

To Store or Not to Store



ENERGY
CONNECTIONS

Presenter Ian Conibeer

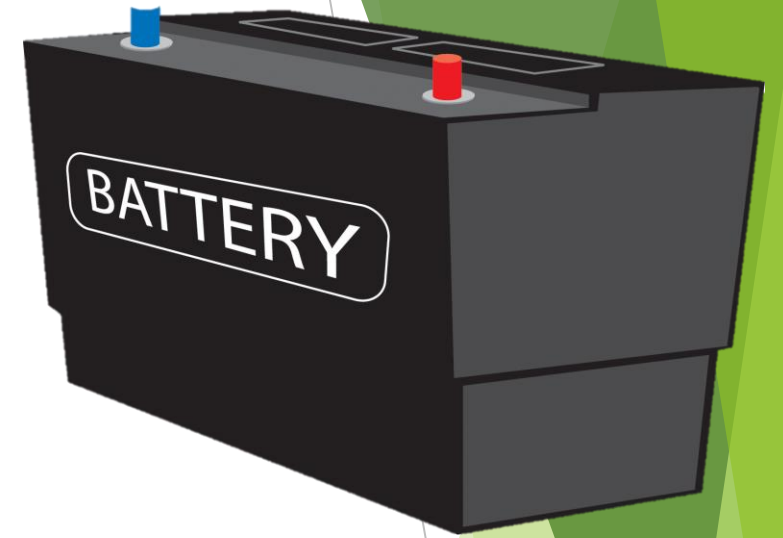
Renewable Energies Technician



**ENERGY
CONNECTIONS**



Storage of power



Energy Connections Baldhill Rd Pakenham

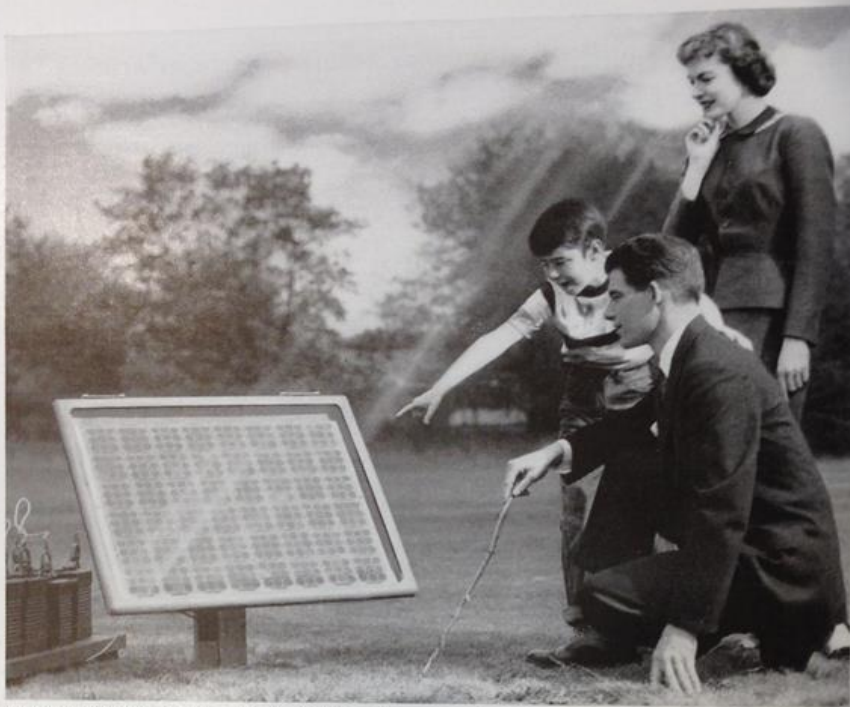




Energy Connections Baldhill Rd Pakenham

Latest Technology

Energy Connections Baldhill Rd Pakenham



Something New Under the Sun. It's the Bell Solar Battery, made of thin discs of specially treated silicon, an ingredient of common sand. It converts the sun's rays directly into usable amounts of electricity. Simple and trouble-free. (The storage batteries beside the solar battery store up its electricity for night use.)

Bell System Solar Battery Converts Sun's Rays into Electricity!

Bell Telephone Laboratories invention has great possibilities for telephone service and for all mankind

Ever since Archimedes, men have been searching for the secret of the sun.

