Fair Value of Distributed Generation project

RenewEconomy articles

This document contains the original text of the article series produced for RenewEconomy as a summary of the Fair Value of Distributed Generation project. (The third and fourth articles were published as a single article.)

A fair price for rooftop solar? Try 10-18c/kWh, Jack Gilding, 20 Mar 2017

This is the first of a series of articles produced by the fair value for distributed generation project. In this article we explain the background to the project and the basis for our calculation that local rooftop solar is currently worth in the range of 10-18c/kWh when all the network, environmental and health benefits are taken into account.
http://reneweconomy.com.au/a-fair-price-for-rooftop-solar-try-10-18ckwh-91433/

A fair price for rooftop solar, part 2: Rewarding local generation, Jack Gilding, 21 Mar 2017

This is the second of a series of articles produced by the fair value for distributed generation project. In this article we look in more depth at one aspect of this value – the avoided use of transmission networks.
http://reneweconomy.com.au/a-fair-price-for-rooftop-solar-part-2-rewarding-local-generation-76904/

A fair price for rooftop solar, part 3: Are FiTs the best reward? Jack Gilding, 22 Mar 2017

This is the third and final of a series of articles produced by the fair value for distributed generation project. In this article, we will look at why it is important to distinguish what exported solar energy is worth from the question of what is the best way to recognise this benefit. The article also discussed the factors that prevent the true value of distributed generation from being recognised and sets out what needs to happen for this to change.
http://reneweconomy.com.au/a-fair-price-for-rooftop-solar-part-3-are-fits-the-best-reward-11625/

Other project outputs are available at http://backroad.com.au/?page_id=97

1. What is a fair price for distributed generation?

This is the first of a series of articles produced by the fair value for distributed generation project. In this article we explain the background to the project and the basis for our calculation that local rooftop solar is currently worth in the range of 10-18c/kWh when all the network, environmental and health benefits are taken into account.

Solar feed-in tariffs (FiTs) have had a controversial and complicated history in Australia. Many states started out with very high FiTs. Arguably some of the premium tariffs were allowed to continue for too long and should have been reduced gracefully, but it is important to recognise that these policies did achieve significant benefits. These schemes built a solar industry in Australia that delivers significant quantities of affordable, low-carbon energy into our grid. The renewable energy industry employs 14,000 people[1] and has led Australia to have by far the highest penetration of household rooftop solar in the world[2].

All the premium (ie paying more than the retail cost of electricity) schemes are now closed to new entrants, although some still have a number of years to run for existing eligible systems.

