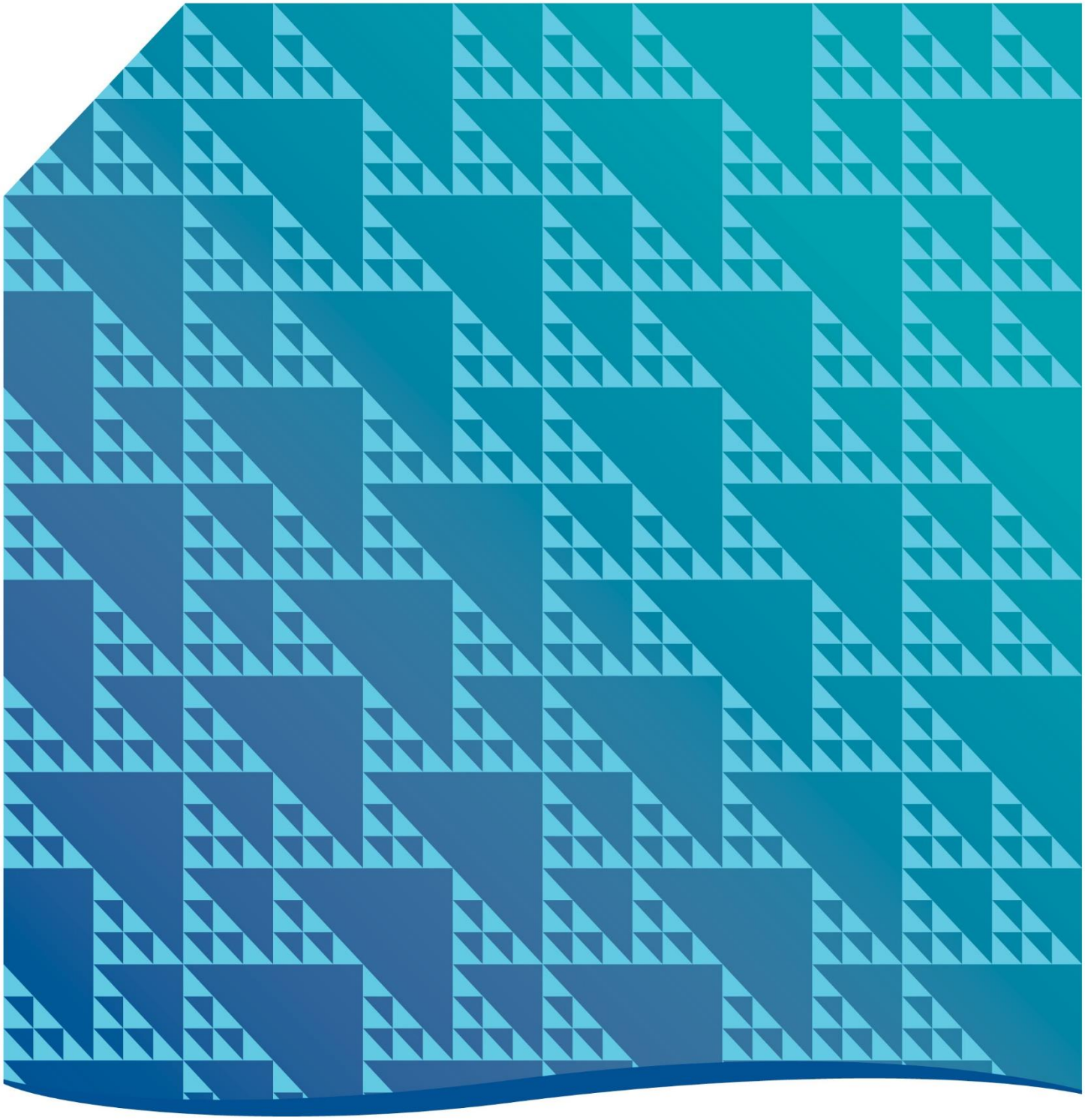
Report to the Minister for Energy and Treasurer

Solar Feed-In Tariff Review



Department of State Growth

Tasmanian Government

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Executive summary

As part of the Government's Tasmania-First Energy Policy, the Minister for Energy and Treasurer have requested that a review of Solar Feed-in Tariff (FiT) arrangements be undertaken to ensure that those households and small businesses that have installed solar are suitably rewarded and that options are considered to incentivise further installation of solar in Tasmania.

At the 2012 Council of Australian Governments (COAG) meeting all states and territories agreed on revised National Principles for Feed-in Tariff Arrangements key of which was a commitment that all premium FiT arrangements would be closed to new participants by 2014 with all other FiT customers receiving a 'fair and reasonable' value for their exported electricity.

There are two FiT rates available to residential Tasmanian electricity customers, as prescribed in the *Electricity Supply Industry Act 1995*.

- The Regulated FiT Rate. This represents the 'fair and reasonable' rate, determined by the independent Tasmanian Economic Regulator which is currently set at 8.541 cents per kilowatt hour (c/kWh).

- The Transitional FiT Rate. This rate is only available to customers who had a qualifying solar generation system connected or contracted prior to 31 August 2013. Eligible residential customers receive a premium FiT rate of 28.283 c/kWh for a transitional period until 1 January 2019.

As at the end of June 2018, there were approximately 29 273 solar installations in Tasmania which were eligible to receive the FiT rate. Of these 16 424 customers are on the Transitional FiT Rate.

The Transitional FiT was legislated to be made available for a period of five years from 2013 in order to allow people that had invested in a solar system to recoup the cost of their investment during that period.

The key findings of the Committee are that:

- there is no justification to continue the Transitional FiT rate

- the primary customer benefit from solar is offsetting own use, not reselling to the grid

- improvements in energy efficiency within the home are a more cost effective way to reduce household electricity costs

- to improve customer benefits from solar, household metering arrangements that allow customers to offset all of their usage with the output from solar PV are desirable

- those that installed systems following the announcement of the closure of the Transitional FiT and prior to the closing of the scheme, should have been aware that they would only receive five years of this rate

- there appears to be a high degree of misunderstanding in the community about how retail tariffs are set and the costs of grid supply to premises

- the number of solar installations is continuing to grow even with the 'fair and reasonable' Regulated FiT rate
- the cost of solar installations and battery installations are continuing to fall
- there is a need for an incentive to enable those in the community that are most disadvantaged to reduce their electricity costs through energy efficiency initiatives such as solar
- a move to introduce Time of Use (ToU) export tariffs may be desirable, but should be the subject of an investigation by the Tasmanian Economic Regulator to determine its suitability and appropriateness in the Tasmanian context
- solar provides little benefit to the State's energy security
- there are only marginal benefits to increased solar on network operations and in some cases it may result in additional costs.

Based on these key findings the Committee has developed a number of potential actions which could be adopted by Government across four key areas:

1. Incentivising the Uptake of Solar - assisting solar customers to maximise their own energy generation and usage through overcoming upfront financial barriers to purchase solar battery storage systems. The adoption of 'smart' solar storage systems may also offer network management benefits and assist in any future move towards a ToU FiT regime.
2. Equitable Access to Solar - mechanisms to spread the benefits of solar generation more equitably across the Tasmanian community – the benefits of solar installation are primarily only able to be accessed by middle and upper income home owners.
3. Better Feed-in Tariffs - investigating the appropriateness and potential benefits of introducing ToU FiT rates in Tasmania.
4. Minimising Electricity Costs - building on the successful operation and benefits that the TEELS has had in helping reduce cost of living pressures on Tasmanian households by improving the energy efficiency of households and assisting the take up of domestic solar systems.