For it is known that the same kindly rays that help the flowers and the grains and the fruits to grow also send us almost limitless power. It is nearly as much every three days as in all known reserves of coal, oil and uranium.

If this energy could be put to use — there would be enough to turn every wheel and light every lamp that mankind would ever need.

The dream of ages has been brought closer by the Bell System Solar Battery. It was invented at the Bell Telephone Laboratories after

long research and first announced in 1954. Since then its efficiency has been doubled and its usefulness extended.

There's still much to be done before the battery's possibilities in telephony and for other uses are fully developed. But a good and pioneering start has been made.

The progress so far is like the opening of a door through which we can glimpse exciting new things for the future. Great benefits for telephone users and for all mankind may come from this forward step in putting the energy of the sun to practical use.

BELL TELEPHONE SYSTEM



Why use batteries



Lead based batteries.

Battery Types

- ▶ Disadvantages
- ▶ Emit explosive hydrogen.
- ▶ Large and Heavy.
- ▶ Contains lead
- ▶ Low DOD
- ▶ Require maintenance
- ▶ Can't easily add capacity
- ▶ Advantages
- ▶ 1. Cheap
- ▶ 2. Proven technology.
- ▶ 3. Recyclable??



Battery Types

“Improved Lead”

► Disadvantages

- 1. Large and Heavy.
- 2. Contains lead
- 3. May not be recyclable
- 4. Can't easily add capacity
- 5. Not as cheap as previous option.

► Advantages

- 1. Fairly good DOD 50%
- 2. None to very little explosive gases
- 3. Proven technology.
- 4. Recyclable but not 100%,
- 5. No Maintenance



Battery Types

Nickel iron

- ▶ Disadvantages
- ▶ 1. Large and Heavy.
- ▶ 2. More cells needed
- ▶ 3. Requires lots of maintenance
- ▶ 4. Not all chargers capable of charging.
- ▶ Advantages
- ▶ 1. Very good DOD, extremely long life.
- ▶ 1. None to very little explosive gases
- ▶ 3. Proven technology.
- ▶ 4. Fully recyclable.
- ▶ 5. No Dangerous metals
- ▶ 6. Can add capacity



Lithium varieties

► Disadvantages

- 1. Expensive.
- 2. Unproven as large scale storage.
- 3. Not recyclable
- 4. Very poor operating temperature range **0 to 40 degrees C**
- 5. Can't be transported by plane as too dangerous.

► Advantages

- 1. Very good DOD 80%
- 2. No explosive gases
- 3. Compact
- 4. Light weight.



Battery Types

Flow batteries.

- ▶ Disadvantages
- ▶ 1. Expensive.
- ▶ 2. Extremely large and heavy
- ▶ 3. Mechanical pump
- ▶ 4. cost of replacement cell.
- ▶ Advantages
- ▶ 1. Very good DOD 100%
- ▶ 2. Little to No explosive gases
- ▶ 3. will store energy indefinitely when flow stopped.
- ▶ 4. Replaceable cell
- ▶ 5. Can add capacity