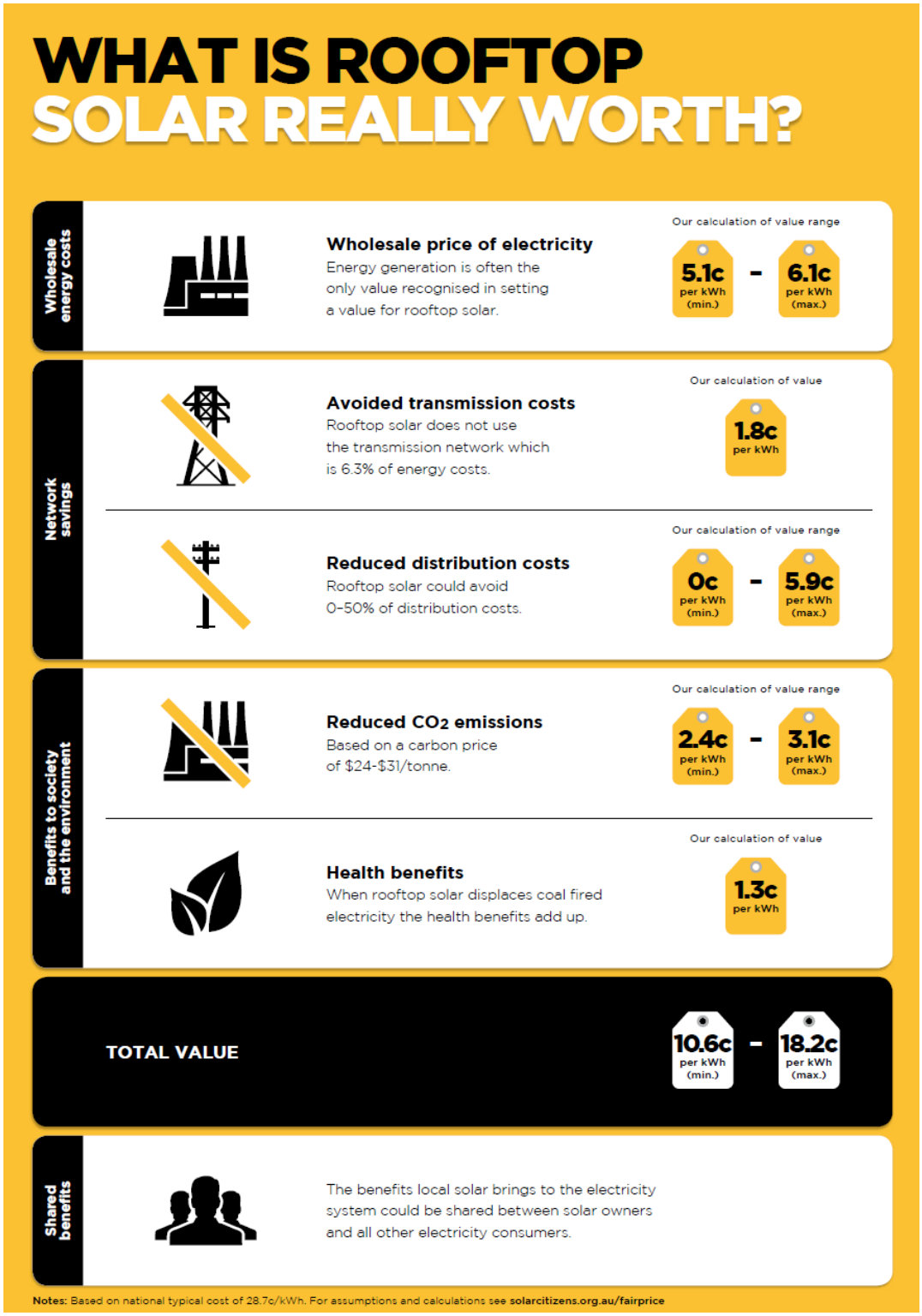
Setting of regulated minimum FiTs in Australia has always been a state responsibility. The current situation in the National Electricity Market (NEM) region is that regulated minimum tariffs are set in regional Qld, Victoria and Tasmania. There is no regulated FiT set in SA (as of 1 January 2017), NSW, ACT and SE Qld, with governments and regulators arguing that in a competitive retail market, retailers will offer an attractive FiT to attract customers.

Regulatory bodies periodically review the methodology for determining FiTs and it was the combination of three forthcoming state reviews that prompted a consortium of organisations to seek and receive funding late in 2015 from Energy Consumers Australia to review and advocate on these methodology issues. The consortium consisted of Solar Citizens, the Alternative Technology Association, the Australian Solar Council, the Total Environment Centre, the Clean Energy Council and the Tasmanian Renewable Energy Alliance. Submissions were made to state review processes in Queensland, Victoria and Tasmania, as well as to the review that led to the abandonment of regulated FiTs in South Australia. We also produced a range of advocacy materials that are currently being used in the Solar Citizens *Fair Price for Solar* campaign.

One of the headline findings of our project is that local rooftop solar is currently worth in the range of 10-18c/kWh when all the network, environmental and health benefits are taken into account as summarised in the following graphic.

[1] 2015 figure from https://www.cleanenergycouncil.org.au/policy-advocacy/reports/clean-energy-australia-report.html Over half of these jobs are in rooftop solar.

[2] Preliminary Report of the Independent Review Into The Future Security Of The National Electricity Market, p.13



Methodology and assumptions

Our approach was to consider the various components of the electricity supply chain and estimate what contribution distributed generation could make to each. In order to do this we calculated national average costs for a typical residential electricity bill for the main components of the supply chain[3]. For more details and references see the project website.

[3] NEM residential supply chain cost components, http://backroad.com.au/wp-content/uploads/2016/11/NEM-residential-supply-chain-cost-components-v07p.xlsx 28 Nov 2016. Based mainly on AEMC Residential Electricity Price Trends - base figures 2014-2015.

Wholesale price of electricity

Regulators have traditionally used an average wholesale price for energy when calculating FITs. Arguably, solar exports are worth more than the average price because (except in Tasmania) they are fed in during times when wholesale energy prices are higher than average. This is in line with the COAG agreed principle that FiTs should take into account "the time of day during which energy is exported." In Victoria, from July 2017 the new solar FiT of 11.3c includes 8.1c for the wholesale price of electricity including a weighting to reflect the timing of solar export.

In addition to the avoided cost of purchasing wholesale electricity, solar pv can play a role in pushing down the wholesale price of electricity for all consumers through the 'merit order effect' which can be significant when demand and wholesale prices are high.

The range used in our estimate (5.1c-6.1c) is based on the national average price for 2014-2015 through to a 20% premium to cover time of day and merit order benefits. These figures are likely to be very conservative given recent and projected increases in wholesale electricity costs.

