The smart energy home

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Part of Energy Queensland

Introduction

Homeowners make many decisions when designing and constructing a new home, including how they will use and potentially generate and even store their own electricity. Property developers also have to make decisions in relation to energy supply, taking into account trends in the wider energy sector and how homes of the future may use energy.

We hope this guide will help homeowners and developers make informed and smart energy decisions for short and long term benefit.

In this guide we will look at:

- **Energy supply options for your new home**
- **The pros and cons of electric vs gas appliances**
- **Smart home technologies**

Energy supply options for your new home

When building a new home, one of the key energy related decisions homeowners will make is whether the energy supply will be electric only or electric plus gas. In residential developments, gas (reticulated natural, piped LPG or bottled LPG) can be provided as an alternative energy source for water heating and cooking.

There was a time when many consumers preferred gas for cooking, particularly for cooktops. However, improvements in appliance technology and changes in energy prices have made electric stoves and induction cooktops a more attractive and often a lower cost option. Modern electric cooking is fast and efficient.

Also, running costs for heating water by electric storage, heat pump or solar PV (electric boosted) are usually cheaper than gas, especially LPG. Please be aware that instantaneous electric hot water systems have a very high demand and may not be suitable for premises on demand based tariffs.

Advantages for using electric appliances are:

- One energy bill for homeowners
- No gas connection costs
- No ongoing fixed charges for gas supply
- On-site generation of electricity from solar PV and battery storage can be used to run electric appliances
- They are more easily incorporated into a smart home and controllable by a home energy management system.

The pros and cons of gas vs electric appliances

Appliance	Pros	Cons
Gas oven and cooktop	• Excellent heat control • Reach desired cooking temperature very quickly • Available during a power outage	• Mains gas connection required for piped LPG and natural gas • Fixed and usage charges apply for piped LPG and natural gas, so you will pay fixed charges for electricity and gas, making gas cooking expensive (bottled gas may reduce fixed charges)
Electric oven and cooktop	• Modern electric ovens and cooktops are as fast at reaching desired temperatures as gas • Similar temperature control to gas cooktops • Modern electric cooktops are easier to clean	• Induction cooktops require magnetic cookware (alloys such as aluminum are not suitable), and homeowners may need to upgrade their cookware
Gas hot water - storage and instantaneous	• Instantaneous gas is efficient • Instantaneous gas installation costs are similar to electric • Instantaneous systems are far smaller in size than gas and electric storage units • Lower greenhouse gas emissions than electric systems purely using grid electricity	• Can't use electricity generated from solar PV to offset costs • Gas costs have the potential to fluctuate in the future more than electricity prices • Extra costs for the mains gas connection for piped LPG and natural gas • Fixed and usage charges apply for piped LPG and natural gas, so you will pay fixed charges for electricity and gas. Bottled gas may reduce or eliminate these fixed charges but the gas price is usually higher and gas bottles need to be refilled or replaced when exhausted
Electric storage, heat pump or solar (electric boosted) hot water	• All systems can be connected to economy tariffs saving up to around 25% on electricity running costs • Heat pump and solar hot water systems can save up to around 85% in electricity running costs[1] • Can use electricity generated from solar PV and battery storage • Technological innovations are underway that will assist in incorporating electric hot water systems with home energy management systems	• Solar hot water and heat pumps have higher installation costs • Solar hot water and heat pumps may require more maintenance due to more complicated plumbing and/or moving parts • Heat pumps make some noise and care must be taken when choosing the location for installation

[1] Source: Queensland Government Energy Wise Queensland and Australian Government Heat Pump Water Heater Guide for Households documents.

Smart home technologies

Solar power

A solar photovoltaic (PV) system is a great way to reduce greenhouse gas emissions while providing savings on the electricity bill. With significant price reductions over time, a solar PV system for the average size home is now as low as $4,000 to $5,000 after subsidies. Depending on how the electricity generated is used or stored, the average solar PV system could save the householder up to $1,000 each year[2] on the electricity bill.

The electricity generated by solar PV can be used in a number of ways:

- Within the home – this reduces the amount of electricity purchased from the electricity retailer
- Exported to the grid – excess solar electricity not used in the home when it is being generated can be exported back to the electricity grid and sold to the electricity retailer
- Stored in batteries – excess generated electricity can be stored in batteries for later use, usually during the evening.

