

ENERGY EFFICIENCY AND RENEWABLE ENERGY

ENERGY EFFICIENCY

Energy Efficiency is the single most effective way of reducing energy consumption and cost in the design and operation of your home.

It applies to:

- Building design (see also Passive Solar Design fact sheet)
- Appliances and other energy users (space heating and cooling, hot water systems, lighting)
- Operational energy demand (for lighting, heating, cooling, ventilation, appliances)

BUILDING DESIGN (SEE THE PASSIVE SOLAR DESIGN FACT SHEET)

1. Site location
2. Orientation for direct solar gain
3. Zoning for thermal efficiency
4. Thermal mass
5. Insulation
6. Ventilation
7. Glazing for direct solar gain

8. Sealing of draughts
9. Shade
10. Landscaping

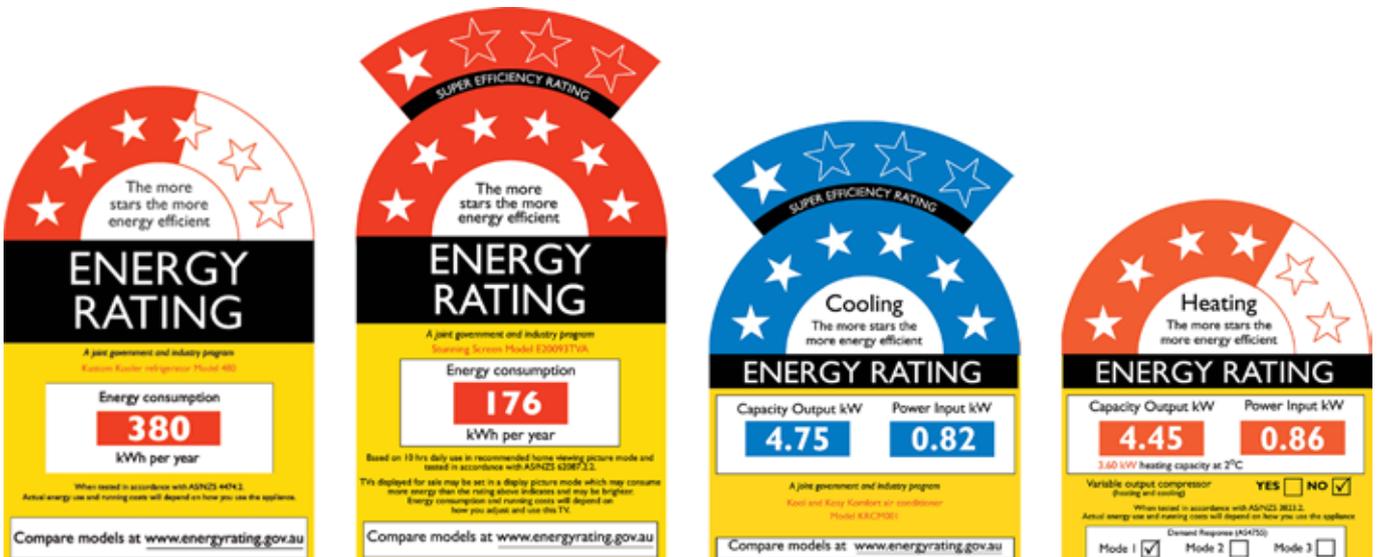
ENERGY EFFICIENT APPLIANCES

The type of appliances you chose and how you use them will have a big impact on the energy savings achieved in your home.

Appliances include TVs, home entertainment systems, refrigerators, washing machines, dishwashers, blenders, grinders, mixers, irons etc.

The energy efficiency of appliances is required to be stated on the Energy Star label attached to the appliance and this star rating describes the performance of the appliance in relation to its energy efficiency. Appliances with a higher star rating use less energy and produce less greenhouse gas emissions. The average annual consumption for the appliance is stated in kWh per year.

The size of an appliance can also have an impact on its energy consumption, even if it has a high star rating, so choose the size of the appliance most appropriate for your needs.



Modern high tech electronic equipment is often fitted with a standby mode making it convenient to start up instantly when required. Unfortunately, in the standby mode, the appliance still consumes electricity, which can amount to 10-12% of its normal use, so it is important to ensure appliances are turned off at the power point.