The review process

As part of the Government's Tasmania-First Energy Policy, the Minister for Energy and the Treasurer requested that a review of Solar Feed-in Tariff (FiT) arrangements be undertaken to ensure that the those that have installed solar are suitably rewarded and consider options to incentivise further installation of solar photovoltaic (PV) in Tasmania. The Tasmania-First Energy Policy sets a target for Tasmania to be 100 per cent electricity self-sufficient in renewable energy generation by 2022 and further installation of solar in Tasmania could assist in meeting this target.

The Review has been conducted by an Interdepartmental Committee comprised of the Department of State Growth, Department of Treasury and Finance, and chaired by the Director of Energy Planning. The Terms of Reference for the Review are included at Appendix 1.

The Committee reviewed previous reports, considered arrangements in other jurisdictions, sought input from key stakeholders, appointed a consultant (Frontier Economics) to undertake modelling and sought public submissions.

The Committee also considered the significant changes to the energy market in the past few years, such as increasing levels of solar generation, battery storage, digital metering and consumer energy contribution to the grid.

Public submissions were sought on 7 July 2018 with the consultation period ending on 6 August 2018.

This Report are the findings of the Committee.

Background

A Feed-in Tariff (FiT) is paid to customers for the energy they export to the grid. The amount paid is based on a rate per kWh exported and can be applied to exports from distributed generation, including that from mini-hydro and wind generation as well as from rooftop solar.

National policy context

At the December 2012 meeting of the Council of Australian Governments (COAG), all states and territories agreed on revised National Principles for Feed-in Tariff Arrangements. These revised principles included a commitment that all premium FiT arrangements were to be closed to new participants by 2014. All other FiT customers were to receive a 'fair and reasonable' value for their exported electricity.

Current arrangements

The *Electricity Supply Industry Act 1995* (ESI Act) and the *Electricity Supply Industry (Price Control and Related Matters) Regulations 2013* (*Pricing Regulations*) set out the requirement for the Tasmanian Economic Regulator (TER) to determine the FiT rate for solar customers and what must be considered as part of the investigation and determination process.

The TER undertakes an investigation every three years to determine how the FiT rate is to be calculated. The FiT rate determination sets the formula for the amount to be paid by authorised retailers to FiT customers for electricity exported to the grid. This formula is then used by the TER to set an updated annual rate (the Regulated FiT Rate).

The Committee notes that the TER will be undertaking its next investigation this financial year which will take effect from 1 July 2019.

There are two FiT rates available to residential Tasmanian electricity customers, as prescribed in the ESI Act:

- The Regulated FiT Rate. This represents the 'fair and reasonable' rate, determined by the independent Tasmanian Economic Regulator. On 21 June 2018, the TER determined, in accordance with the 2016 Regulated FiT Rate Determination (2016 FiT Determination)[1], that the Regulated FiT Rate for 2018-19 will be 8.541 cents per kilowatt hour (c/kWh).
- The Transitional FiT Rate. This rate is only available to customers who had a qualifying solar generation system connected or contracted prior to 31 August 2013. Eligible residential customers receive a premium FiT rate of 28.283 c/kWh for a transitional period until 1 January 2019. After this date, these customers will be reverted to the Regulated FiT Rate. In 2016-17 the cost of providing the Transitional FiT to those customers was $11.7 million. This cost is paid for by TasNetworks lowering profits, which

[1] Determination made by the Tasmanian Economic Regulator on 5 May 2016.

in turn reduces the returns available to the Government to provide services to the community.

FiT rates are also available to small business customers, including the above Regulated FiT rate and a specific Transitional FiT rate.

- Small business customers who had a qualifying solar generation system connected prior to 31 August 2013 are eligible for the Transitional FiT rate. The Transitional FiT rate for small business customers is 38.577 cents in relation to each kilowatt hour within the first 500 kilowatt hours (or other specified threshold if billing period is not quarterly) and 28.319 cents per kilowatt hour for all other electricity supplied. As at the 30 June 2018 there were 543 small business customers receiving the Transitional FiT rate.

The current legislated FiT arrangements arose in order to provide certainty for solar customers. While there was an earlier scheme offered by Aurora Energy, it was offered on a voluntary basis and did not provide consumers with certainty in respect to the rate they would receive for energy exported to the grid.

Under the current provisions of the ESI Act, the Transitional FiT rate expires on 31 December 2018.

Solar in Tasmania

As at the end of June 2018, there were 29 273 solar installations in Tasmania which were eligible to receive the Feed-in Tariff rate. Of these around 16 424 customers are on the Transitional FiT Rate. Since the Transitional Rate was introduced in 2013 approximately $50 million in payments have been paid to solar customers (Table 1).

	2013/14	**2014/15**	**2015/16**	**2016/17**	**2017/18**
Number of customers with solar systems	20,328	22,940	25,007	27,094	29,273
Number of Transitional FiT Customers	18,950	18,792	17,961	17,194	16,424
Number of Regulated FiT customers	1,378	4,148	7,046	9,900	12,849
Number who ceased to be Transitional FiT customers	449	1,137	848	774	775
Cost of Transitional FiT	$4,134,601	$12,684,946	$13,022,714	$11,675,292	$10,261,327

Table 1 Feed in Tariff Customer Summary (Source TasNetworks Annual Electricity Distribution Network Performance Reports)

The number of customers on the Transitional FiT Rate has been reducing each year, as customers make changes to their existing arrangements and move to the Regulated FiT. Of the customers that have been or are on the Transitional FiT:

- approximately 10 000 installed their systems in either 2013 or 2014, which was after a decision was made at COAG in December 2012 that all States would cease premium FiT rates.
- approximately 3 600 systems were installed prior to 2011, with average system sizes of 1.6 kW or lower. These customers receive limited benefit from the Transitional FiT due to the small

output capacity of their panels and the fact that their systems are based on older, less efficient technology.
- most solar installations are limited to the T31 (light and power)/T41 (heating and hot water) metering arrangement where solar can only be used to offset usage against one tariff (generally T31).

Based on information provided in the submission from Aurora Energy, the demographic profile of a typical Tasmanian solar customer is a middle income homeowner aged 55 or above.

There are a range of factors that make Tasmania different to other States and Territories when it comes to solar generation.

- Tasmania has a winter peak energy demand. Other jurisdictions generally have a summer peak that is driven by air conditioning usage. This correlates much more closely to solar output and allows solar customers to better utilise their own generation, store it in a battery for use at peak times and/or export it to the grid at a time when the network needs additional generation to cope with peak demand.
- Almost all of Tasmania's energy is already generated from renewable energy. Solar production in other States generally offsets fossil fuel powered generation, increasing the proportion of electricity coming from renewables and offsetting carbon emissions.
- At times, Tasmania suffers from a shortage of rainfall to be used in the production of electricity, but unlike some other jurisdictions doesn't suffer from a lack of generation capacity.
- The solar resource is weaker in Tasmania than other States and Territories, which reduces the efficiency of Tasmanian solar PV systems.

In regard to network arrangements, Tasmania is different to other jurisdictions in that the maximum demand on the network occurs in winter and generally on a cold winter morning. As network costs are largely driven by the maximum demand on the network, solar PV rarely generates much electricity at peak times, meaning solar customers place as much load on the network as other users.

Review of previous reports

As part of the Tasmanian Energy Reforms that resulted in the introduction of full retail competition from 1 January 2014, the then Government released an issues paper in May 2013 titled *Feed-in Tariffs: Transition to Full Retail Competition*, seeking public submissions. The paper detailed the proposed arrangements that would apply for FiT's from 1 January 2014.