Avoided transmission costs

Retailers pass charges for the use of the transmission network on to consumers irrespective of whether the energy is sourced via the transmission networks or locally from solar pv. Customers pay for a service that is not provided (use of the transmission network for the proportion of their energy that comes from distributed generation).

We argue that transmission charges should only apply to the electricity actually carried on the transmission network and that these savings should be treated as a benefit of distributed generation. In the next article in this series we deal with this issue in more detail.

Reduced distribution costs

Distributed generation can place less strain on the distribution network and thereby reduce costs in at least two ways. Firstly, energy from solar pv is typically used close to the point of export and therefore makes significantly less use of the 'poles and wires.' Secondly, a significant proportion of the cost of the distribution network is the transformers which convert higher voltages down to 230V. Solar inverters have this capability built in and export power at 230V. The value of solar pv in reducing costs for network operators is highly dependent on time and location, as well as the capacity and asset life cycle of local distribution infrastructure. Our maximum value saving assumes local solar avoids using the high voltage and subtransmission parts of the distribution network, which account for over 50% of costs.

Reduced CO_2 emissions

Each kWh of solar pv that displaces coal-fired electricity avoids carbon pollution worth a minimum of 2.4c to 3.1c using current carbon pricing estimates. Carbon pricing consistent with the global objective of keeping global warming well below 2°C would translate to a much higher value.

Health benefits

Based on research by the Australian Academy of Technological Sciences and Engineering, each kWh of solar pv that displaces coal fired electricity contributes 1.3c in reduced health costs. This benefit is not currently reflected in any Australian FiTs but recent Victorian legislation makes provision for future FiTs to include a component based on the "avoided human health costs attributable to a reduction in air pollution". In its determination of the 2017-2018 Victorian FiT, the Essential Services Commission concluded that "the necessary data to quantify those benefits with sufficient reliability to include them in a FiT are not available at present" so this is an important area for future research and advocacy.

Retailing costs

We did not consider retailing costs in our assessment. These make up 29% of typical residential electricity bills nationally or about 8.3c/kWh. Under current regulatory arrangements it is not possible for consumers to avoid these costs except by going off-grid. New technology such as local storage and system such as

peer-to-peer trading provide the potential for new models that could avoid or substantially reduce the retailing components of the electricity prices. However this would require significant regulatory change.

Additional benefits

Distributed renewable energy generation, including solar pv, has many benefits on top of those considered in our methodology. These are real economic advantages even though they cannot be readily translated to a c/kWh value:

Direct jobs: Research by Ernst & Young for the Climate Council has shown that generating 50% of our electricity from renewables by 2030 would lead to over 28,000 new jobs and over 50% more employment than a business as usual scenario.

Industry development: Beyond the direct jobs in solar installation, building Australia's capacity in emerging technologies such as battery storage and energy management will create the jobs of the future as the world moves to a decentralised and decarbonised energy system.

Energy security: An electricity system that is based on distributed local generation from a variety of renewable sources combined with local storage will not only reduce costs, it will make for a more robust and secure system that is less prone to failures caused by centralised infrastructure.

Price stability: Renewable energy technologies have high capital costs, but very low and predictable running costs and no fuel costs. This contributes to long term price stability compared with fossil fuel alternatives.

Energy literacy: Installation of solar pv gives homeowners a strong interest and motivation to better understand and manage their energy consumption. This will be an important driver of the uptake of new technologies such as local storage, demand management and integration of electric vehicle charging which can ultimately lead to a more flexible and economical electricity system.

In subsequent articles in this series we will look in more detail at the contribution of distributed generation in avoiding or reducing network costs, as well as discussing the difficulty in getting these benefits reflected in electricity pricing.