A 'Green Switch' is a wireless home energy control system which will help manage standby power use by making it easy to switch off appliances that are not in use.

A green switch comprises two units – a small portable remote control unit and a small 'slave' unit which plugs into the 240V wall socket, into which an appliance is plugged. The appliance can then be turned on and off using the remote control unit.

An alternative to a green switch is a 'Master Control Switch' which is a switch that can be installed over nominated circuits (power and lighting) to enable the fittings on the nominated circuits to be all switched off at once. For instance, when retiring at night, all lights and appliances in the house that are on (or are on standby) can be turned off from the one conveniently located position.

Ask your builder to install a Master Control Switch over nominated power and lighting circuits.

A 'Smart Meter' is normally installed by the electricity supply company and provides data that enable customers to make choices about how much energy they use by providing them with accurate real-time information about their electricity consumption.

SPACE HEATING

In the cool climate of Googong, heating will most likely represent the majority of your energy consumption, so install the most efficient heating system available and ensure that the heat you generate is retained within the building by the use of thermal mass, insulation and draught sealing (see Passive Solar Design factsheet).

The amount of heating you need depends on many things, including your home's star rating, extent of draughts and microclimate.

Options for space heating to achieve a comfortable home include:

- Solar Hydronic
- Solar to air
- Reverse cycle air conditioning
- Electric
- Gas
- Solid fuel

HOT WATER

Hot water is the next largest energy user after space heating.

Purchase the most energy efficient hot water system available

and ensure that it is positioned to maximise solar gain while minimising heat loss from the storage tank itself and from the pipework taking the heated water to delivery points.

The choice of the most appropriate system is detailed on the Hot Water fact sheet. An evacuated tube system would provide the most efficient water heating system in a location such as Googong as such a system will extract the maximum heat from the available sunlight.

Locating the system close to outlets is important to minimise runs to delivery points, so locating bathrooms close together can assist to reduce heat loss in pipework. Insulating the pipework will assist in retaining the valuable heat energy generated by the collector panel.

LIGHTING

Advances in lighting technology mean that energy efficient lighting is possible with no sacrifice in lighting quality. Older style incandescent light fittings which produced a significant amount of heat have been replaced by compact fluorescent and LED lamps with significant savings in energy consumption.

LED lamps in particular can reduce energy consumption by up to 70% compared to incandescent fittings and have lifetimes of 50,000 hours which make their initial cost more acceptable over the long term.

LED lamps are also more reliable, efficient and operate at safe low voltages.

LIGHTING PLAN

A lighting plan comprising natural daylight, low energy light fittings, lighting control systems and innovative circuitry can:

- Provide a high level of visual comfort
- Use daylight via windows, skylights, skytubes and clerestory windows where appropriate
- Have low energy requirements
- Include motion sensors for limiting the time lights are on and turn off when not required
- Highlight the architecture and design
- Minimise consumption by designing circuits so that only lights that are needed are switched on

OPERATIONAL ENERGY DEMAND

The amount of energy consumed in your home will depend on a number of factors, not the least of which is the amount of time appliances, lights, air conditioning and heaters are switched on or left in standby mode, ready to leap into action in the blink of an eye.

Motion sensors and timers can save a lot of energy where, for instance, lights will only turn on when you enter a room or space controlled by the motion sensor. Lights will remain on as long as the person is in the room. The time length of the sensor can be adjusted to suit the activity.

As previously mentioned, forgetting to turn off appliances at the main power point can also contribute to significant 'phantom' energy use, which can amount to 10-12% of the appliance consumption.

CONTROL SYSTEMS AND POWER MANAGEMENT

Understanding your home energy use is a first step to managing and potentially reducing your energy consumption. A simple way to start coming to grips with your consumption patterns is to install a power usage meter which lets you measure energy use and calculate the running costs of different appliances as well as their greenhouse gas emissions.

Knowing which appliances consume the most electricity will help you choose when to use them based on the electricity rate at the particular time you plan to use them. For example, you may choose to use your washing machine during off-peak times when electricity is cheapest.

Wireless meters let you take readings without having to access the main socket unit.

More sophisticated (and expensive) systems operate as 'data loggers' which will monitor energy use over a range of appliances, including air conditioning systems. This type of system will be useful, to those seeking to make serious changes to their usage patterns.