The issues paper proposed that:

- all existing Aurora Energy Net Metering Buyback Scheme customers - including all intending customers who have paid a deposit on a distributed generation system - would continue to receive the of 28.283 c/kWh rate for their net exported electricity until 1 January 2017, on the condition that the customer remains on their existing retail contract;
- the TER would determine a fair and reasonable feed-in tariff that would apply from 1 January 2014 and the TER would undertake substantial public consultation in setting the new rate;
- the feed-in tariff rate would be reviewed by the TER annually; and
- retailers would be entitled to recover any amount paid to customers, under the grandfathering arrangements that is in excess of the Regulated FiT, from the Government-owned network business.

Following extensive consultation, a final position paper was released in August 2013. A key change was made to the proposed arrangements as a result of public feedback. The duration of the period during which existing customers would continue to receive their current FiT rate was extended from three to five years, until 1 January 2019.

The consultation process identified that a significant number of customers had made capital investments in the belief that their current FiT rate was guaranteed through their five-year connection contract with Aurora Energy. However, the five-year connection contract deals only with the technical specifications of the customer's solar or other micro renewable generation systems, and did not relate to the FiT rate.

As a result, the *Electricity Supply Industry Amendment (Feed-in Tariffs and Other Matters) Bill 2013* was introduced into the Parliament on 17 September 2013. The legislation was passed by both Houses of Parliament and received Royal Assent on 6 November 2013.

During debate in the House of Assembly, the then opposition shadow Energy Minister stated that:

"When the government first announced its proposal to put in place a grandfathering arrangement, which we had called for, the government had indicated a period of three years and we indicated at the time that we thought that was probably not sufficient. We are pleased that the government has seen fit to extend that grandfathering arrangement to a period of five years. From the Tasmanian Liberals' perspective we would agree with the minister that it strikes the right balance. It is a fair outcome. It made a lot of sense for many people. A lot of the connection arrangements were based on a period of five years so there was a certain

logic to that and it certainly avoided the worst of the exposure some people were otherwise concerned they might experience."[2]

Arrangements in other jurisdictions

Appendix 2 outlines current FiT rates for residential customers and a summary of State and Territory solar/battery incentive programs. A number of jurisdictions, like Tasmania, have a regulated minimum FiT rate. Other jurisdictions have no regulated rate but rely on market competition. In the Northern Territory there is a buyback scheme where residential customers receive whatever their consumption tariff is at the time.

A number of jurisdictions have recently launched battery storage subsidy schemes. South Australia announced in September 2018 that it will provide competitive interest rate loans of up to $600 per kWh (to a maximum of $6 000) of capacity for the installation of battery storage. Victoria similarly launched a battery storage program in September 2018 which provides a grant of up to $4 838 to assist households to install battery storage. These programs follow the ACT's Next Generation Energy Storage program which began in April 2016, providing grants of around $4 000 for battery storage systems. Given current and impending generation constraints in these jurisdictions, promotion of increased solar generation and flexibility has merit.

As can be seen from the table in Appendix 2, whilst other Australian jurisdictions have longer time periods for the cessation of 'premium' FiT rates, new standardised premium FiT rates are not being introduced and higher FiT rates are linked to the introduction of ToU pricing regimes. Other complimentary measures to support solar customers are overwhelmingly in the form of loan schemes primarily for battery storage systems.

[2] Tasmania, Parliamentary Debates, House of Assembly, Thursday 19 September 2013 - Part 2 - Pages 24 - 115

Stakeholder consultation

A period of public consultation ran from 7 July 2018 to 6 August 2018. Information regarding the review including a consultation paper were made available via the Department of State Growth website. Advertisements were also placed in The Mercury, The Examiner and The Advocate newspapers inviting written submissions to the Review.

The consultation paper posed the following questions:

1. What changes could be made to current FiT arrangements (for example, a different FiT rate structure) to provide incentive to install rooftop solar generation and appropriately reward consumers that have already installed rooftop solar generation?
2. Would those changes be likely to result in any other indirect or unintended impacts (beneficial or otherwise)?
3. What contribution does rooftop solar generation make to Tasmania's energy security?
4. What are the social and environmental benefits and costs of rooftop solar generation? What is the value of these benefits and costs?
5. Do the community benefits of incentivising further solar installations outweigh the costs of providing those incentives?
6. Are there alternative mechanisms (other than changes to FiTs) that could be used to incentivise and reward the installation of rooftop solar generation?
7. Is there potential for rooftop solar systems, smart metering and battery storage systems to help manage or limit peak demand?
8. Are the opportunities to benefit from rooftop solar available equitably across the community?
9. Any other relevant matters that the person or group submitting would like to raise for consideration.

While some submissions directly addressed the questions, others provided general comments only. In total 63 submissions were received.

In respect to the views put forward on the Transitional Rate ending, the majority of submissions by individual stakeholders and by solar advocacy groups such as the Tasmanian Renewable Energy Alliance (TREA) and Save Our Solar called for an increase to the Regulated FiT Rate of 8.5 c/kWh once the Transitional Rate has finished. A number of suggestions for a new Regulated Rate were proposed, with some suggested rates ranging from 18 c/kWh to 21.6 c/kWh.

These views were countered by TasNetworks, Aurora Energy, and the University of Tasmania (UTAS) submissions, which argued that 'Premium rates' such as the current Transitional Rate of 28.283c/kWh were no longer justified and should cease.

A number of reasons were detailed by stakeholders for supporting an increase in the Regulated FiT rate ranging from the value of the energy generated to the State, assumptions relating to savings to the transmission network, the role solar plays in reducing carbon emissions, employment benefits and expanding Tasmania's Distributed Energy Resources (DER) network. Some individual solar customers also argued that a continued 'premium' Transitional FiT Rate was needed in order for customers to recoup their investment. Other solar advocates argued that a higher FiT rate

(significantly higher than the Regulated FiT) was important in encouraging the continued take up of solar by domestic customers.

The key themes that were raised by stakeholders during the consultation process can be broken down into the following 11 issues:

- Value of Solar PV – wholesale rate calculation
- Feed-in tariffs should be set at the same rate as retail prices
- Is a high FiT rate needed to drive further investment in solar?
- Avoided transmission costs
- Savings to distribution network
- Reduced carbon emissions
- Energy security
- Potential benefits of moving towards ToU FiT rates
- Potential benefits of battery storage
- Support for continuing the TEELS
- Are there opportunities to provide the benefits of solar more equitably across the community?

The feedback provided in respect to each issue is summarised below along with the Committee's response.

Value of solar PV – Wholesale Rate Calculation

Discussion

A key argument common to solar advocates is that solar PV generation allows for increased energy exports across Basslink and that the value that accrues to the State and its energy businesses from these exports should be reflected and priced into the FiT. Save Our Solar argued that Tasmania should have the highest FiT in Australia in order to allow for greater exports into the NEM. Climate Tasmania stated that the export component should be valued at 10-13 c/kWh. TREA argued for a FiT rate of 21.6 c/kWh based on a range of assumptions.

The major element of TREA's calculations relating to a proposed higher Regulated FiT Rate is the wholesale value of energy. TREA argues that solar generation allows for increased exports over Basslink and that solar generators should be paid for the value of this generation to the State based on average export prices which TREA calculates at 9.8c/kWh and 11.8c/kWh.

The current Regulated FiT Rate is based on the wholesale price of energy set by the Treasurer under the Wholesale Electricity Price (WEP) Order, which has been set at 7.968 c/kWh for 2018-2019.