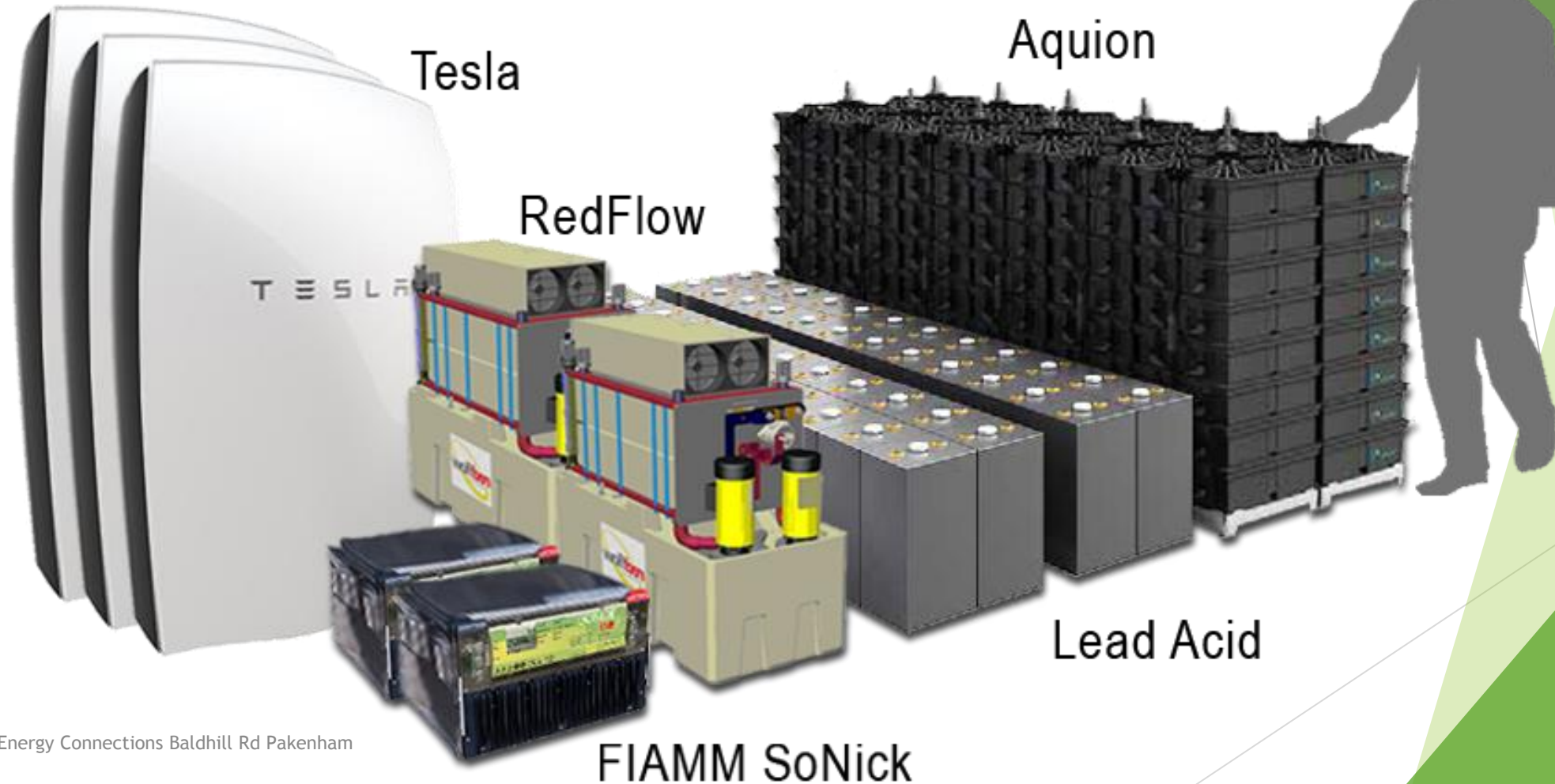


Sodium Nickel or salt battery

- ▶ Disadvantages
- ▶ 1. More expensive. (made in Switzerland)
- ▶ Advantages
- ▶ 1. Very good DOD 80% and good life.
- ▶ 2. No explosive gases
- ▶ 3. Compact
- ▶ 4. Light weight.
- ▶ 5. Fully recyclable
- ▶ 6. Best operating temperature of all batteries -20 to 60 degrees C
- ▶ 7. Extremely safe by design
- ▶ 8. Can easily add capacity