To maximise the use of electricity generated from your own solar PV, some appliances like hot water systems and pool filters that are not connected to a Controlled Load (or Economy) tariff, can be programmed to operate between around 9am and 3pm, when solar power is being generated. There are a range of devices available to do this, from inexpensive switchboard timers ($50 to $100 plus installation) to home energy management systems that start from around $500 plus installation. These can also be used to maximise the amount of solar power used in the home.

[2] Based on a 5kW solar PV system producing on average 20 kWh/day, of which 50% is used in the home, and primary tariff consumption is charged at 30.c/kWh.

PeakSmart air conditioning

PeakSmart is a device installed in the air conditioner that helps manage peak demand on the electricity network. The majority of air conditioner brands offer a range of PeakSmart compatible air conditioners, which comply with AS4755.3.1.

PeakSmart air conditioners are able to receive and respond to a signal from the electricity network, which temporarily reduces its energy demand. This signal is only sent on the few days of the year when the electricity network is under stress. The effect is similar to the air conditioner being in economy mode, so the householder should not notice any difference to their comfort level.

We recommend PeakSmart air conditioners be specified for inclusion in new homes. PeakSmart air conditioners cost no more than “normal” air conditioners, but have benefits for developers, homeowners and the community. Customers who buy PeakSmart air conditioners to put in their new home can get a cashback on each eligible air conditioner installed. Developers also may be able to take advantage of cashback incentives after installation. Importantly, the home is assisting the sustainability and reliability of the wider electricity network.

Off-peak controlled load tariffs

Off-peak controlled load (or economy) tariffs are great for appliances like hot water systems, pool pumps and electric vehicles, that don't need a constant supply of power.

These tariffs are cheaper because we can interrupt the power supply to reduce the load on the electricity network. This usually occurs in the morning and evening peak periods but can change from day to day and vary in duration.

For appliances where you need power on a constant basis or at a regular time each day, you may prefer to connect them to the standard primary tariff which gives you power 24/7.

To take advantage of off-peak controlled load tariffs in new homes, appliances need to be on dedicated circuits wired back to the switchboard. Make sure these circuits are installed at the time of construction to the area where these appliances will be connected, as the costs to install after the home has been built will be more. Off-peak controlled load metering should also be installed during construction.

It is important to note that if you have appliances on an off-peak controlled load tariff, you won't be able to run them off a solar PV system that is connected to your primary tariff.

Electric vehicles

Electric vehicles (EVs) are becoming more common on our roads, and are expected to increase in popularity as more models become available and prices come down over time. Whilst there are more and more public charging stations, home based charging is considered a necessity by most EV owners so they can charge their EV overnight.

EV charging requirements vary between makes and models. In some cases, charging an EV in the home can be done via a standard electrical power point (240 volts at either 10 or 15 amps). Dedicated EV charging units that offer a faster charge are another option for use in the home. These must be installed by a licensed electrical contractor, usually have a higher power draw and require higher rated (i.e. thicker) electrical cabling, and must meet other electrical safety requirements. In some cases, these fast charge units require a three-phase supply to the premises.

Dedicated EV charging units, above 20 amps single phase (about 4.6kW) must be connected in a way that allows the Network operator (Ergon Energy or Energex) to temporarily slow or cease charging, to help reduce network demand during high peak demand days. Your installer will be able to advise on which option is best suited to your requirements. Charging can also be controlled via a Home Energy Management System (HEMS). It's far cheaper to install a dedicated connection point (usually in the garage/carport) at the time of construction, than to retrofit later.

For more on EVs and EV charging, visit **ergon.com.au/electricvehicles** or **energex.com.au/electricvehicles**.

Smart devices can help keep energy costs down

Home energy management systems

Home Energy Management Systems (HEMS) are smart devices that monitor, analyse and control energy in the home to help homeowners keep energy costs down. While building management systems have been common in commercial buildings for a number of years, residential HEMS have generally been restricted to simple home automation systems, and due to high costs, only in high end homes.

As with battery storage and electric vehicles, HEMS are expected to become more prevalent over the next few years as the number of both large manufacturers and smaller companies launch new systems onto the market.