The TER uses the WEP in its Standing Offer Determination as the substantive basis for the current Regulated FiT of 8.5 c/kWh. The TER's calculation of the FiT also reflects other factors such as the avoidance of losses that occur when electricity is transmitted through the grid and Australian Energy Market Operator (AEMO) charges. The Tasmanian regulated wholesale price is determined by the

Wholesale Contract Regulatory Instrument, which is based primarily on the Victorian forward contract price adjusted using a rule-based methodology to account for factors unique to the Tasmanian power system.

TREA indicates that it has undertaken an analysis of the value of Basslink imports/exports and Victorian wholesale NEM prices. TREA asserts that the wholesale export price is between 9.8 c/kWh -11.8 c/kWh. Consequently TREA argues that the wholesale value of solar energy should be priced at 9.8 c/kWh -11.8 c/kWh.

It is noted that other Australian jurisdictions (such as Victoria) use the Wholesale Method in calculating a solar FiT. Under the wholesale method it is assumed that solar PV customers are like the large scale generators who sell electricity to energy retailers in the NEM. Importantly, under this method the price paid to the solar PV system owner for solar PV system exports takes into account the time when the excess electricity is exported. As such exports during non-peak and lower demand periods (and hence lower value electricity) are reflected in the calculation of the FiT.

Aurora Energy has conducted an analysis based on a NEM meter data sample (4 200 small customers) to create a Small Customer Solar Net Export Profile. This analysis shows that the majority of net exported domestic solar occurs in the lower demand periods during the middle of the day with declining benefit provided during periods of peak customer demand in the mornings and afternoon.

Aurora Energy therefore does not support any increase to the solar FiT (above what is determined under the current Fair and Reasonable methodology). Aurora also noted that the Australian Competition and Consumer Commission also supported this view in its *2018 Retail Electricity Pricing Inquiry Final Report.*

TREA's calculation of the value of exported household solar appears to be based on its assumption of the average price for energy exported into the NEM at 11.8 c/kWh. TREA's calculation makes no allowance for the fact that the majority of net exported domestic solar energy occurs in the lower demand periods (and therefore the electricity generated is of lower value than electricity generated at peak times) but attaches the highest average export price for the purposes of the calculation.

TasNetworks also argues that any FiT that pays customers in excess of the market value of the energy their system produces rewards rooftop solar customers at the expense of other customers, either through higher prices or lower dividends to Government from TasNetworks.

The Committee also notes that TREA's calculation appears to be based on the spot price for a one year period only. The spot price can fluctuate from year to year, either downwards or upwards. As such it is difficult to see how an accurate forward forecast in relation to a future spot price could be made in relation to calculating the FiT rate.

Committee's response

The Committee considers that the Tasmanian regulated wholesale price is the most appropriate basis for determining the Regulated FiT Rate.

Feed-in tariffs should be set at the same rate as retail prices

Discussion

A number of stakeholders, particularly individual householders argued that the solar FiT should be set equal to the retail price of electricity (for example, at the variable energy rate for Tariff 31, currently 26.4 c/kWh). Some submissions claimed that the retailer is able to purchase electricity exported from solar customers and then sell it to other customers at little or no cost to the retailer outside of the FiT they pay.

However, as Aurora Energy notes, retail electricity prices recover the total cost of the whole electricity supply chain. These costs are not incurred by solar customers for electricity exported to the grid. Consequently setting the solar FiT at the retail electricity price would therefore overstate the value of the solar generation exported and pay for services that a solar FiT customer does not provide.

Solar advocates arguing for a FiT or component of the FiT set at the retail cost of electricity do not take into account that a retailer has to recover all costs of the electricity supply chain in its pricing. These costs include metering and settlement arrangements in the NEM including network costs for every kWh of electricity supplied to a customer regardless of how the electricity was generated. Retailers also have significant costs in the day to day running of their businesses including regulatory, corporate, marketing, customer billing and managing complaints/inquiries. Domestic producers of solar incur none of these costs and retailers do not avoid these costs when they purchase solar electricity from domestic generators.

If the FiT rate was set to equal the retail rate it would be non-commercial for Aurora Energy to purchase solar energy as it could purchase energy more cheaply from the market. If it was required to purchase solar energy by legislation at the retail rate it is likely that it would make significant losses on those purchases and would be forced to recoup these losses from other non-solar customers.

Committee's response

The Committee does not believe that the FiT rate should be set at a rate equal to the retail price of electricity.

Is a high FiT rate needed to drive further investment in Solar?

Discussion

Some stakeholders argued that a high FiT was an effective mechanism to incentivise customers to adopt domestic solar. Save Our Solar argued that Tasmania should have the highest FiT in Australia to encourage the further adoption of rooftop solar. TREA also called for an increase in the Regulated FiT rate as part of a range of measures to encourage further investment by Tasmanian households.

A number of individual solar customers also argued that a continuation of a 'premium' Transitional FiT rate was needed in order for customers to recoup the investment cost of installing solar systems.

Previous State and Federal incentives and FiT schemes at the State level have driven the take up and growth in rooftop solar systems by domestic customers. The increase in the number of Tasmanian households that had installed or contracted solar systems prior to 31 August 2013 to qualify for the Transitional Rate provides an example of how a 'premium' FiT rate can drive increased investment in solar. However the solar industry in recent years has matured and the cost of solar systems has significantly decreased which has to a large extent negated the need for 'premium' FiT rates.

This fact was recognised by a number of stakeholders, the Alternative Technology Association (ATA) in its submission states that the average price of installing solar systems has fallen by around 25 per cent in the last two years. UTAS similarly stated that premium FiTs are no longer required in Tasmania in order to stimulate the residential PV market, owing to the now favourable economics of rooftop solar.

Despite a general move away from generous FiT schemes, the decreased costs of solar systems (Figure 1) has continued to provide sufficient incentive to ensure that installation rates nationally have not declined.

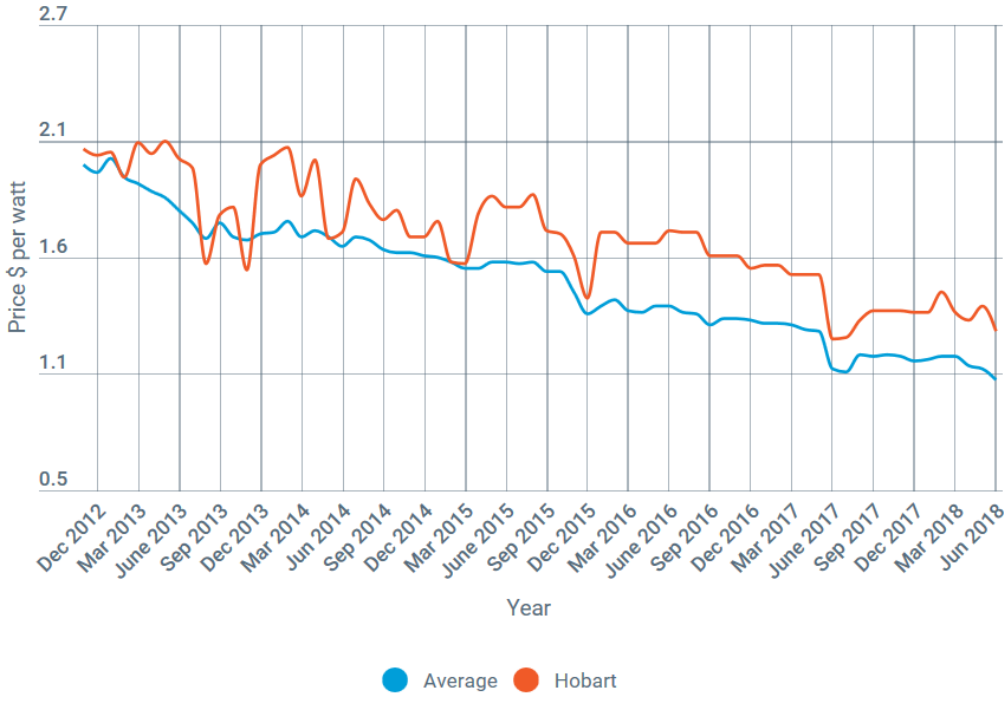

Figure 1 Average Cost of a 5kW Rooftop Solar System in Australia and Hobart[3]

Data from the Australian Energy Council shows that solar generation in Australia increased by 22.8 per cent in 2017, including a 19 per cent increase in Tasmania and a 29 per cent increase in NSW, where a fair and reasonable (market value of solar PV generation) FiT is the only option available.

