Solar Assessment Checklist

The sun is a source of free energy for space heating (passive solar design), solar water heating and electricity generation (photovoltaic electricity). Even a small amount of sun can help improve your home's energy efficiency and comfort, and several sunshine hours a day gives you the options of considering reducing your power bills with solar hot water and photovoltaic electricity.

Understanding the site where your house is located is important for selecting the most appropriate renewable technology for your household with the best chance of performing well in your home. This guide helps you to understand the main issues that you will need to think about in assessing your site and situation for using solar energy.

Three inter-related factors are key to optimum solar resource use

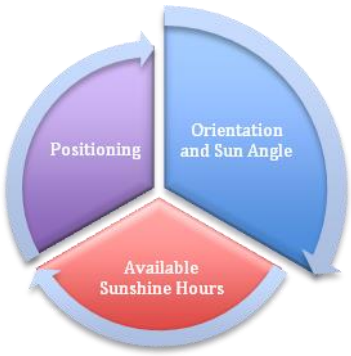
A) Orientation and Sun Angle
B) Available Sunshine Hours
C) Positioning

NOTE: Seek professional advice if there is any doubt or difficulty with the assessment, and before any system decisions are made.

Work through the following three checklists to assess your site:

- Checklist A: Orientation and Sun Angle
- Checklist B: Available Sunshine Hours
- Checklist C: Positioning

CHECKLIST A: Solar Feature: Orientation and Sun Angle



Important points:

- The sun shines from the north, so any surface facing north (preferably in a range of 20º west to 30º east of true north) will capture sun. True north can be found from local maps and street directories; or use a rough visual while on the site - the line between you and the sun at midday is an estimate of true north.
- Winter sun is lower angled than summer sun, so it sits lower in the sky. This affects the required 'tilt' of solar water heating and photovoltaic panels, as well as the amount of winter sun captured for passive heating.
- Tilt angle is the angle of the solar panels in relation to the ground. Generally for the best average performance over a year, the latitude of the site is the tilt angle for a photovoltaic panel, or solar collector. Latitude varies down New Zealand: Auckland is around 36º, Wellington 41º and Dunedin 45º.
- Tilting the panels an extra 10 degrees above latitude (so the angle is steeper) will give more electricity or hot water in the winter because the sun is lower in the sky. Decreasing the angle from latitude so the panel is flatter will provide more electricity or hot water in the summer because the sun is higher in the sky.
- The chosen tilt angle will depend on what the systems are meant to deliver for each situation (winter hot water may be more important for some, or maximum electricity from summer sun may be needed for others).

Orientation and Sun Angle Checklist

Passive Space Heating

Question: Which way does the house face?
TIP: It should face north - walls/windows should be larger on the north side. North-facing walls and windows capture sun during the day; West-facing capture afternoon/evening sun and East-facing will capture morning sun.

- ◯ **Good** — All day sun especially in winter
- ◯ **Possible** — Sun for about 4 hours/day
- ◯ **Not Good** — Sun for less than 4 hours, morning or evening only

Question: Does the house have eaves?
TIP: Eaves/overhangs should be of a length to provide shade during the summer and allow low-angled winter sun in.

- ◯ **Good** — Standard eaves that let in winter sun
- ◯ **Not Good** — Long eaves/ verandahs that block winter sun

Question: Do the windows allow enough sun into the right rooms?
TIP: High thermal mass surfaces inside the house (concrete/brick floors or walls), which are exposed to sun, will store the sun's warmth and release it later in the day when the temperature drops.

- ◯ **Good** — Windows let in sun onto heat absorbing surfaces
- ◯ **Possible** — Either windows or some wall space to retrofit them
- ◯ **Not Good** — No option to retrofit windows or alter floor surface

Orientation and Sun Angle Checklist (part 2)

Solar Water Heating (SWH) and Photovoltaic Electricity (PV)

Question: How much of the roof faces north? Is there enough space to place a solar water heater or a photovoltaic panel?
TIP: Roofing and eaves can be designed to allow for passive heating and cooling needs inside the house, while ensuring maximum access to sun on the roof. Only part of the roof needs to face north to be useful for placing a system - PV needs more than solar water heating.

