# ANDEFENA

A STRATEGIC RESILIENCE FIRM

# CUSTOMER OPTIONS

## BASIC

**Net-zero ready**

- Fully electric home
- 7 Star NatHERs
- (assumes standard electric cooktop & instant electric hot water)

## BETTER

**Low carbon and Net-zero ready**

Basic plus:

- Induction Cooktop
- Heat Pump Hot water

## BEST

**Net-zero carbon**

Better plus:

- ‘Right Sized’ Solar PV system

# Home Energy Cost Savings

## POTENTIAL ENERGY COST SAVINGS

**MAX COST SAVINGS**

# 50%

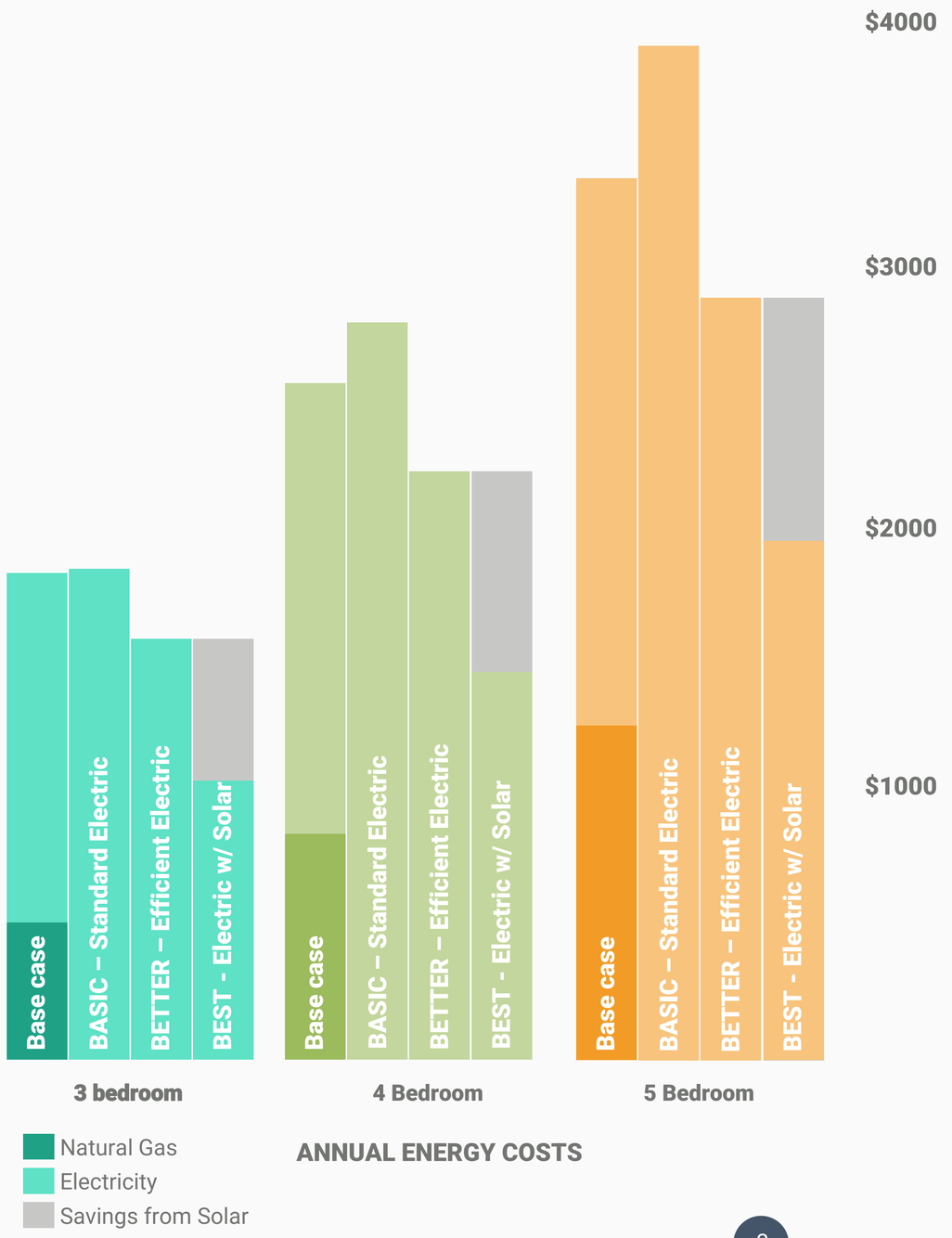
The exclusion of natural gas from a property means the residents do not need to pay the daily consumption charges associated with a gas connection. Even so, residents of a Wildflower ‘Basic’ home could expect to pay up to 15% more then a ‘base case’ home due to the high energy consumption of instantaneous electric hot water systems.