Approximate side by side comparison of a 20 kWh battery application



Motivations for Storing power



Energy Connections Baldhill Rd Pakenham



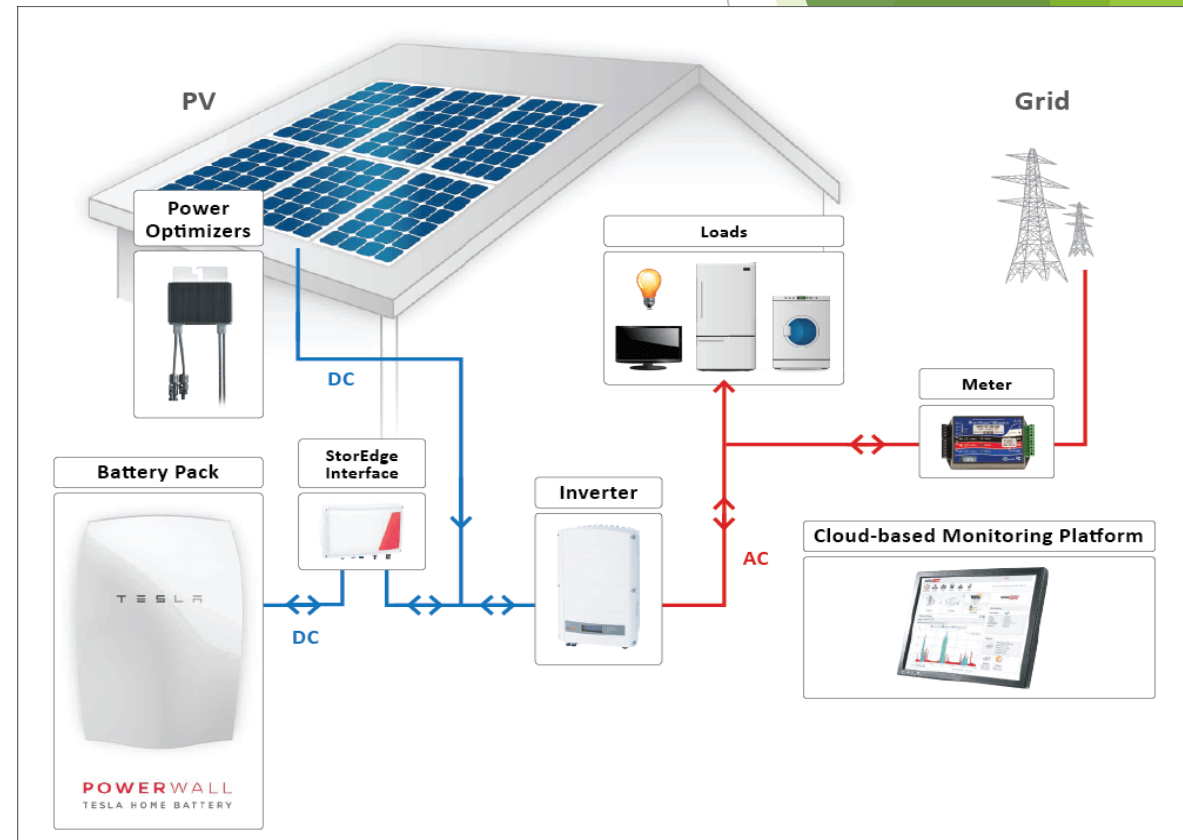
Cheapest form of home based battery storage

- ▶ A Hybrid or Grid support is the cheapest.
- ▶ Solar Not essential for a Battery System.
- ▶ Not all of these systems work in the same way.
- ▶ Pre installed solar may not be able to contribute.
- ▶ The ultimate system may need to employ a generator.