[3] Choice (2018). The cost of getting sun smart. https://www.choice.com.au/home-improvement/energysaving/solar/articles/solar-panel-payback-times), downloaded 1 August 2018.

Aurora Energy notes that the number of solar customers on the 'fair and reasonable' Regulated FiT has increased by approximately 2 000 customers per annum since the Regulated FiT Rate was introduced in 2013.

TasNetworks in their submission similarly notes that between 2011 and 2013 all Australian jurisdictions had moved away from bonus schemes for new solar customers with no impact on the continued growth of solar installation nationally.

The Committee also notes that the Australian Government's Small-scale Renewable Scheme also provides a financial incentive to install residential solar until 2030. Small-scale technology certificates (STCs) are provided 'up front' for a system's expected power generation over a 15 year period or, from 2017, from the installation year until 2030 when the scheme ends. Customers who install rooftop solar generally assign their right to create these STCs to a registered agent in exchange for an upfront discount off the cost of their system or a cash payment.

According to Aurora Energy this up-front discount would equate to a subsidy of approximately $3 000 for a customer installing a 5 kW solar system in Hobart. The subsidy to rooftop solar owners under this scheme is funded by all electricity customers. In 2018-19, the STC liability to be recovered from Tasmanian customers will be approximately $13.1 million, representing approximately 2.5 per cent, or $52, of an average Tasmanian regulated small customer's annual bill.

The Committee notes the continuing growth in solar installation by Tasmanian households over the past five years although these customers are only eligible for the 'fair and reasonable' Regulated FiT Rate, which is currently 8.541 c/kWh (and has been lower than this at times over that period).

In addition, the Tasmanian Government already provides support for new solar customers via the TEELS. Rooftop solar is the most popular product selected in the scheme comprising 37 per cent of total applications.

Committee's response

The Committee notes the significant and on-going reduction in the capital costs of solar systems in recent years and the continued growth in installations despite a generalised move away from 'premium' FiT schemes. These falling costs suggest that market forces will continue to improve the financial case for Tasmanian customers to invest in rooftop solar without the need for a FiT rate above that set by the Regulator.

The Committee therefore does not consider that any FiT rate above that set by TER is required to incentivise the further take up of rooftop solar by Tasmanian households.

Avoided transmission costs

Discussion

A number of stakeholders stated that small scale solar generators make little use of the electrical transmission network and therefore network charges to solar PV generators should be rebated and these savings passed onto solar owners, primarily as a component of the FIT rate. TREA's submission argued that Aurora Energy passes TasNetworks 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. Consequently solar owners are being charged for a service they do not use and transmission charges should only apply to the electricity actually carried on the transmission network.

TREA submits that 80 per cent of these savings should be passed onto solar owners with the remaining 20 per cent allocated to the retailer. TREA calculates these transmission savings as being worth 3.19 c/kWh of a future FiT rate.

The UTAS submission also identifies savings on transmission charges as a saving that a retailer makes when purchasing rooftop solar exports.

Based on discussions with TasNetworks, the Committee understands that transmission charges are levied on retailers based on the amount of metered consumption at a customer's property. This means transmission charges are imposed on customers regardless of where energy is sourced. TasNetworks passes these costs directly onto the retailer. As a result there is no means by which the retailer can derive financial benefit from avoided transmission costs arising from the purchase of energy generated by solar PV.

TasNetworks submission also cites the recent review of solar FiTs conducted by the New South Wales Independent Pricing and Regulatory Tribunal (IPART). This review suggested the benefits of rooftop solar were only able to be realised in limited parts of the NSW network where it has the ability to reduce peak demand.

Tasmania has a winter peaking network with peak periods that occur early in the morning and late in the afternoon, largely as a result of increased heating load. Therefore, the majority of solar generation (that occurs during the middle of the day) does not coincide with the times when the network is most in demand. Potential benefits to the network are therefore not realised because solar generation without storage capability does not reduce the demand on the network.

From the information provided by TasNetworks, it appears that the key determinant of transmission network costs is building and maintaining the network for the benefit of all Tasmanian customers to cope with peak demand. The Committee also notes that in its 2016 Regulated FiT Determination Statement of Reasons, the TER stated:

"From the evidence presented by TasNetworks, the Economic Regulator has concluded that, at this time solar does not contribute to reductions in peak demand and therefore does not lead to avoided transmission costs. Given that currently there is no material or measurable evidence of transmission cost reductions as a result of solar, the Regulator is unable to account for avoided transmission costs in the FiT rate determination".[4]

Committee's response

The Committee considers that at this time solar PV does not make any measureable contribution to reductions in peak demand and therefore does not lead to avoided transmission costs.

[4] Office of the Tasmanian Economic Regulator (2016) Regulated Feed-In Tariff Rate Determination For Standard Feed-In Tariff Customers

Savings to distribution network

Discussion

TREA's submission states that exported energy from solar PV is typically used close to the point of export and therefore makes significantly less use of the 'poles and wires'. Also a significant proportion of the cost of the distribution network is the transformers which convert higher voltages down to 230 volts. Solar inverters have this capability built in and export power at 230 volts. TREA argues that the benefits of lower network usage by distributed generation should be recognised and reflected in the FiT.

TasNetworks however advise that the addition of rooftop solar can create challenges that may require additional expenditure on the network which is currently funded by all customers. The key issue relates to sustaining the quality of supply to customers connected to the distribution network, which relates to TasNetworks obligation as a Distribution Network Service Provider (DNSP) to operate the network within a set voltage range. The growth in the capacity of rooftop solar has created challenges for the network as growth of exports from solar PV systems produce more energy during off-peak times. The increased prevalence of rooftop solar may increase variation in generation which causes voltages to vary beyond regulated limits.

The Committee also notes that distribution costs are based on metered consumption and do not take into account the source of generation. As a result, retailers are unable to make financial gains through distribution charges when purchasing and on-selling excess electricity from distributed generation, and Aurora Energy is unable to avoid these charges. The Committee also notes that in its 2016 Regulated FiT Determination Statement of Reasons, the TER stated:

"The main driver of network costs is not the volume of electricity distributed to customers over time but the cost of building the network to meet peak demand. The output of solar PV systems is out of phase with recognised peaks in system demand in Tasmania, meaning that distributed generation has not given rise to distribution network cost savings."[5]

Committee's response

From the information received the Committee concludes that at this time, solar PV does not contribute to reductions in peak demand and therefore does not lead to avoided distribution costs.