The improved efficiency of the electric heat pump hot water system, means that the Wildflower ‘Better’ home is between 16% and 27% cheaper to run then the ‘Basic’ home.

Solar PV provides greatest benefit by reducing the day-time energy consumption from the grid. The Distributed Energy Buyback Scheme (DEBS) has recently been reduced and provides little incentive to sell energy back to the grid during the day. As such the benefits of solar are predominately through self-consumption of the energy.

The ‘right-sized’ solar PV, provides benefits which sees the Wildflower ‘Best’ home offer residents the potential to save up to 50% in energy costs compared to the ‘Basic’ option.

Whilst household batteries have potential for additional annual savings, the high installation cost of these systems means that this option has been excluded from the study.



# ENERGY COST DATA

## The Wildflower development is fully electric and hence the base case is non-compliant within the community

Due to the high energy consumption associated with instantaneous electric hot water, the basic option results in higher energy costs then the base case home which uses gas for water heating. The cost savings seen within the better option are primarily achieved through switching to an electric heat pump hot water system due to high water heating loads and the significant efficiency improvements they offer compared to an instantaneous system.

| | 3 Bed \| 2 Person Household (90m$^2$) | | | | | 4 Bed \| 4 Person Household (130m$^2$) | | | | | 5 Bed \| 5 Person Household (150m$^2$) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Wildflower** | **Base case** | **Basic** | **Better** | **Best** | **Best plus Battery** | **Base case** | **Basic** | **Better** | **Best** | **Best plus Battery** | **Base case** | **Basic** | **Better** | **Best** | **Best plus Battery** |
| Modelled Electricity | $1,330 | $1,890 | $1,580 | $1,040 | $420 | $1,700 | $2,835 | $2,182 | $1,430 | $480 | $2,080 | $3,900 | $2,841 | $1,840 | $700 |
| Modelled Natural Gas | $540 | $0 | $0 | $0 | $0 | $890 | $0 | $0 | $0 | $0 | $1,320 | $0 | $0 | $0 | $0 |
| Total Cost | $1,870 | $1,890 | $1,580 | $1,040 | $420 | $2,590 | $2,835 | $2,182 | $1,430 | $480 | $3,400 | $3,900 | $2,841 | $1,840 | $700 |
| Annual Savings (compared with Base case) | - | -$20 | $290 | $830 | $1450 | - | -$240 | $408 | $1,160 | $2,110 | - | -$500 | $559 | $1,560 | $2,700 |
| Savings (%) | - | (1%) | 16% | 44% | 78% | - | (9%) | 16% | 45% | 81% | - | (15%) | 16% | 46% | 79% |
| Annual Savings (compared with Basic) | na | - | $310 | $850 | $1,470 | na | - | $653 | $1,405 | $2,355 | na | - | $1,060 | $2,060 | $3,200 |
| Savings (%) | na | - | 16% | 45% | 78% | na | - | 23% | 50% | 83% | na | - | 27% | 53% | 82% |

# ADDITIONAL BENEFITS

### CARBON NEUTRAL HOMES

The Intergovernment Panel on Climate Change (IPCC)[1] has identifed the need to achieve zero carbon emissions by 2050 to minimise the worst impacts of climate change.
As natural gas is a fossil fuel, carbon emissions from its consumption can not be avoided. By utilising only electricity within a home, it allows for homes to operate as carbon neutral, either through the use of on-site solar PV or by choosing to purchase green renewable electricity from the grid.

### HEALTHY HOMES

Burning natural gas within a home has been linked with a series of health problems due to toxic pollutants released while cooking. Comparable to the impact of passive smoking, natural gas is linked to an increased risk of asthma in Children and 3.2million premature deaths per year.[2]
Utilising an induction cooktop means that no fuels are burned within the home making them safer and healthier than gas-burners.

### COMFORTABLE HOMES

The use of solar reduces the cost burden associated with running appliances within the home. As we experience more extreme heat due to a changing climate, utilising solar PV to run air conditioning will mean lower-costs and more comfortable, healthy homes. This is particularly important for residents who are susceptible to heat-related illness, such as the elderly or those with existing health conditions.

### RESILIENT HOMES

Some batteries can be set-up to allow homes to have a supply of energy during blackouts. This means that in the case of a blackout some appliances can maintain power, providing residents with an operating refrigerator, lighting and some GPOs available for charging devices, maintaining wifi or entertainment during a black out.