Good	Possible	Not Good
Need at least 5-8 m2 facing north for SWH and at least twice that for PV panels	Less than area above, or option for a frame to be placed facing north	Roof shaded most of the day with no option to place a frame on the roof

Question: What is the pitch of the roof?
TIP: A flat/low pitch (usually less than 15º) will capture more summer sun, while a steep roof (greater than 40º) will capture more winter sun. Roof pitch is part of ensuring the right tilt angle for SWH and PV –because it's not always the same as site latitude, a frame can be used to position the system to perform better.

Good	Possible	Not Good
For solar water heating, north facing roof pitched between 30-40 degrees	SWH as above or steeper, will give better winter options	Flat roof will give limited success, a frame would be needed. [Note: for PV, it depends on when/how much electricity is needed]

Question: How robust is the roof structure?
TIP: A frame may be required for roof-mounting PV panels to get optimum tilt angle, and/or the roof also needs to take the weight of a SWH system

Good	Not Good
Structurally sound and able to take weight of panels and possibly a frame	Old unsound roof, or limited strengthening options

Orientation and Sun Angle Checklist (part 3)

Passive Space Heating, Solar Water Heating and PV

Question: Does the shape of the site allow for buildings to be constructed or changed enabling more sun to be used?
TIP: The more area exposed to the north, the more sun is available.
This may also depend on what matters most – views, shelter from weather, privacy, exposure to sun or other specific features.

Good	Possible	Not Good
North-facing site with room to meet all needs	Access to sun requires building redesign or sacrifice of other features	Few options to access sun or other needs prioritised higher

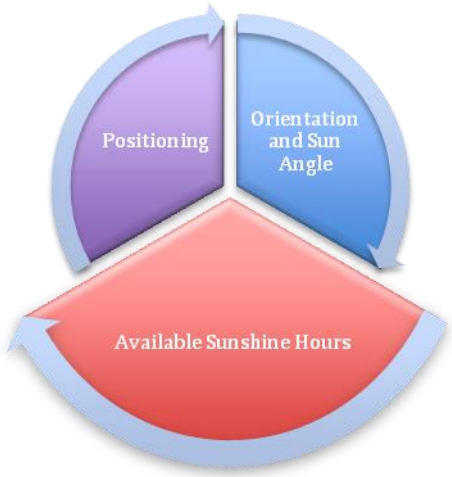
Question: If a roof is not used for PV panels, is there a suitable area available for ground-mounted PV?
TIP: For ground-mounted PV, a suitable area should be facing north, be big enough to safely position the system without risk of damage, and close enough to point-of-use to minimise electrical losses from long cables.

Good	Not Good
Enough area close to point of use & safe to use	Not enough area

SUMMARY: ORIENTATION & SUN ANGLE

Good	Possible	Not Good
The house and site generally fit the 'Good' criteria above. A north -facing site is best especially for a new build as it allows for whole house to be designed for passive space heating and other solar systems.	The house and site have a mix of the criteria above. If there is access to sun but other features are possible or not good, then seek professional advice to properly assess the options.	The house and site criteria are generally 'Not Good' especially if there is little option to get access to sun through either retrofitting or changing site features.

CHECKLIST B: Solar Feature: Available Sunshine Hours



Important points:

- More sunshine hours means more available solar energy. Sunshine hours are measured by weather stations all round the country and the data for specific locations can be sourced from NIWA's National Climate Database
- ***When*** sunshine is available can be as important as ***how much***, if space/water heating or electricity is required at a specific time. System design needs to manage both these factors.