Reduced carbon emissions

Discussion

A number of stakeholders stated that solar generation plays a key role in helping reduce carbon emissions. TREA stated that each kWh of solar PV that displaces imported coal fired electricity from Victoria creates a reduction in carbon emissions that is worth a minimum of 2.4 to 3.1c/kWh using current carbon pricing estimates.

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[5] ibid

The Victorian single rate FiT for 2018-2019 is 9.9 c/kWh and this includes an allowance of 2.5 c/kWh for the "avoided social cost of carbon". TREA argue that a similar allowance should be applied to the Tasmanian FiT since any increased solar generation in Tasmania notionally reduces imports of mainly coal fired Victorian electricity.

Tasmania has the lowest per capita greenhouse gas emissions of any Australian state or territory. Our latest emissions figures show that Tasmania has reduced its emissions by 90 per cent from 1990 levels. The latest Clean Energy Australia report released by the Clean Energy Council of Australia highlights that Tasmania is the most significantly advanced state in terms of renewable energy penetration (88 per cent)[6] and the State is on target to reach the Government's goal of being 100 per cent self-sufficient in renewable energy generation by 2022. Solar PV at less than 1 per cent of the state's generation plays a modest role in reducing Tasmania's carbon emissions.[7] Hydro generation is a vastly greater contributor to carbon reduction.

The Committee notes that TREA also argues that solar generation allows for export of renewables into the NEM and should be priced at 11.8 c/kWh. To argue for an additional 2.4 to 3.1c/kWh for displacing imports from Victoria is double counting. Additionally, the Australian Government's Small-scale Renewable Energy Scheme (SRES) already compensates solar PV owners for emissions abatement and other environmental benefits provided by solar PV installations.

Committee's response

Whilst the Committee acknowledges the environmental benefits of solar PV, the Committee believes that existing mechanisms sufficiently compensate solar PV owners for these benefits.

Energy Security – argument that solar aids energy security

Discussion

TREA in it submission argued that Distributed PV contributes to diversity of supply and makes Tasmania's electricity system less dependent on rainfall, or single points of failure such as Basslink.

The UTAS submission stated that although solar accounts for less than 1 per cent of the State's generation, rooftop solar provides diversity in energy generation in Tasmania and has the potential to grow significantly and make an indirect contribution to the state's energy security.

Aurora Energy's submission states that the contribution of rooftop solar generation to Tasmania's energy security is currently low and will remain so into the future. Aurora Energy cites AEMO projections that show that although rooftop solar generation will increase five-fold by 2036, this increase is offset by consumption growth, meaning that the relative contribution to Tasmania's energy security will remain low. Consequently Aurora Energy believes that there is no need for incentives for additional solar generation from an energy supply security perspective.

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[6] Clean Energy Council (2018) *Clean Energy Australia Report*. Southbank, Victoria.

[7] Office of the Tasmanian Economic Regulator (2018) *Energy in Tasmania Report 2017*.

This view is supported by the work undertaken by the Tasmanian Energy Security Taskforce in 2016-17, which concluded that while small scale renewable energy such as rooftop solar provides some energy supply security benefits (that is, makes a small contribution to reducing the on-island energy deficit and diversifying electricity generation), the overall impact on reducing the on-island energy deficit is low based on current projections. Based on this assessment, the Taskforce concluded that it did not propose that additional policy measures be initiated to support solar installations as a mechanism for bridging the on island energy gap.

At approximately 1 per cent of the State's energy output, an argument for rooftop solar to develop into a material contributor to Tasmania's energy security is unlikely. This is especially the case given further on-island developments in renewable windfarm generation and the potential of energy projects such as Battery of the Nation and increased interconnection with the mainland. The long-term energy security position of the State has also been strengthened by the implementation of the Taskforce's energy security framework.

Committee's response

The Committee notes that solar PV only plays a very modest role in assisting the State's energy security and is unlikely to become a material contributor.

Potential benefits of moving towards ToU FiT rates

Discussion

A number of stakeholders including TREA, UTAS, and ATA called for time varying or ToU FiT rates to be made available to small scale solar generators. Stakeholders outlined a number of advantages from moving to ToU including, encouraging solar households to invest in batteries and encourage solar owners to feed energy back into the grid (or use stored energy for their own consumption) when it is most useful in reducing peak demand.

At a high level, a customer ToU FiT assumes that the provision of electricity has different costs at different times of the day.

A move to a ToU regime would see households given the option of exporting energy into the grid at times of peak demand and receive a premium tariff for that electricity. Any move toward a ToU export regime would require 'smart meters'.

In relation to exporting electricity into the grid, solar owners in Victoria and regional Queensland have the option of choosing a FiT that varies according to the time of the day and the regulator in NSW has recommended a similar arrangement.

However both TasNetworks and Aurora Energy have reservations about a move toward an export based ToU FiT. TasNetworks submission states that the growth in solar may create challenges for the network as rooftop solar systems produce more energy during off-peak times. The increased prevalence of rooftop solar may increase variation in generation which may cause voltages to vary beyond acceptable limits.

TasNetworks believes that greater emphasis should be placed on solutions and technology that allow rooftop solar customers to maximise utilisation of their own generation rather than exporting it into the grid.

The Committee notes that other Australian jurisdictions are implementing ToU FiT arrangements most recently Victoria and NSW and that a move to ToU FiT is being advocated by a number of solar advocacy groups.

Aurora Energy understands that other jurisdictions with a regulated solar FiT have introduced a time varying (or 'Time of Use') solar FiT. Aurora Energy does not believe that there is sufficient merit in introducing an alternative solar FiT rate structure in Tasmania. Such an approach would likely not benefit customers in Tasmania given that solar generation primarily occurs in periods of low system demand. Aurora believe that a time-varying structure based on the wholesale cost of electricity is likely to disadvantage customers, with a lower priced solar FiT provided in the middle of the day when net solar export occurs. This is different to mainland states, where solar generation export occurs at times closer to peak system demand.

Were the solar FiT to be changed to a time-varying structure, this could cause a misalignment between the solar FiT and the value of wholesale energy prices set by the TER. Any misalignment may create a financial risk for Aurora Energy.

A ToU FiT coupled with the take up of batteries (which will allow for storage for export) and smart metering could offer benefits to solar customers through encouraging the export of electricity into the grid potentially providing greater returns for investors in solar and playing a role in providing energy at peak times. The Committee also notes that a number of submissions highlighted that the implementation of a ToU FiT would also incentivise and drive the take up of solar storage batteries.

Aurora Energy has also informed the Committee changing the solar FiT rate to a time-varying structure would require a mass meter exchange program. This is likely to take considerable time to plan and implement.

Committee's response

The Committee considers that any move to a future ToU FiT regime should be the subject of an investigation by the TER with full consultation with the State's Energy businesses and other key stakeholders to determine feasibility and appropriateness of such a policy.

Benefits of battery storage

Discussion

The electricity system is moving to a much greater role for renewable energy and for distributed generation and storage of energy. Distributed energy resources (DER) refer to smaller generation units that are located on the customers' side of the meter, such as rooftop solar and battery storage units, wind generating units and mini/micro hydro. TasNetwork's advises that by 2027 over 40 per cent of Australian homes are likely to have some form of DER with over 40 000 homes having some form of renewable energy resource (primarily solar). TasNetworks expects that DER are going to be an important part of Tasmania's energy sector in the decades to come.

A number of stakeholders including TREA and UTAS were supportive of increased take up by solar customers of solar storage batteries. The ATA also noted increased investments by households in battery storage systems despite typical payback times of more than ten years.

Solar batteries enable households to store excess energy, helping them to maximise usage of the energy they generate and allowing them to offset peak consumption charges by using excess electricity that they have generated earlier, reducing electricity bills.