[1] IPCC AR6 Climate Change 2023 Synthesis Report https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_SPM.pdf
[2] 'Why Gas has to go' GBCA https://new.gbca.org.au/news/gbca-news/why-gas-has-to-go/

# CUSTOMER TALKING POINTS

## SIZE OF SOLAR PV SYSTEM

The size of the Solar PV systems modelled are selected to match the energy consumption of the home and to fit on smaller roof areas. Assuming 'typical'[1] consumption, these 'right-sized' Solar PV systems could allow the homes to operate as net-zero energy over the year. These systems are provided as base or minimum recommendation, we generally recommend installing the largest system that will fit on the available roof space.

Solar PV providers often recommend a 6.6kWp system. This is due to economies of scale which make oversizing a system cheaper when considering the $ per kWp[2] installed price.

The low DEBS price in WA means that oversized systems will be getting little cost benefit for any electricity sold back into the grid and they may not achieve the same payback timeframes as 'right-sized' systems, but even-so larger systems should still expect reasonable pay-back timeframes.

Larger PV systems will provide additional operational cost benefits, particularly when coupled with a battery, allowing solar to be used in the evenings when electricity pricing is highest.

Note: It is costly to increase the size of a Solar PV systems after installation, so we recommend customers choose a larger system to future-proof themselves, particularly if they intend on installing batteries at a later date.

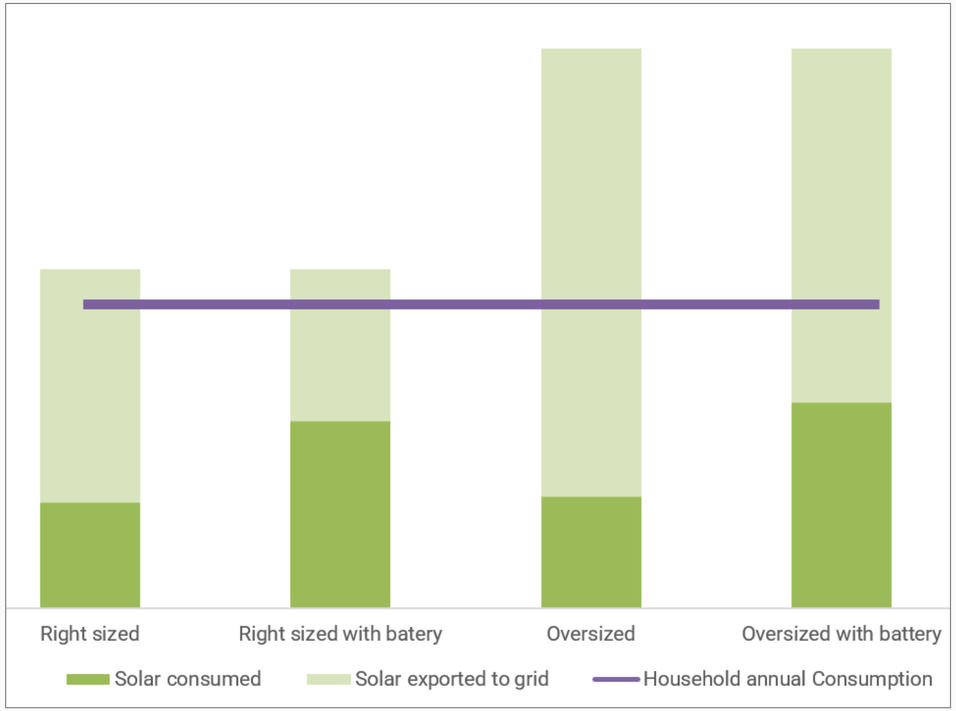



Diagram indicating solar consumed by a home-owner with and without batteries for different solar PV sizes.

[1] We have used energy assumptions based on common modelling protocols (NatHERs, Green Star, BASIX) to determine the 'typical' consumption for each home. It is important to note that every family operates a home differently so total energy consumption can vary widely within the same home.
[2] Solar price index, accessed 08 August 2023 https://www.solarchoice.net.au/residential/solar-power-system-prices/

# CUSTOMER TALKING POINTS

## TIPS FOR GETTING THE MOST FROM THE PV SYSTEM

- Try to switch energy consumption to times of the day when the sun is shining. For example, set timers on appliances (dishwasher, clothes washer/dryer, hot water unit) to run during the day to make the most of solar generated, rather than running them at night and paying for grid electricity.
- Schedule appliances so that only one or two are running at the same time during the day. Running all appliances at the same time can cause you to exceed the solar energy being generated, meaning you end up buying energy from the grid. Scheduling them to run, one after another during the day means that all energy can be free from the Solar PV system.