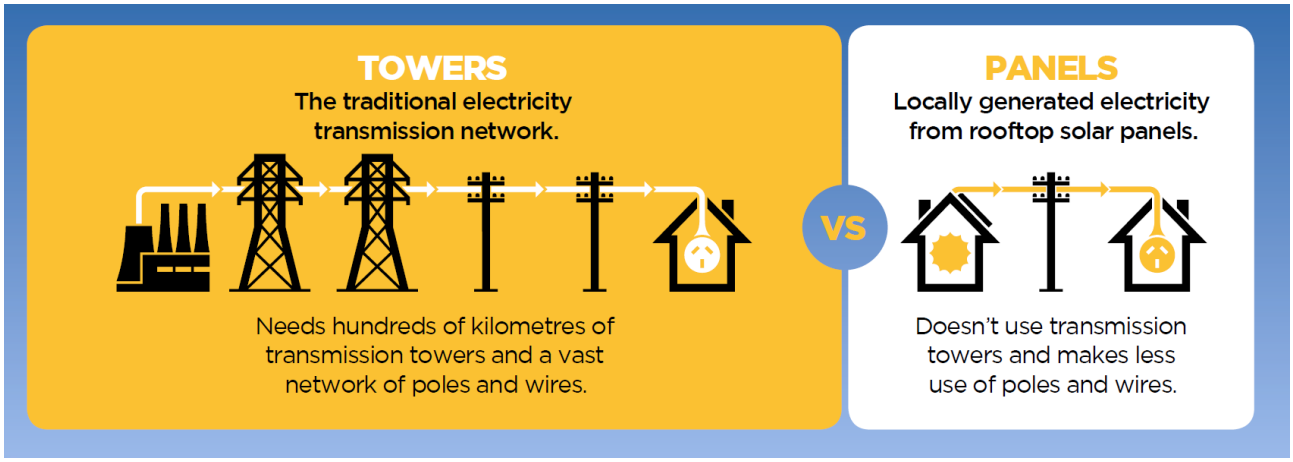
Jack Gilding is the Executive Officer of the Tasmanian Renewable Energy Alliance and was the project manager for the project "*Research review and advocacy on the fair value of distributed generation*".

The project was funded by Energy Consumers Australia as part of its grants process for consumer advocacy projects and research projects for the benefit of consumers of electricity and natural gas. The views expressed in this document do not necessarily reflect the views of Energy Consumers Australia.

2. Towers versus panels – the case for rewarding local energy generation.

In the first article in this series we looked at the many values of distributed generation. In this article we look in more depth at one aspect of this value – the avoided use of transmission networks.

Around 6% of the typical Australian residential electricity bill pays for the transmission network, but an increasing amount of energy comes from local generation which does not use this network. Changing the electricity market rules to reflect this reality could provide a bonus for solar owners and encourage a more cost effective electricity system.



Under the national electricity rules, the cost of building and maintaining the transmission network is passed on to retailers, who pass it on to customers. On average transmission network charges make up about 6%[4] of a residential electricity bill and distribution network charges about 40%[5].

Transmission charges are levied on all the electricity used, but an increasing proportion of electricity consumed comes from local generation (mainly household solar) which makes no use of the transmission network.

Customers should not pay transmission costs for the proportion of their energy that is sourced locally. These saving should be reflected in the price paid by retailers for energy fed into the distribution network by solar owners (and other distributed generators).

The benefits would be:

- Solar owners would receive a higher price for their exported energy.
- In the longer term, costs would be reduced for all consumers because a lower cost method of supplying energy would be supported.

How could it work?

There are several ways that electricity pricing rules could recognise the fact that local generation does not use the transmission infrastructure:

- A proposed rule change by the Total Environment Centre, the City of Sydney and the Property Council of Australia was submitted in 2015 to the Australian Energy Market Commission (AEMC). This proposed a mechanism called Local Generation Network Credits. Distributed generators would be paid a credit reflecting the fact that where energy is generated and consumed in the same area, the limited use of the grid should be reflected in lower costs. The AEMC rejected this proposal.

[4] National average for transmission. States vary from 5-15%. See solarcitizens.org.au/fairprice for details.
[5] National average for distribution. States vary from 38-49%. See solarcitizens.org.au/fairprice for details.

- Retailer could be given a credit for the proportion of the energy they buy from distributed generators connected to the distribution network (including solar energy exported by their customers). The electricity rules already provide for 'avoided TUoS' (Transmission Use of System) payments to large embedded generators that reduce the peak demand on the transmission network.
- The charge passed on to retailers for use of the transmission network could be based on the amount of electricity they buy from generators connected to the transmission network. (Currently the charge is based on the total amount of electricity they sell.) This would be analogous to the fact that retailers pay NEM fees based on the amount of electricity they buy from the NEM rather than the amount they sell.

The last two mechanisms (which have the same effect) would reduce network costs paid by retailers in proportion to the amount of exported solar energy they buy from their customers rather than from central generators. It is an accepted part of the setting of feed-in tariffs (FiTs) in Australia that they recognise savings to retailers and pass these savings to solar owners.

We believe the bulk of the savings on avoided use of the transmission network should be passed on to solar owners. This would increase the FiT by around 2c/kWh nationally. However a case could be made that a small proportion of these savings could be shared with retailers and networks to provide them with a motivation to implement this arrangement.

Would it be fair to other customers?

Some people argue that because the transmission networks are already built, reducing the transmission charges for some customers would just increase the costs for other customers. But forcing customers to pay transmission charges for all the energy they use irrespective of its source discourages the more efficient option of local generation.