TasNetworks is supportive of any policy that supports Tasmanian customers taking-up technologies that help incorporate DER into the network such as advanced meters and smart batteries. TasNetworks submission further states that:

"Policy initiatives should encourage the use of technology, such as advanced meters and communication-enabled batteries that increase the overall efficiency of the network, drive down costs to all customers and enable solar customers to maximise benefits for their own households."

TasNetworks although supportive of solar battery technology, does have concerns in relation to uncontrolled installation of household batteries, where the network does not have visibility of these batteries and suggest that this risk can be mitigated by inclusion of 'smart' batteries. Smart battery systems are communications capable.

Aurora Energy's submission stated that while network constraints may be mitigated through 'smart' battery installation (and associated technologies that facilitate the network having control over solar export) in the future, it remains unclear that a peak demand problem exists in Tasmania.

It is Aurora Energy's view that any incentive to install batteries to manage any perceived peak demand issues should be provided separately to solar incentives and not linked to the FiT. The Committee notes that while there are benefits to consumers from combining solar PV and battery systems, the upfront capital costs of installing battery storage systems can make them financially unviable to install.

The Committee also notes that other jurisdictions such as South Australia have recognised the benefits of solar battery installation but noted that the upfront financial costs to consumers can make installation financially challenging. South Australia has recently announced a combined subsidy/loan scheme with the Clean Energy Finance Corporation to allow householders to purchase solar storage batteries.

Committee's response

The Committee considers that a funding mechanism, such as a grant program and the continuation of the interest free Tasmanian Energy Efficiency Loan Scheme may be appropriate to support customers with the upfront capital costs of installing battery storage.

Support for continuing TEELS

Discussion

The Government introduced the TEELS in May 2017 to help reduce the cost of living pressure on Tasmanians by improving the energy efficiency of households.

The scheme was set up to enable residential and small business customers to access interest-free loans to purchase energy efficiency products such as heat pumps, double and triple glazing and solar

hot water or solar panels to help improve energy efficiency and reduce costs.[8] The scheme allows Tasmanian residents and small businesses the opportunity to apply for a loan with zero per cent interest for 36 months for eligible energy efficient products up to a value of $10 000.

The scheme was originally announced with a finance pool of $10 million, however this was extended to $20 million due to the popularity of the scheme. The scheme was extended from 1 May 2018 providing a further $20 million in no interest loan finance. The current scheme is scheduled to conclude on 30 April 2019, or once the $20 million of finance is expended.

At 26 August 2018, over $25.4 million in loans have been approved to 3 203 successful applicants. Popular products requested under TEELS have included solar panels and battery storage systems (Figure 2).

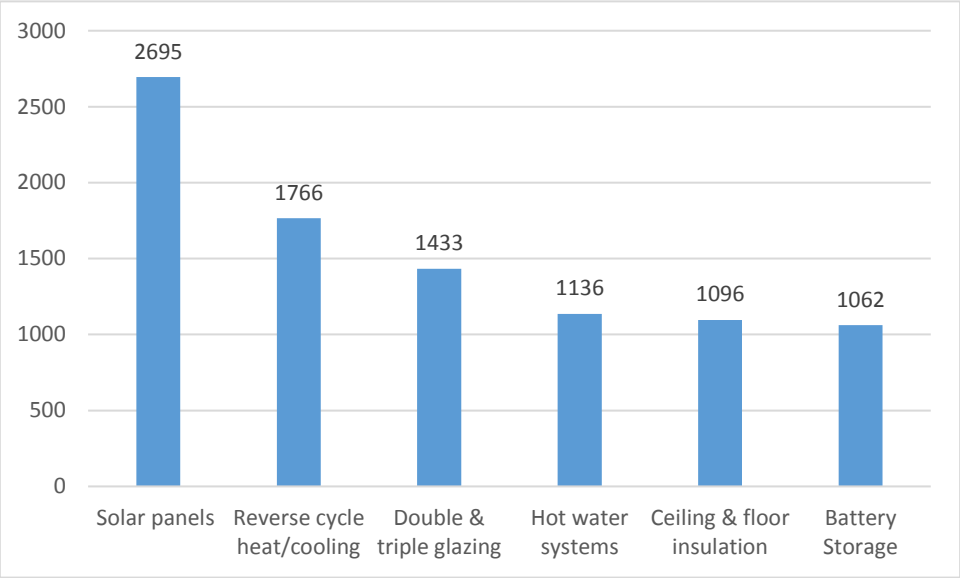


Figure 2: Most popular products requested through TEELS (as at 26/08/18)

A number of submissions by stakeholders, including TasNetworks, Aurora Energy and TREA raised the benefits of energy efficiency to households and programs such as TEELS. They also called for the continuation of TEELS. For example in Aurora Energy stated that:

"…investing in household energy efficiency is a more inclusive and impactful investment for Tasmanian customers, particularly those households where lack of energy affordability and/or poor household energy efficiency is already a significant issue…"

… Aurora Energy proposes the Government considers inclusive policy initiatives that practically benefit a broader base of Tasmanian customers, with a particular focus on low income or vulnerable customers. These

[8] The following products are available under the scheme: Heat pump (Reverse cycle air conditioner) - Min 2.5 Star Energy Rated; Solar panels; Solar power battery storage; Efficient wood heater; Hot water system - gas, air source heat pump or solar; Condensation control system; Ceiling and floor insulation; Double / triple glazing

Block out curtains, blinds and pelmets; Honeycomb blinds; Draught sealing and reglazing windows;

Fridge, freezer or washing machine - Min 3 Star Energy Rated; Lighting upgrades

initiatives could include continuing the TEELS program with Aurora Energy's support to deliver enduring improvements in Tasmanian household energy efficiency;"

UTAS in its submission recommended that

"…changes to FiT are not implemented alone, but are introduced as part of a more comprehensive policy package including "the provision of suitable capital support (zero- or low-interest loans), or schemes for up-front financing which recognises the inherent future value / revenue stream from solar generation."

TREA noted a continuation of the TEELS program would assist the take up of solar PV and energy efficiency measures.

Committee's response

Improvements in energy efficiency within the home is an effective way in which to reduce household electricity costs. The Committee supports schemes such as TEELS which provide a mechanism to enable consumers to improve energy efficiency and which can be directly relevant to supporting further installation of solar and battery technology in the State.

Are there opportunities to provide the benefits of solar more equitably across the community?

Discussion

A number of submissions highlight the need to ensure that the benefits of solar are more equitable across the community.

UTAS suggested that:

"Solar PV systems are, generally speaking, being taken up less by particularly low-income households, and are likely rarely, if at all, installed on rental properties or strata-title/body-corporate run properties. A large fraction of the population is thus virtually locked out, in absence of other appropriate support mechanisms, from enjoying the benefits of residential solar PV."

In its submission Aurora Energy provided details on the demographic profile of solar customers which suggests that a typical Tasmanian solar customer is a middle income homeowner, aged 55 or above. It also stated that the ability to benefit from rooftop solar generation is inequitable across the Tasmanian community

TasCOSS raised concerns that without policy certainty there is the potential for a two tiered energy system that favours those who can access and afford solar over those who cannot. They also raise the issue that access to electricity is a basic human right for all Tasmanians:

"As an essential service, electricity needs to be available to all who need it, at a price they can afford, in an environment where their rights are respected and protected. When low income and disadvantaged Tasmanians cannot afford the electricity they need, they will go without essentials like heating, cooking, cleaning and lights."