## UNDERSTAND YOUR CONSUMPTION

- The way energy is used within a home has the biggest impact on how much you will pay on bills.
- Installing an energy meter and smart app will help you to understand your consumption and make changes that have a big impact to your bills.

## TIPS FOR SAVING ENERGY

- Biggest opportunities for reducing consumption within the home:
  - **Hot water** is a significant energy load. Options to reduce hot water consumption include:
    - Taking shorter showers
    - Install low-flow showerheads (approx. 6l/min)
    - Install high efficiency heat pump hot water systems (COP4+)
  - **Air conditioning** is one of the largest loads. Options to reduce heating and cooling costs include:
    - Building sealing[1] – good quality construction to reduce drafts and air leakage. Ask your builder to consider building wraps, extra attention to sealing joints and consideration for reducing air leakage from ventilation and light fixtures.
    - Improved passive design – aim to have living rooms facing east or north and bedrooms to the south. Request your builder to aim for a 7 Star NatHERs rating.
    - Select an air-conditioner that can be zoned, allowing you to set temperatures in each room and to turn off rooms when they are not occupied.
    - Set point temperatures – set you air conditioning to 24°C in summer and 19°C in winter, every degree makes a difference to energy consumption.

[1] Note: air tightness and ventilation should always be considered together. A home that is air-tight with insufficient ventilation could lead to issues of condensation, mould and low air-quality. Getting the balance right is paramount to a healthy, low-energy home

# MODELLING ASSUMPTIONS

The below provides a breakdown of modelling assumptions used within the modelling. Assumptions are based on current building code standards and commercially available appliances within a cost-effective price range.

| Standard Assumptions | Base case | Wildflower |
|---|---|---|
| Electrification | Natural gas hot water and cooktop | Fully electric |
| NatHERs ratings* | 6 stars* | 7 Star |
| Air-conditioning | Split system COP 3 | Split system COP 3 |
| Hot water | Instantaneous Gas Hot water | Instantaneous Electric Hot water (95% efficiency) |
| Lighting power densities | 5W/$m^2$ | 5W/$m^2$ |
| Appliance energy ratings | 2 star dryer<br>4 star washing machine<br>4 star dishwasher<br>4 star fridge | 2 star dryer<br>4 star washing machine<br>4 star dishwasher<br>4 star fridge |
| Solar PV | Nil | 3-5kWp PV system |
| Battery | Nil | Nil |

* WA has deferred BCA 2022 energy efficiency provisions until 2025

| Household assumptions | 3 bedroom | 4 bedroom | 5 bedroom |
|---|---|---|---|
| Home Type | 3 bedroom, 2 bath, 2 car | 4 bedroom, 2 bath, 2 car | 5 Bedroom, 2 bath, 2 car |
| Floor area (excluding garage) | 90$m^2$ | 130$m^2$ | 150m2 |
| Example Home | Gisborne | Bondi | Montreal |
| Household type | 2 person household | 4 person young family | 5 person mature family |
| Occupancy assumptions | Higher daytime load due to WFH and/or Downsizer profile | Standard occupancy profile with most consumption in morning and evenings | Higher hot water and appliance consumption due to larger family and mature children/teenagers |
| Solar PV | 3kWp | 4kWp | 5kWp |

| Electricity price | Peak (c/kWh) | Super off-peak (c/kWh) | Off Peak (c/kWh) | Daily charge (c/day) | Peak Solar DEBS (c/kWh) | Off-Peak Solar DEBS (c/kWh) |
|---|---|---|---|---|---|---|
| Electricity price | 51.25 | 8.2 | 22.55 | 123 | 10 | 2.25 |
| Natural Gas | Gas 1 (c/MJ) | Gas 2 (c/MJ) | | Daily charge (c/day) | | |
| Natural Gas Price | 4.8 | 4.3 | | 32.03 | | |

Electricity pricing based on August 2023 available time of use offers, WA Synergy Electric and natural gas pricing