Networks owners (state and private) do face a dilemma caused by the huge investments in existing infrastructure and the fact that electricity demand is static or falling. Potentially this can mean increased costs for users of the network if the same revenue is recouped from a reducing consumer base.

This assumes that networks have a 'right' to continue receiving the same payment for the service they provide even when the demand for the service drops. This assumption is embedded in existing rules for the national electricity market which allow networks to earn a guaranteed return on their 'regulated asset base' (RAB) irrespective of the amount of electricity they transport.

Distributed solar is often targeted as the cause of reducing demand (and hence increasing costs for non-solar customers) but in fact analysis by Hugh Saddler[6] showed that reduction in electricity demand between 2006 and 2013 was largely due to energy efficiency programs, structural change in the economy and the response of electricity consumers to higher electricity prices. Solar pv made a relatively small contribution, accounting for only 7% of the demand reduction.

The fact that networks are paid on the basis of their assets rather than on the service they provide distorts the operation of the market. It encourages networks to invest in network infrastructure, rather than seek out more efficient ways of meeting the energy demand. Despite the fact that demand for centrally generated electricity is fairly static, the national regulator has approved the expenditure of around $30bn on network upgrades over the next 5 years[7]. At a guaranteed rate of return of 6% this is $1.8bn annually that customers need to pay to networks.

The solution to increasing electricity costs is to find ways to reward the most efficient mechanisms for meeting electricity demand rather than to pay for infrastructure whether it is used or not. One approach would be a write-down of asset value, which is common in other industries faced with reduced demand or

[6] Power Down: Why is electricity consumption decreasing?, Hugh Saddler, The Australia Institute, Paper No 14, 18 Dec 2013 http://www.tai.org.au/content/power-down

[7] AER State of the Energy Market 2015 p.75. https://www.aer.gov.au/publications/state-of-the-energy-market-reports

technological change which renders assets less valuable. A recent report[8] points out that "Australia's electricity networks are extraordinarily profitable, realising many multiples of the returns being realised by Australia's best performing ASX50 companies" and that revaluing their asset base to 'maximum efficient' values would reduce network prices paid by customers by 15-40%.

Changing the rules so that consumers do not pay long distance transmission charges for energy that is generated locally would be one small step towards a fairer and more cost effective electricity system.

[8] Assets or Liabilities? The Need to Apply Fair Regulatory Values to Australia's Electricity Networks, Hugh Grant, ResponseAbility 5th May 2016
http://euaa.com.au/entries/general/major-report-indicates-significant-scope-for-electricity-prices-to-fall

3. How is distributed generation best rewarded?

In the first article in this series we showed why exported rooftop solar energy is worth 10-18c when all the network, health and environmental benefits are taken into account. In the second article we looked specifically at the benefits from avoided use of the transmission network.

It is important to distinguish what exported solar energy is worth from the question of what is the best way to recognise this benefit.

What mechanisms are available for rewarding distributed generation?

Feed-in tariffs (FiTs) are the simplest and best known mechanism for supporting distributed renewable energy generation, but there are other ways that are increasingly being explored to better reflect the various benefits of distributed generation.

Below we explain some existing and proposed mechanisms and look at their advantages and disadvantages.

Finally we argue why we believe a regulated FiT should remain the base mechanism for rewarding this value.

Increasing self-consumption

It is worth first reinforcing the important but often overlooked point that the best way for solar owners to maximise the value of their solar investment is to use as much of the electricity they generate as they can *at the time they generate it*. Exported energy typically earns about 6c/kWh but using it in-house often saves 20-30c/kWh. This is one of the value propositions for household batteries in conjunction with solar – energy can be stored to avoid later purchase. Even without batteries many households can maximise the savings from their solar generation by changing the time tasks such as washing clothes and dishes, and heating hot water are done. For detailed practical advice on this see Chapter 5 of the ATA Life after FiTs report.

Feed-in tariffs

In some states[9] FiTs are set at the state level and all retailers required to pay them to customers ("regulated FiTs"). In other states it is left to retailers to decide how much (if anything) to offer solar owners ("retailer FiTs"), with regulators typically claiming that competition will ensure that solar owners are offered a fair price.

With the exception of the new arrangements in Victoria from July 2017 (see below), all FiTs in Australia are paid just for energy exported to the grid and some other minor benefits and are at a constant rate in c/kWh (although the rate varies between states and between retailers). Additional benefits, including network, health and environmental benefits, are ignored or regarded as out of scope.

Time and location specific FiTs

One of the arguments against FiTs is that they do not reflect the fact that, for retailers and networks, the value of energy fed back into the grid is highly dependent on both the time and location. The Essential Services Commission (ESC) in Victoria investigated these issues in detail and recommended that FiTs should be based on both the time of day (roughly reflecting times of peak demand) and location (to reflect greater line losses in remoter parts of the state).