Basic Types of systems

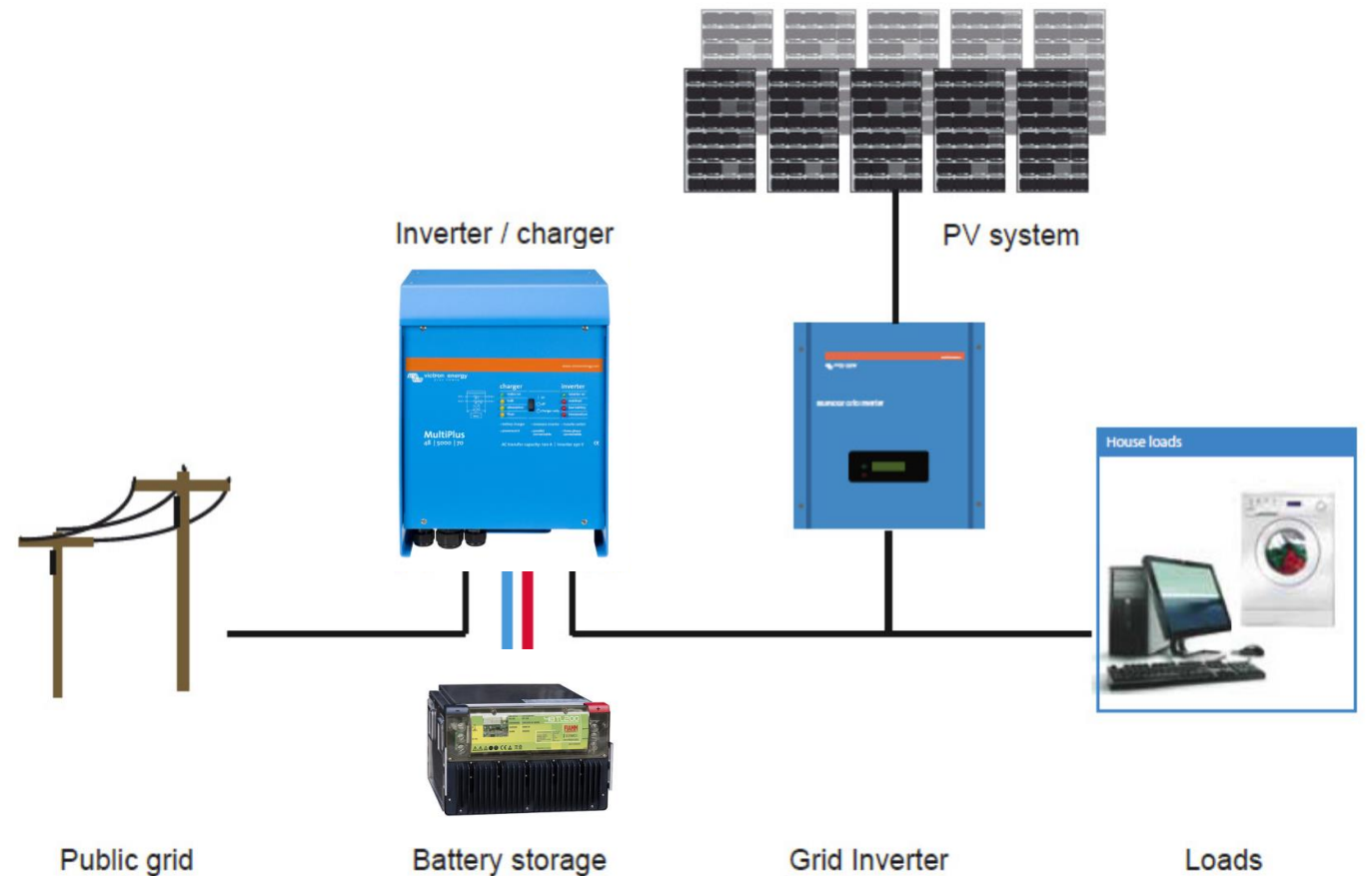
Battery add on to Existing solar inverter

- ▶ Disadvantages
 - ▶ 1. No power when grid gone
 - ▶ 2. Not able to support large loads in most houses
 - ▶ 3. Can only be added to some Grid connected Solar inverters.
 - ▶ 4. Extremely high battery voltage.
- ▶ Advantages
 - ▶ 1. Cheapest.
 - ▶ 2. Saves some money by shifting some stored renewable energy
 - ▶ 3. Wall mountable, assuming very strong wall.



Grid Support system “Grid Hybrid”

- ▶ Add on inverter/charger and battery.
- ▶ Disadvantages
 - ▶ 1. More expensive
 - ▶ 2. Requires more space.
- ▶ Advantages
 - ▶ 1. Power when grid gone
 - ▶ 2. Able to support most loads
 - ▶ 3. Shift stored energy
 - ▶ 4. Solar can be used when grid gone.
 - ▶ 5. Generally safer battery
 - ▶ 6. Able to support diversion loads