Available Sunshine Hours Checklist

Passive Space Heating, Solar Water Heating and PV

Question: How many hours of direct sunshine are available through the year (especially in winter)? All day or only a couple of hours?
TIP: The more hours you have, the more space or water heating can be gained. PV's operate all day but work best with plenty of direct sun. Clouds and haze will reduce available sunshine.

Good
At least 6-8 clear hours, preferably all day

Possible
At least 4 hours during the middle of the day in winter

Not Good
Less than 4 hours or at either end of the day (sun is weaker)

Question: How much do your sunshine hours vary between summer and winter, and how does this fit with when it's needed most?
TIP: Sun path and sun angle change with season, so sometimes hills and obstacles can provide shade at different times of the year, or weather patterns might affect clouds and haze. Whatever system is used will need to be positioned according to the best time for sun in the house and/or on the roof.

Good
No significant seasonal weather or obstacles for 6-8 hours sun a day

Possible
Obstacles to sun can be removed or allowed for to get at 4 hours as above

Not Good
Seasonal weather, obstacles to sun cannot be removed or allowed for

SUMMARY: AVAILABLE SUNSHINE HOURS

Good
The house and site fit the 'Good' criteria above. All day sun with clear winter days is best, if winter heat and electricity are a priority

Possible
The house and site can access around 4 hours of sun. Orientation and sun angle criteria would have to be good.

Not Good
The house and site 'Not Good' especially if there is little option to get access to sun through either retrofitting or changing site features.

CHECKLIST C: Solar Feature: Positioning

Important points:

- Shading from obstacles must be minimised to ensure the best performance of any solar system - in winter, obstacles on the north side cast shadows two to three times their height. (Shade can be designed in for summer cooling while not interrupting performance of roof-mounted systems. Any shading of panels reduces efficiency)
- Slope of a site can affect seasonal access to sun – clever design of new build or retrofit features can sometimes overcome this.
- Keeping views and shelter from prevailing weather usually needs to be balanced against positioning for the sun.

Positioning

Passive Space Heating, Solar Water Heating and PV

Question: How close are hills, neighbours and trees? Is this likely to change (being built-out or growing bigger)? Can they be reduced or removed?
TIP: At least six metres from a single storey (more for higher buildings) to the north is preferable for sun access. Aerial photos can help identify neighbourhood features. Removal is not always practical! Privacy can be a reason for not altering obstacles if you or the neighbours are concerned

Good
Large obstacles more than 6 metres away with no risk of change

Possible
Obstacles exist but can be altered, or house redesign can reduce effect

Not Good
Large obstacles are too close and cannot be removed

Question: Sloping sites - where does the slope face, and are there options for the best positioning for sun?
TIP: North-facing is best, south facing slopes lose sun early in winter. The steeper the slope the fewer options there are for sun. A narrow site may give fewer options for avoiding shading.

Good
North-facing site, or options exist to position rooms /systems for sun access

Possible
Narrow site but north facing; slope facing east or west but options exist to position rooms /systems for sun access

Not Good
Narrow south-facing slope, with no options for system placement or house redesign

Question: Is the appearance of SWH or PV important?
TIP: If these systems are deemed unattractive, then they may need to be positioned to reduce visual impact as long as they can still work. This can be an issue in some of New Zealand's heritage precincts

Good
Appearance not an issue

Not Good
Appearance is an issue for position where system will work best

Positioning (part 2)

Passive Space Heating, Solar Water Heating and PV

Question: How does the site change at different times of the day and in different weather conditions?
TIP: Understanding this can help strike a balance with sun, wind, shelter, views and privacy

Good

Site can deliver for all needs while allowing a solar system to perform

Not Good

Site changes with time and weather means other needs are prioritised above

SUMMARY: SOLAR POTENTIAL BASED ON POSITIONING

Good

The house and site fit the 'Good' criteria - there are plenty of options for accessing sun by managing slope and obstacles

Possible

The house and site meet a mix of criteria with some thought needed to ensure the best positioning for rooms and/or systems

Not Good

The house and site have few or no options for positioning, or other needs are more important than accessing sun