The Victorian government rejected the ESC recommendation of a location based FiT on the grounds that it "would unduly complicate the FiT scheme".

Implementing time-based FiTs requires communicating smart meters that record and report import and export of energy in half hour intervals. Victoria is the only place where this infrastructure is widely implemented, although it is currently being rolled out in other states on an incremental basis.

[9] Different arrangements apply in SE Qld (no set FiT) versus the rest of Qld (regulated minimum FiT).

Renewable energy certificates

As part of Australia's Renewable Energy Target legislation, solar owners are entitled to create and sell "Small-technology certificates" (STCs but commonly called RECs) that reflect the first 15 years anticipated renewable energy generation from their systems. STCs are typically signed over to the solar installation company and used to reduce the up-front cost of the system. From January 2017 STCs reduced to 14 years output and will be progressively reduced by one year's output each year until they are completely phased out by 2030.

Network support payments

Distributed generation has a high value when it can reduce the demand on distribution networks at times they are running at close to capacity. Additional local generation (or demand reduction) can potentially avoid the need for multi-million dollar upgrades to the network. Current regulatory arrangements allow network operators to offer "network support payments" as a way to avoid or postpone costly network upgrades. These payments could provide a viable additional financial benefit for distributed generation in specific locations due to the advent of battery systems and smart software that can control when locally stored energy is fed back into the grid. While these payments have the potential to be quite high (around $1/kWh), the fact that they will only be paid at limited times and specific locations mean that they are likely to be only a useful supplementary financial benefit for some distributed generation systems. This is the basis of payments that will be made to owners of solar and battery systems on Bruny Island in Tasmania as part of an ARENA funded trial.

Payments based on wholesale market prices

In the NEM, wholesale electricity prices are set every half hour and can vary widely from a few cents a kWh to a (very occasional) maximum of $14/kWh. Regulated FiTs are based on annual average wholesale prices. Paying distributed generators for exported energy that reflects wholesale market prices at the time of export would potentially provide benefits to solar owners, particularly when high wholesale prices match times of peak solar production as is often the case in heatwaves. This can also benefit retailers if they can buy energy from their customer more cheaply than from the wholesale market. These arrangement works particularly well if solar in combined with storage allowing energy to be fed into the grid at times of maximum value. This is the basis of the GridCredits100 product offered by retailer Diamond Energy in conjunction with software control systems supplied by Reposit Power.

Rather than sell energy back to the same retailer they buy electricity from, local generators have the theoretical possibility of selling their surplus power directly on the wholesale market. A business called a "small generation aggregator" can pool electricity bought from individual generators and sell it on the wholesale market. As with other options described above, this option requires smart metering infrastructure and is more valuable if battery systems allow control of the time of export.

Network rule changes

Current electricity market structures do not reward the fact that distributed generation makes less use of the transmission and distribution networks than centralised power stations. Various rule changes have been proposed to address this disadvantage. In particular a rule change promoted by the Total Environment Centre, the City of Sydney and the Property Council of Australia proposes "Local Generation Network Credits". These would be payments from distribution networks to owners of distributed generators that reflect the long term benefit of reduced network investment. The AEMC decided not to implement this rule change.

We believe a strong case for the rules to be changed to reflect the lower use of networks by distributed generation (see second article in this series). But NEM rule change processes are complex and incumbent businesses can lobby effectively against changes. Even successful changes can take years to come into effect.

Victoria setting new directions in FiT methodology

It is a very welcome change to see the far broader terms of reference and the detailed analysis that has gone into the process for establishing a new framework for rewarding distributed generation in Victoria. The work done by the Essential Services Commission (ESC) has been impressively detailed in identifying both energy value and network value components of distributed generation.

In Victoria from 1 July 2017 solar owners will be paid a FiT of 11.3c (see here and here for details).

For the 2017-2018 FiT the ESC has:

- based the wholesale value calculation on forward projections of wholesale price rather than historical figures (this is significant at a time of increasing wholesale prices),
- weighted the wholesale prices to take account of the time that rooftop solar is exporting based on actual historical data from a sample of solar installations,
- included for the first time an allowance (2.5c) for the "avoided social cost of carbon".

Additional innovations that may be introduced in future Victorian FiT determinations are:

- a FiT rate that varies based on the time of day in three bands (peak/shoulder/off-peak) as well as an additional 'critical peak' payment at times of very high wholesale prices
- an allowance for the network value of distributed generation based on a final ESC report due shortly
- an allowance for "the avoided human health costs attributable to a reduction in air pollution".