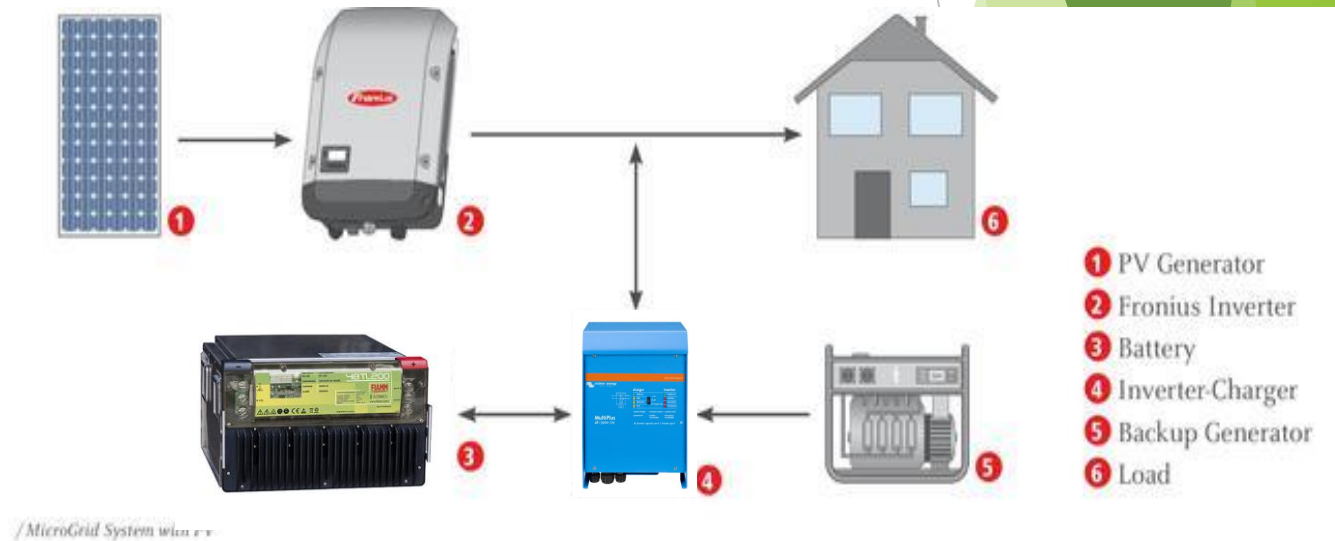
Full Grid support “Grid Hybrid/Off Grid”

► Disadvantages

- 1. More expensive.
- 2. More space.
- 3. Generator may not be suitable due to neighbours. (Can still use grid as back up)

► Advantages

- 1. Power when grid gone
- 2. Support all loads (depending on size)
- 3. Saves money by shifting stored energy
- 4. Solar available when grid gone.
- 5. Safer battery voltages and Chemistry.
- 6. Able to support diversion loads.
- 7. Full resilience