HEMS vary in price from a few hundred dollars for a basic system that will monitor energy consumption and production, to more complicated systems that will also control appliances and provide some automation in the home for $500 to $1,000. Some HEMS are being used to maximise solar use on-site, control batteries, and adjust electricity consumption to match tariff pricing signals.

HEMS are made up of two main components: hardware that is installed in the home (normally in or near the switchboard), and a software application. HEMS transmit and receive signals through the home's Wi-Fi or its own mobile network communications.

Typically HEMS:

- Monitor and display energy usage and generation in the home (online/via an App)
- Control circuits or individual appliances to optimise energy use e.g. in the form of "set and forget" timers and/or manually switching appliances on or off via a smart phone app or website
- Act as a gateway device that can "talk" to other Internet of Things (IoT) devices such as air conditioners, smart appliances and door locks.

Battery energy storage systems

Energy storage in homes is becoming a reality thanks to improvements in battery technology, increasing numbers of suppliers, and reductions in cost. At present, it is more economically viable for some households than others, but downward price projections indicate many households will consider battery storage in the coming years.

Battery systems in homes are becoming a reality largely due to the falling costs of solar PV. Solar PV affordability is allowing customers to install large solar PV systems that generate more electricity than can be used during the day. Batteries are able to store this excess energy for use during the evening and night. Depending on the electrical configuration, battery energy storage systems may also be able to provide electricity when there is a power outage.

Currently, a typical home battery system costs between $5,000 and $15,000. The size of the inverter (power), battery bank capacity (energy) and battery chemistry (lithium ion being the most common) all impact cost. The design of your home and construction requirements to comply with various emerging standards for installation should also be considered.

Key energy measures checklist

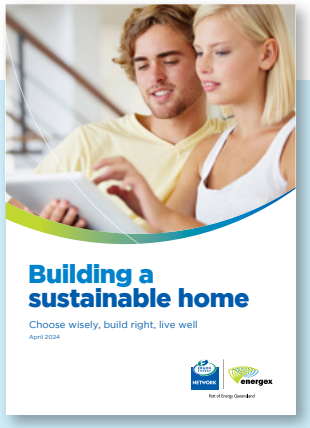
Measure(s)	Optimal time to implement	Who's responsible	Benefit
Install electric ONLY appliances for cooking/water heating	At time of house design/ construction	Home owner/builder	One energy bill, no gas connection costs, no ongoing fixed charges for gas, tariff options
Install solar PV	At time of house design/ construction. Can also be done later with little cost impact	Home owner/builder	Lower electricity bills and help reduce household greenhouse gas emissions
Install PeakSmart air conditioners	At time of house design/ construction	Home owner/builder	Access to cashback* incentive payments
Connect major appliances like hot water systems and pool pumps to dedicated circuits	At time of house design/ construction	Home owner/builder	Gives customer option to connect to off-peak controlled load tariffs for lower electricity bills or manage energy use through a HEMS
Connect major appliances to off-peak controlled tariffs	At time of house design/ construction or during the connection process	Home owner/builder	Lower electricity costs
Install dedicated circuit for future electric vehicle (EV) dedicated charger	At time of house design/ construction	Home owner/builder	Minimal cost if done during construction, 'EV-ready' home
Install home energy management system (HEMS)	At time of house design/ construction. Can also be done later with little cost impact	Home owner/builder	Monitor and control energy use to reduce energy costs
Install battery storage or pre-wire for later installation	At time of house design/ construction	Home owner/builder	Store and use excess solar PV generation during peak times and power outages (if configured to do so)

* Eligible areas only

Need more information?

There are a range of resources available to help you develop smart housing solutions.

- For more tips on saving money and electricity visit ergon.com.au/saveelectricity or energex.com.au/saveelectricity
- Also, check out the Australian Government's Your Home – Australia's guide to environmentally sustainable homes
- You can also email us at demandmanagement@ergon.com.au or demandmanagement@energex.com.au



Also available is Building a sustainable home guide for customers, which addresses key design and construction issues in new housing.

You can view the Building a sustainable home guide on our websites under Renovation & Building.

	Ergon Energy	Energex
General enquiries (7am – 5pm, Monday to Friday)	**13 74 66**	**13 12 53**
Power outages	**13 22 96**	**13 62 62**
Life threatening emergencies only triple zero (000) or	**13 16 70**	**13 19 62**
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