The impact of tariff reforms on distributed generation

Throughout the National Electricity Market there is a strong push towards what are called 'cost reflective tariffs'. The theory is that consumers will be motivated to use the network more efficiently and costs will be constrained. New tariffs will tend to have higher fixed charges and lower consumption charges. This will discourage energy conservation and make exported solar energy less valuable. There is also a trend to time-of-use tariffs and demand-based tariffs (a charge based on peak consumption during a billing period). These tariff structures can also reduce the value of exported solar energy, but potentially increase the financial benefit of systems that combine solar with local storage. Stored energy can be used to avoid purchasing energy at peak price times (on a time of use tariff) or reduce a customer's peak demand (on a demand based tariff).

Why FiTs are still important

The general trend over the last few years has been for reducing FiTs and for regulatory bodies to opt out of setting them on the argument that the problems will be solved by competition between retailers. There are two problems with this argument:

- Many of the benefits do not accrue to retailers, but to networks, society and the environment so retailers have no incentive to reward them.
- Retail electricity offerings are so complex that it is difficult for consumers to assess which offer is best for them and the FiT rate paid is only one small part of this consideration.

Over time it is likely that some of the more market based mechanisms will provide a valuable addition to regulated feed-in tariffs. However we believe a regulated minimum FiT should be set in in all jurisdictions and should remain the main mechanism for rewarding solar exports because:

- Distributed generation has real value to retailers but, without a regulated FiT, retailers will pocket this benefit rather than reward households that export solar energy.
- Distributed generation at times of peak demand drives down wholesale energy prices which benefits all consumers.

- There are social and environmental values that are reasonably consistent across all locations and a FiT is the most practical way of recognising these values.

In the final article in this series we will look at what needs to happen to ensure that distributed generation receives a fair price for exported energy.

4. The future of distributed generation

In previous articles in this series we have shown that locally generated renewable energy is seriously undervalued in the current operation of our electricity system. In this final article we look at why this occurs, the contribution that distributed generation can make to the energy system of the future and what we need to do bring about the necessary transformation.

What's stopping support for distributed generation?

The electricity rules are based on the models of the past

Electricity prices are set by national rules that are designed for a centralised system of big power stations, big distribution networks and big retailers selling electricity to passive consumers. These rules are designed to finance the investments of the past, not to build the energy system of the future. Local generation is seen as either a minor distraction or a problem because it reduces the income going to pay for existing infrastructure.

Short term benefits are highly localised in place and time

In the long term moving to a system based on more distributed generation has many benefits, but the immediate financial benefits are very dependent on time and place. At some times and locations solar pv contributes to reducing network peaks. This can both reduce the need for multi-million dollar upgrades to network infrastructure and suppress peak wholesale energy prices, which saves all consumers money. In particular locations, the ability to feed energy back into the grid could avoid network constraints. Identifying these opportunities and finding mechanisms to reward them is complex and will require a much smarter grid.

Diverse benefits

Moving to a more distributed energy system has benefits for the electricity network, for households, for society and for the environment.

For households: lower energy costs, more control, long term price stability. With battery storage and EVs: ability to combine benefits of household and transport energy costs.

For networks: less investment in transmission and distribution infrastructure. Ability for energy to be fed back into the grid at times of peak demand. Contributions to power quality including voltage regulation and power factor correction[10].

For society: job creation, industry development, energy security, energy literacy, health benefits of reducing fossil fuel use.

For the environment: distributed renewable energy contributes to reducing the multiple catastrophic effects of climate change, as well as reducing direct pollution from fossil fuels.

The compartmentalised way that modern society works lacks mechanisms for recognising this cumulative benefit. The labour market economists say that investing in solar pv is not the cheapest way to create jobs. The big generators say it is not the cheapest way to generate electricity. Politicians claim there are cheaper ways to reduce CO_2 emissions. We lack mechanisms to look at the big picture of where we want to get to.

Vested interest

There are many complex issues in valuing distributed generation that are the subject of genuine debate. But there is also the simple fact that the current electricity system is run by billion dollar businesses (whether they are owned privately or by state governments) that make a lot of money selling electricity. In 2014-2015 generators on the NEM earnt $7.7bn. On top of this customers pay network costs (currently around $12bn a year) plus retailing costs.

[10] The benefits are currently being researched and demonstrated in the Networks Renewed project being undertaken by the Institute for Sustainable Futures. https://www.uts.edu.au/research-and-teaching/our-research/institute-sustainable-futures/our-research/energy-and-climate-8

On top of their financial power, generators, networks and retailers have additional power arising from monopoly provision (in the case of networks) or market concentration (in the case of generation and retailing). Three private businesses—AGL Energy, Origin Energy and EnergyAustralia—jointly supplied over 70% of small electricity customers at 30 June 2015. These three businesses are also increasingly dominant in generation. They increased their market share in electricity generation from 15% in 2009 to 45% in 2015[11].

