

The Power of 3

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Driving the future further

Overview

For reasons that include, but are not limited to, the threat of climate change from the production, transport and burning of fossil fuels, the ways in which power is supplied and distributed worldwide are undergoing unprecedented change, with plenty still to come.

Innovative technologies are creating new opportunities that, ultimately, have the potential to disrupt conventional models of power supply – not least the advent of electric vehicles, burgeoning global uptake of which is encouraging broader, and smarter, grid applications.

On a consumer level, disaffection with governments, with 'big business' in general, and with utility companies in particular is prompting tech-savvy customers to investigate going off-grid. Often, the stimulus is not so much a good return on investment or payback time but, rather, the feel-good factor of going green, a desire for autonomy, or perhaps even paranoia associated with being monitored by a 'big-brother' style smart meter (despite the fact that the latter can provide real benefits – for electricity providers and consumers alike – by facilitating innovative demand management initiatives and more economical pricing options, and by informing end-users in more detail about their energy consumption).

Going off-grid:

pipedream or promised land?

“

Should I stay or should I go? If I stay I could pay double, but leaving might mean trouble. This indecision's bugging me – should I stay or should I go?”

[with apologies to The Clash]

Case study: Australia

In general in Australia, a small number of large, remote generators provide power at high voltage through a transmission system connected to customers via a lower voltage distribution grid. Power flows one way and the distribution networks divide it into small quantities for customers.

However, such centralised power generation, and the traditional poles-and-wires system of delivery, are increasingly problematic in many outlying areas, given the threat of bushfires (and other natural disasters). Whether triggered by network faults, arson or lightning, recent conflagrations nationwide have destroyed hundreds of millions of dollars worth of infrastructure, not to mention people, pets, homes, livestock and livelihoods.

Meanwhile, city households are experiencing ever higher rises in energy prices, despite a decrease in energy use over the past decade. As a result, consumers are becoming more actively 'engaged' in their electricity useage and rooftop solar panels are now ubiquitous. By the end of last year, more than 23 million panels had been installed nationwide, equating to one each for every man, woman and child in the country. Now, the availability of intelligent inverters and smart battery storage systems is accelerating the push for cleaner, cheaper power.

Historically for very remote Australian properties and communities, the tyrannies of distance have put mains electricity out of reach or rendered it prohibitively expensive, with noisy, smelly, expensive-to-run liquefied petroleum gas (LPG) or diesel generators usually relied upon instead.

The winds of change

There is no doubt that the ways in which power is supplied require revamping. Research by Australia's CSIRO¹ reveals huge potential to transform utility business models across the country. By not changing, providers risk losing up to a third of their customers and alienating those who remain and who must bear more of the fixed costs of their grid.

Disruption from renewable generation and demand for side technologies, as well as climate change and other social/political imperatives, look set to severely test current infrastructure². According to the CSIRO, Australian homes and businesses will be powered by more than 20 different energy sources and technologies by 2050, so grids of the future will be operating in a potentially very altered environment.

But moving away from predictable, controllable systems involves a huge amount of effort, capital and capacity building and, unsurprisingly, power networks are dragging their feet. Baulking at reducing costs (which means writing down assets and accepting lower revenue), they are instead trying to retrieve their upfront costs more quickly ... hence those higher bills.

Since 2012, the Australian Renewable Energy Agency has been researching clean energy and 'innovative integrated solutions' to support grids, improve network stability and reduce or offset the costs of upgrading the electricity network, with the aim of ensuring a reliable supply for 11 million customers nationwide³. Now, given the inevitability of change, preparations are underway for the monumental makeover required.

Battery storage: the key?

Assuming that both consumers and electricity providers adequately understand and control their power usage (particularly during periods of peak demand), battery innovation has the potential to reduce the two biggest contributors to rising electricity bills – network and wholesale energy costs.

Whether it's consumers actively designing or customising their own solutions to obtaining power, or an entire electricity system in which renewables thrive, battery storage has far-reaching implications for the electricity supply chain.