# SENSITIVITY ANALYSIS

Energy cost sensitivity – Comparison of modelling to published energy costs in Perth

| | Gisborne | Bondi | Montreal |
|---|---|---|---|
| | Base case | Base case | Base case |
| Modelled Electricity | $1,330 | $1,700 | $2,080 |
| Modelled Natural Gas | $540 | $890 | $1,320 |
| Total Modelled Cost | $1,870 | $2,590 | $3,400 |
| Actual Electricity 'average' Synergy (same size and occupancy in Piara Waters)* | $1,722 | $2,064 | $2,358 |
| Actual Natural Gas Finder (Calculated from Finder data August 2023)** | $840 | $1,040 | $1,180 |
| Total Actual Costs | $2,562 | $3,104 | $3,538 |
| Difference | $692 | $514 | $138 |

Modelled results are lower than published data costs. This is to be expected for the following reasons:

- Modelled homes are designed to todays building standards, meaning they will use less energy annually compared to an older home
- The floor area of the Wildflower homes modelled are smaller than a typical Perth home, meaning they use less energy for lighting and air conditioning.
- 'Actual' Natural gas data has been adapted from an 'average' bill in Perth and has a high-level of uncertainty with regard to how costs translate across the different home types

* https://www.synergy.net.au/Your-home/Energy-tips/Compare-your-bill#/ accessed August 2023
** https://www.finder.com.au/average-energy-bill-australia accessed August 2023

# SENSITIVITY ANALYSIS

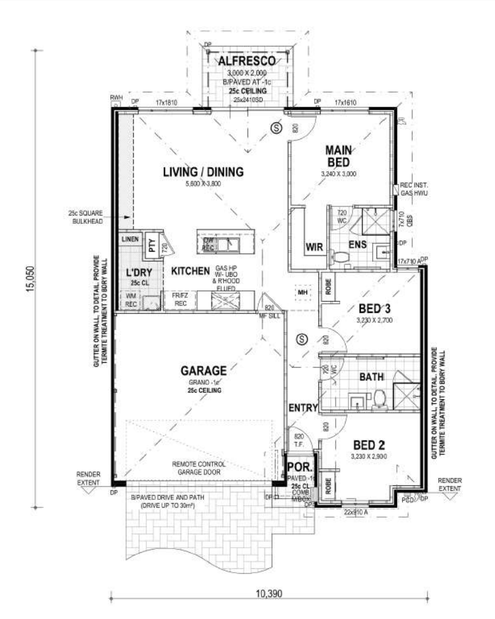
Solar PV size

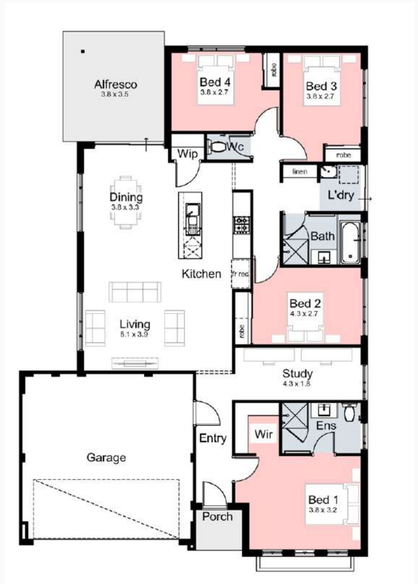
| Annual Electricity costs | Gisborne | Bondi | Montreal |
|---|---|---|---|
| | | | |
| Modelled Solar | $1,070 | $1,480 | $1,900 |
| Modelled Solar with battery | $420 | $480 | $700 |
| 5kWp PV | $920 | $1,400 | $1,900 |
| 5kWp PV with 10kWh battery | $150 | $320 | $700 |
| 6.6kWp PV | $820 | $1,280 | $1,780 |
| 6.6kWp PV with 10kWh battery | $13 | $125 | $420 |

The Solar PV options modelled range from 3kWp to 5kWp, these systems were chosen for the following reasons:

- The Homes modelled have smaller hipped roofs. Solar selections are based on systems that are designed to easily fit on these roof types.
- The Distributed Energy Buyback Scheme (DEBS) only offers 2.25c/kWh for energy sold back to the grid. This provides little incentive to sell energy back to the grid during the day. Making it most cost effective to size a PV system sufficient to meet a homes demand, rather than over-sizing the system.
- Larger PV systems (if roof space is available) will provide additional operational cost benefits when coupled with a battery to allow solar to be used in the evenings when electricity pricing is highest.

# HOMES ASSESSED





| | Gisborne | Bondi | Montreal |
|---|---|---|---|
| Bedrooms | 3 | 4 | 5 |
| Occupancy | 2 | 4 | 5 |
| Conditioned area | 85 | 135 | 160 |
| Roof area for solar | 24 | 40 | 40 |
| Living area | 40 | 54 | 61.2 |
| Bedroom area | 30.3 | 53.5 | 72 |