The business model of incumbent generators, networks and retailers is under serious threat as new technology makes it affordable for people to produce and store some or all of the electricity they need. When the rules are argued over, it is a lopsided fight between huge businesses with big budgets, lawyers and professional lobbyists on one side, and small community and consumer organisations on the other. For big businesses, legal costs are an operating expense so ultimately it is the customer who pays for the legal battles.

What could the future look like?

Despite recent parliamentary theatrics, finger pointing and talk of a role for 'clean coal', it is clear that the climate imperative and the march of technology will ensure that the electricity system of the future will have a much greater role for renewable energy.

The rear-guard actions to prevent the decline of coal-fired electricity are almost certainly futile, but the role of gas versus renewables remains an important issue for research and advocacy.

It is equally important that we have well informed debate and action about the nature of a future electricity system based mainly on renewable energy.

Possible scenarios include:

- **The death spiral for networks**: rapid advances in integration of solar, batteries, electric vehicles and energy management systems lead to households with the capital going largely or completely off-grid, even in densely populated areas.
- **Business as usual but with renewables**: Incumbent generators and networks will favour continuation of a centralised network that puts them in control. New large scale renewable energy generation is already competitive with new gas and coal generation, but a network that relies increasingly on central renewable energy generation will require significant new investment in transmission infrastructure and energy storage.
- **Sharing the benefits of distributed generation**: supportive regulation and innovative service offerings can ensure that decentralised generation and storage can reduce costs for all consumers and build a more resilient electricity network.

The death spiral is not in anyone's interest. Networks will lose the potential benefits of distributed generation. Households going it alone will not be able to sell their excess generation and will pay more for backup that could be more cost effectively provided by the network. Those who cannot afford to go off-grid may end up paying for infrastructure that becomes increasingly expensive as it loses economies of scale.

Relying just on centralised renewable energy generation and storage would have valuable environmental outcomes but will not result in the most robust or cost effective system. But with the current regulatory framework that rewards networks according to how much they invest, incumbents have a strong financial incentive to continue promoting a centralised system.

What needs to change?

To achieve the maximum benefit from decentralised renewable energy:

- State Governments need to set minimum fair feed-in tariffs that recognise the energy and network benefits of distributed solar.

[11] AER State of the Energy Market 2015, pages 124 & 127.

- FiT calculations should reflect the full wholesale value of energy from distributed solar, taking into account the value based on time of day and recent increases in wholesale energy prices.
- The environmental and health benefits of rooftop solar and other renewable sources should be recognised via the feed-in tariff or other mechanisms such as a carbon price on polluting generation.
- Rules for network charges should be updated to reflect the fact that rooftop solar makes much less use of network infrastructure. At a minimum, solar should not be charged transmission costs.
- The technology and regulation of networks needs to make it easy for distributed generation to provide services to the grid, including feeding in energy at times of maximum demand and providing power quality and other ancillary services.
- The retail market needs to be opened up so that rooftop solar owners can sell, share or gift their electricity on the grid paying an appropriate cost for using the local grid.

How do we achieve the required change?

Transforming our electricity system from a centralised, fossil fuel driven one-way distribution system to a smart system that maximises the benefits of decentralised generation, storage and energy management is a huge undertaking that needs to be undertaken at speed while minimising cost and not sacrificing energy security.

Achieving this transformation will require:

- Research and lobbying for the sorts of regulatory changes outlined above.
- Innovative technical products and services that can be implemented at scale in businesses and households.
- Public education to explain both the necessity and the benefits in terms of affordable energy and job creation.
- Political lobbying to counter the disinformation being spread about renewable energy and to support the necessary changes to the operation of the national electricity market.

Our project has made a start on quantifying the benefits. The research and advocacy materials we have produced are intended to assist with both public education and political lobbying. We urge you to make use of them and to sign on to the Solar Citizens Fair Price for Solar campaign to be stay in touch with future activities.

Transformation of our electricity system is both an environmental necessity and an enormously valuable opportunity to create the sustainable jobs and businesses of the future.

Jack Gilding is the Executive Officer of the Tasmanian Renewable Energy Alliance and was the project manager for the project "*Research review and advocacy on the fair value of distributed generation*".

The project was funded by Energy Consumers Australia as part of its grants process for consumer advocacy projects and research projects for the benefit of consumers of electricity and natural gas. The views expressed in this document do not necessarily reflect the views of Energy Consumers Australia.