORMULA

Electricity used (kWh) = average input kW × hours

Cost = electricity used × tariff ($/kWh)

Example: 3 kW × 4 h × $0.30 = $3.60

Light-load operation

A variable-speed system may draw much less than its maximum electrical input when the load is modest. Actual metered data is best.

Peak cold or hot weather

Demand can rise, efficiency can fall, and defrost or fan power may matter. Real cost varies with conditions and the rooms in use.

A nominal 20 kW thermal-capacity label must never be multiplied by the electricity tariff as though it were 20 kW of continuous electrical consumption.

Use your system more intelligently

Practical improvements often cost less than replacing equipment.

Winter comfort

A commonly recommended starting point is around 18-20°C while occupied. Adjust for health, comfort and household needs.

Summer comfort

A commonly recommended starting point is around 25-27°C, using fans and shading where suitable.

Day/night zoning

Condition occupied living spaces during the day and bedrooms at night where the system and airflow design allow.

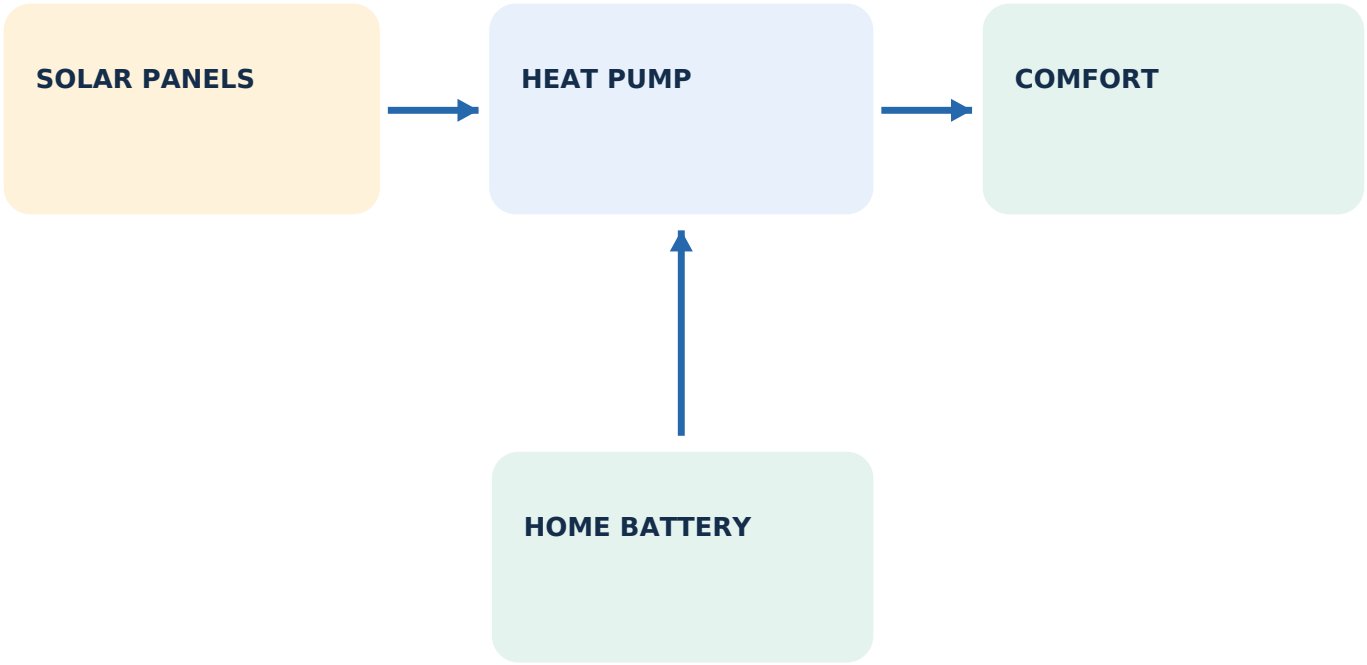
Keep airflow healthy

Clean accessible filters, keep vents clear and arrange professional maintenance. Never obstruct required return-air paths.

Australian Government guidance notes each extra degree of heating or cooling can change energy use by about 5-10%, depending on conditions.

How solar changes heating/cooling costs

Solar can offset some daytime electrical consumption; a battery can shift some energy to later.



During daylight

If solar is producing electricity, daytime heating or cooling may use more of it directly. Export payments are an opportunity cost.

Evening and winter

Batteries can offset some evening use but may not recharge on cloudy winter days. Compare charging losses and available capacity.

A heating/cooling system should be sized for thermal comfort and design weather - not simply to match rooftop solar or battery capacity.

The installer checklist

Request a written calculation and an explanation that an ordinary homeowner can follow.

- [ ] What heating and cooling loads were calculated for each room?
- [ ] What design temperatures and Canberra-region climate data were used?
- [ ] How were ceiling heights, insulation and window U-values included?
- [ ] Were orientation, shading, air leakage and internal gains modelled?
- [ ] What are the exact model numbers and cold-weather heating capacity?
- [ ] How are the duct sizes, return air and minimum airflow determined?
- [ ] Can the system operate safely with only one zone open?
- [ ] What are the rated electrical input, COP/EER and seasonal performance?
- [ ] What noise, warranty, commissioning and maintenance provisions apply?
- [ ] Can I see measured commissioning results and operating instructions?

If the installer offers only a blanket watts-per-square-metre figure, ask what evidence supports it for your building and climate.

Your heating and cooling decision path

Start with the house, then choose equipment and controls.

1

Assess the home

Area, height, glazing, insulation and leakage

2

Model both seasons

Heating and cooling peak loads for each room

3

Compare systems

Splits, multi-splits and ducted options

4

Verify performance

Cold-weather output, efficiency and airflow

5

Commission properly

Airflow, sensors, controls and documentation

6

Monitor and adjust

Comfort, energy use and maintenance

Choose equipment that meets measured comfort requirements, not the largest number on a sales brochure.

Sources and technical notes

Primary Australian guidance and transparent limits on the Googong case study.

AIRAH DA09 - professional load-estimation manual

Australian Government YourHome - heating and cooling

energy.gov.au - heating and cooling

Energy Rating - choosing air-conditioning size

NSW BASIX - heating and cooling loads

ACT Climate Choices - reverse-cycle systems

ABOUT THE GOOGONG EXAMPLE

The home characteristics, NatHERS assessment areas, Daikin upgrade and four-zone groupings are drawn from homeowner-supplied history and building records. No professional heat-load calculation was provided for independent verification.

Editorial date: 31 October 2026. Illustrative equations and tariffs are not site-specific designs. Consult licensed HVAC/refrigeration professionals and verify current standards and product data.