In *Leaving the grid: an ambition or a real choice?*, Rajab Khalipour and Anthony Vassalo argue that:

From an economic perspective, widespread disconnection might not be a realistic projection of the future. Rather, a notable reduction of energy demand per connection point is a more realistic option as [solar]/ battery system prices decline further.

The prices of photovoltaic systems (PV) have fallen considerably in the last decade, and a similar rapid decline in the prices of battery storage systems⁴ would see a flow-on effect of increased demand, at which point economies of

scale would kick in. Australia's Climate Council expects the global market for solar panels and battery storage to grow tenfold by 2020, making living off-grid an increasingly viable option ... and sounding the death knell for any transmission and distribution industries that fail to adapt.

With Australia's world-class renewable energy resources, battery storage represents a huge opportunity to generate even more of our electricity from renewables, and rely less on fossil fuels like coal, gas and oil.

BATTERY STORAGE

COST SAVINGS & THE POTENTIAL TO USE MORE RENEWABLE ENERGY

ROUND-THE-CLOCK, RELIABLE, LOW-CARBON ENERGY SUPPLY

BATTERY STORAGE

+

THE BENEFITS

- HOUSEHOLDS**
 - Access the cheapest electricity retail prices.
 - Use more cheap, self-generated solar power.
- BUSINESSES**
 - Purchase less expensive peak electricity, avoiding peak charges.
 - Use more self-generated solar power.
- ISLANDS, REMOTE AREAS**
 - Reduce reliance on imported diesel or LPG, which are expensive to transport and store.
 - Use more local, cheap renewable electricity.
- ELECTRICITY NETWORKS**
 - Cost-effective alternative to meeting peak demand.
 - Avoid the need for network upgrades.
 - Enable higher percentages of renewable electricity in the grid, especially distributed solar PV in a given area.
- ELECTRIC VEHICLES**
 - Quiet, less air pollution, less maintenance.
 - Recharging cheaper than refuelling with petrol.
 - Car battery can also be used for household electricity storage.
 - Less reliance on fossil fuels if powered by renewable energy.

[Sources: [Bloomberg.com 2014](#); Adelaide City Council 2015; AECOM 2016; AEMO 2016; IRENA 2016; Menzel et al 2016; NSW Government 2016; RenewEconomy 2014c.]



Off-grid systems



Which system is right for me?



On-grid systems

[Source: <http://www.offgridenergy.com.au>]

Intimations of the future

Right now in Australia, leaving the grid is unlikely to be cost-competitive for the average urban household; nor can it guarantee a totally reliable power supply. That said, global investment bank UBS predicts that this will change by as early as 2018⁵.

Rob Stobbe, CEO of one of the nation's largest electricity networks, SA Power Networks in South Australia, sees no long-term future for any form of centralised power generation and transmission, believing it's inevitable that all will become redundant over time⁶.

Regional operators nationwide are already downsizing their networks in favour of localised generation and micro-grids, with utilities installing stand-alone power systems in a number of rural communities and remote

properties. In metro areas meanwhile, facilities such as sub-division-scale battery storage in residential developments are also being trialled by power providers⁷.

Happily for many Antipodean households, as for electricity consumers globally, the choice to go completely off-grid – or link to a micro-grid with just a small connection to the main network – is looking less like a pipedream and more like the promised land ... all that's required is patience.

Which Perth-based company is working to produce cheaper lithium for battery storage technology?

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Notes

- ¹ Commonwealth Scientific Research Organisation
- ² <http://www.futuregrid.org.au>
- ³ <http://arena.gov.au/about-arena/>
- ⁵ <http://reneweconomy.com.au/2014/ubs-australian-households-go-grid-2018>
- ⁶ <http://reneweconomy.com.au/2014/sa-network-operator-rural-communities-quit-grid-38514>
- ⁷ In Western Australia, for example, a community storage facility will power a new residential development at Alkimos, while in a number of rural towns and properties on the edge of the grid, stand-alone systems with solar panels, battery, inverter and back-up diesel generator are already producing and storing electricity independent of the network and supplying continuous power 24/7, regardless of the weather. Among the benefits are improved reliability of power supply and a reduction in bushfire risk due to the removal of poles in paddocks.