/ MicroGrid System with r r

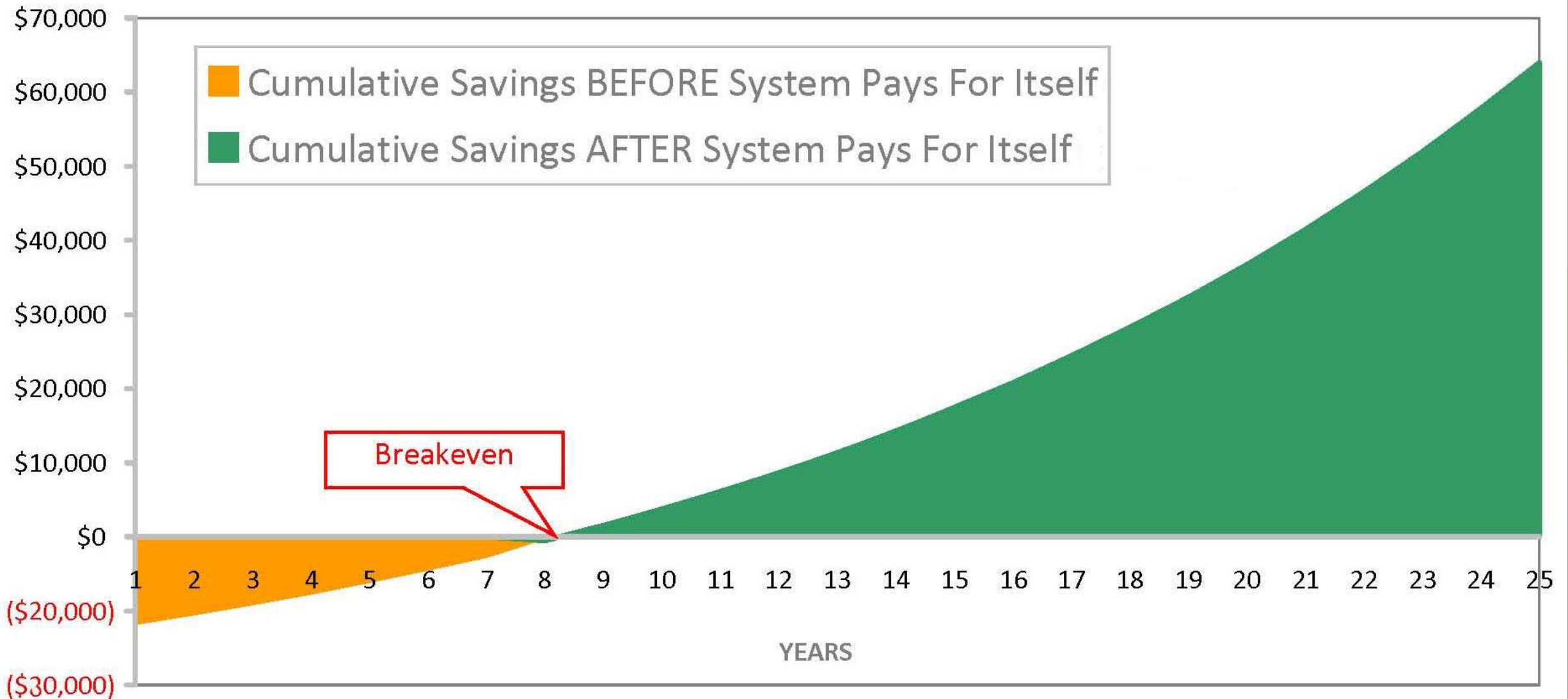
Costs of systems

Costs include installation

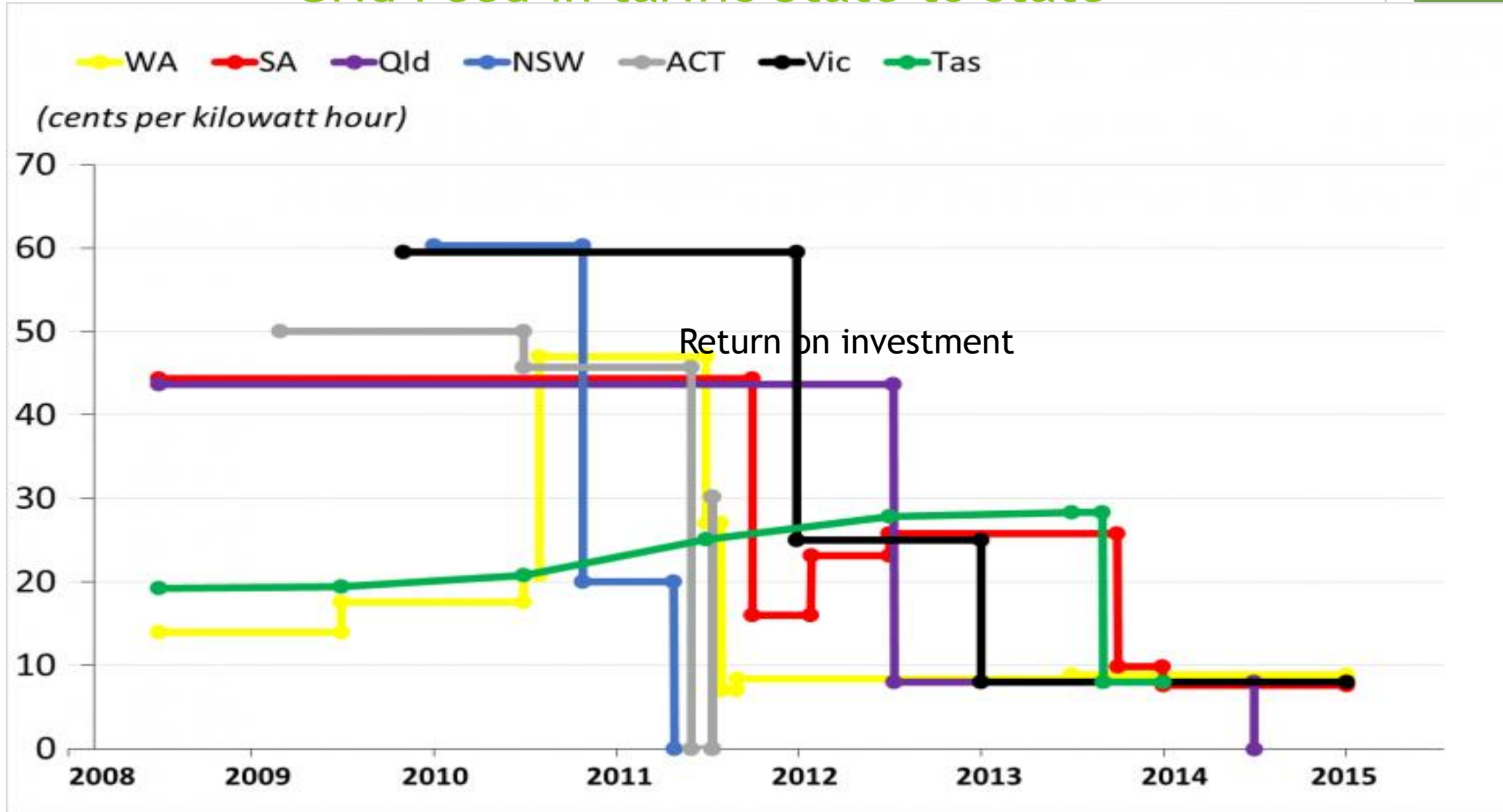
- ▶ Solar Battery or High Voltage battery system start from \$10,000
- ▶ Grid Hybrid support systems around \$10,000 to \$20,000
- ▶ Full Grid support/ Off Grid system from \$18,000 depending on days of storage (autonomy) and integration/supply of generator