RATING TOOLS

There are a number of house energy rating and modeling tools available in Australia for carrying out assessments of the thermal performance of proposed buildings. At present there are no accredited tools which measure overall environmental performance.

The accredited tools which have been developed to assess thermal performance include:

BERS	Building Energy Rating Scheme, which is more applicable to tropical and subtropical climates
NatHERS	National House Energy Rating Scheme is the framework tool used to assess thermal performance of house designs against minimum compliance standards set by the BCA (Building Code of Australia)
AccuRate	Developed for thermal assessment in the ACT, now the standard tool for thermal assessment of residential buildings in Australia
First Rate	Developed by the Victorian Government for use in Victoria

Ratings prepared by accredited assessors using the above tools are accepted by most authorities in Australia.

Using one of the above rating tools will enable the inclusion of factors which will facilitate the design of higher star rated buildings, with the potential for significant energy and water savings.

In NSW, new houses are required to meet minimum energy and water reductions mandated under the Government's BASIX compliance scheme, which requires reductions of 40% in water and 40% in energy compared to standard houses.

Houses in Googong are required to meet the stricter requirement of a 50% reduction in water use as part of the DA process.

The rating tools produce a 'star rating' which indicates the thermal performance of the building in its requirement for heating and cooling within a range or 'band' of energy consumption, measured in MJ/m² per annum, required to achieve comfort levels as follows:

Star Rating	Annual MJ/m ² heating and cooling
1	284
2	186
3	125
4	88
5	66
6	51
7	39
8	26
9	14
10	5

Recent research * by the CSIRO found that building a 5-star rated dwelling will provide improved thermal comfort whilst saving money both during construction and occupancy.

Links

NatHERS

www.nathers.gov.au

BASIX

www.basix.nsw.gov.au/basixcms

CSIRO

www.industry.gov.au/Energy/Pages/Evaluation5StarEEfficiencyStandardResidentialBuildings.aspx

RENEWABLE ENERGY

Installing a renewable energy system in your new home is an investment that will provide long term benefits to you, in the form of a reliable, cost effective source of energy and to the environment in the form of reduced or zero carbon emissions.



In Googong, the most practical and cost effective forms of renewable energy will be from:

1. Photovoltaic (PV) panels on your roof to generate electricity, with either storage via battery back-up or connected to the grid with some form of feed-in tariff to help offset the initial capital outlay
2. A solar hot water system
3. A solar air heating system for internal space heating

The Googong design guidelines require that solar panels installed on a roof be integrated into the roof and there are several options available to achieve this for both tiled and corrugated metal roofs.

The design guidelines require that water storage tanks associated with a solar hot water system not be on the roof.

RESIDENTIAL SOLAR PHOTOVOLTAICS

Residential solar PV systems are these days installed with 'net meters', meaning that home owners who install solar PV systems will use that energy first to power their home. Energy that is not used straight away is exported to the electricity grid.

This 'self-use' electricity is of much higher value than the electricity that is exported to the grid and it is therefore in the home owner's interests to have their solar PV system appropriately sized for their demand in order to maximise self-use, minimise exports and maximise their return on investment.

HYBRID SYSTEMS-BATTERY STORAGE

Battery storage is becoming a cost effective way to store the electricity generated by your PV panels, driven by reducing fee-in tariffs which make grid-connected PV less attractive as an investment.

A hybrid system uses an inverter to convert the electricity generated by the panels to a form that can be used directly in your home. Any excess to household requirements can be shunted either to the grid (with a financial benefit from a feed-in tariff) or to the system's battery bank. Battery banks can draw power from the grid during off-peak periods and store it for later use during peak or 'shoulder' periods.

During a blackout when the grid is offline, the inverter channels power from the battery to pre-designated 'essential circuits' to keep important appliances like light, fridges and freezers running. This can be a lifesaver for a home business dependent on computers.

SOLAR HOT WATER SYSTEMS

See Hot Water Heating Fact Sheet.

SOLAR AIR HEATING SYSTEM

A solar air heater works in a similar fashion to a solar hot water system except that the energy transfer medium is air instead of water which is used to heat the internal spaces in your house.