- ▶ NB: costs are guide lines only and each location/house wiring would need to be assessed
- ▶ NBB: Off grid systems design should be based on daily load, multiply by \$2,500 per kilowatt consumption then add cost of generator.

Return on investment

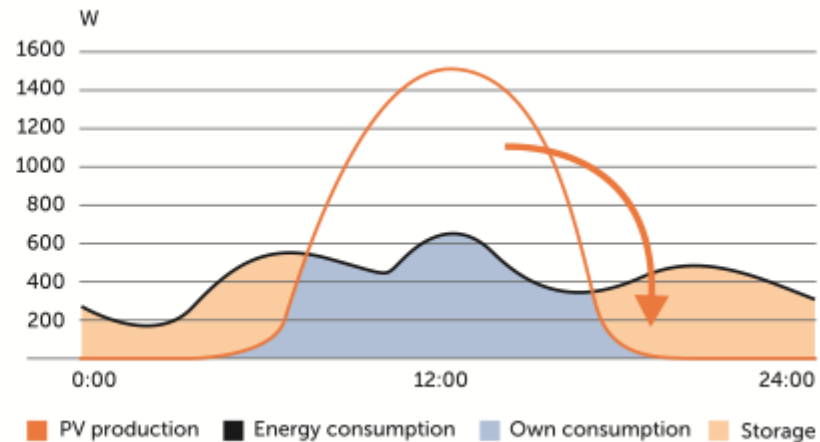
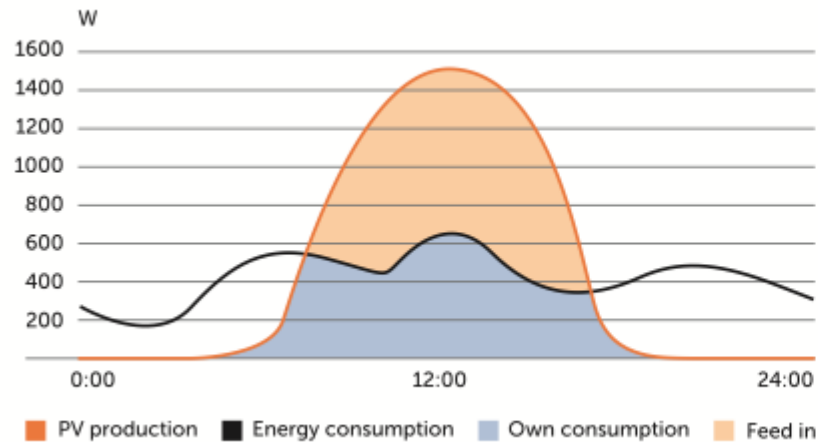


Grid Feed in tariffs State to state



How can the battery storage save money?

Solar generation and battery storage





ENERGY CONNECTIONS

Factory 20, Baldhill Business Park,
25 Balldhill Rd Pakenham,
VIC 3810

PH: 5941 4240

www.energyconnections.net.au

Grid-Connect, Stand-alone and Hybrid Power Systems