TREA's submission supported making the benefits of solar PV better available to tenants, pensioners and low income households.

Another submission made by the ATA suggested:

"Government-backed programs to facilitate access to low-interest finance for low-income owner-occupiers, and to encourage landlords to install solar PV on rental properties, would help ensure that vulnerable Tasmanians don't get left behind in the renewable energy revolution."

In its submission Aurora Energy raised the No Interest Loan Scheme (NILS) Energy Saver Loan and Subsidy program as example of ways to support low income households. Aurora Energy partnered with the Energy Saver Loan and Subsidy program in 2015-16 to provide a funding round to subsidise 50 to 60 per cent toward the cost to purchase new energy efficient appliances up to the value of $3 000. Subsequent funding rounds have seen a total of $1.64 million provided to NILS since November 2015, which has assisted over 1 000 customers in purchasing energy efficient appliances. It is important to note that while solar hot water systems are eligible for funding under the NILS program, solar PV and battery storage systems are not.

Demand for the NILS is extremely high with the most recent round of funding fully subscribed in three weeks.

Other submissions also cited the NILS program as means to improve energy efficiency for lower income households. For example TREA suggested that:

"The state government should support low income customers to be able to invest … in energy efficiency through increased funding for the NILS scheme."

Committee's response

The Committee notes the need to support those in lower income brackets to gain access to solar and that consideration should be given to address the equity of access to solar within the community.

Modelling Results

Expert modelling advice was sought in order to assist the Committee, and the Treasurer and Minister for Energy, to better understand the likely impact on customer bills from the adoption of various policy options.

Frontier Economics (Frontier) was selected to provide the advice. Frontier has recently undertaken similar tasks for a number of other jurisdictions.

Frontier were tasked with:

- estimating energy consumption patterns for various Tasmanian customer profiles
- estimating solar generation patterns for various Tasmanian customer profiles
- modelling the likely bill impact of various scenarios based on the above estimates.

In order to undertake the task, Frontier obtained customer consumption profile data from TasNetworks based on trials that are underway and localised solar generation data from publicly available sources. Frontier was able to feed this data into a proprietary software model - SWITCH - which optimised outcomes for customers under various scenarios and modelled the expected outcome on customer bills.

Key Findings

The Transitional FiT rate will no longer be available from 31 December 2018. Therefore these customers may be looking for ways to maximise consumption of their solar output and/or looking for ways to reduce energy consumption.

The sorts of choices that will be available to these consumers include changing to a consumption ToU tariff (which was not available under the Transitional FiT model), potentially upgrading existing smaller solar systems to larger capacity systems to maximise output and/or adding battery storage to an existing system.

Frontier has modelled the expected impact on electricity bills for various customer profiles against various combinations of actions that could be taken.

Some of the key findings include:

Batteries and Tariffs

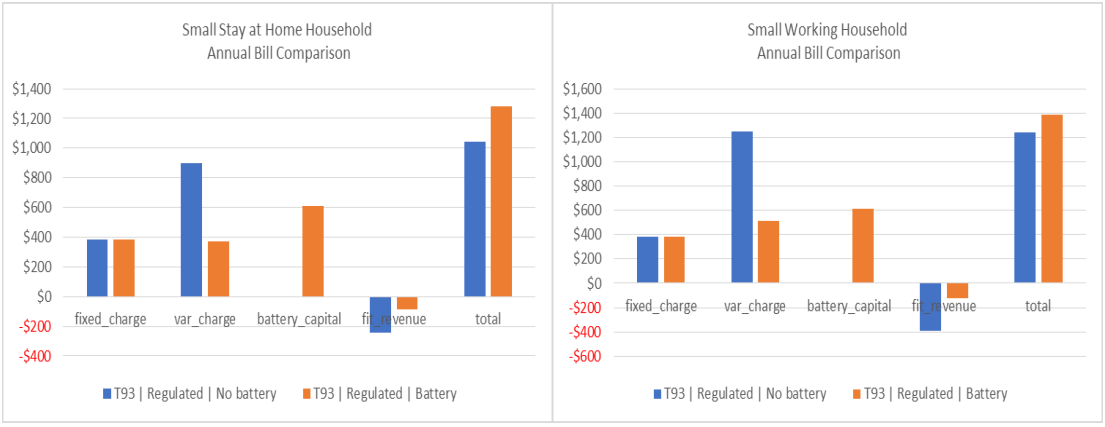
- Solar users view payback periods differently. It is considered that a 6 year payback may be a trigger point for some customers to make an investment but taking a 10 year view aligns with battery system warranty periods. Modelling was conducted for both.
- The capital cost of a solar battery remains substantial with a total installed cost of $10 000+ in most circumstances despite prices falling in recent years.

- Because of the high capital cost, no customer and system combination that includes a solar battery can be demonstrated to be financially viable over a 6 or 10 year period without a Government subsidy on the cost of the battery.

- A subsidy of 50 per cent of the capital cost of the battery up to a maximum of $5 000 was then modelled to lessen the initial outlay required by customers.

- After the repayment of capital is factored in, it is still difficult for solar batteries to demonstrate financial viability over a 10 year pay-back period for most customer profiles, even with a substantial subsidy.

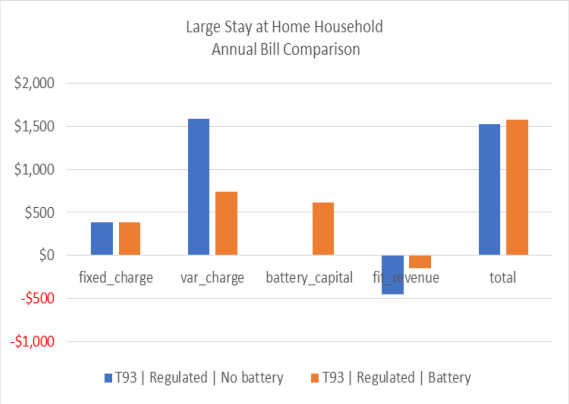
- A comparison of the bill outcome for a representative *Small Stay at Home Household* compared to a *Small Working Household*, on a with and without a subsidised solar battery basis, both on tariff 93 (Time of Use), is shown below:

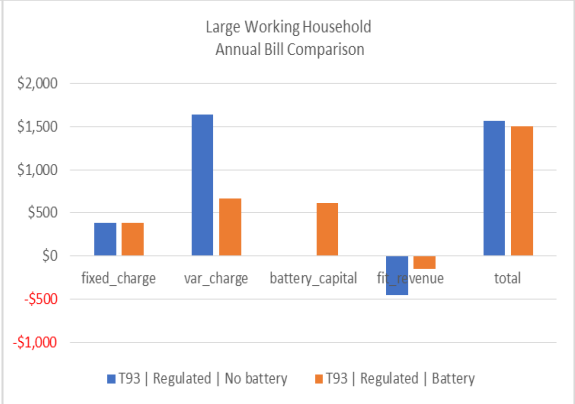


- As the chart shows, both small customers have a significantly lower annual variable charge for electricity (saving between approx. $500 and $700 per year) once a battery is added. However, when the repayment of the (subsidised) battery is taken into account, as well as the loss of export FiT income, the overall annual bill is higher once a battery is added. Essentially this demonstrates that even with a generous subsidy, the capital cost of the battery spread over 10 years is still more than the savings it generates in lower variable charges throughout the year for these customers.

- However, some larger users may be able to generate a positive financial return over that period of time depending on their specific circumstances.

- A comparison of a representative *Large Stay at Home Household* compared to a *Large Working Household* is shown below:





- The savings on variable charges are even more pronounced than in the small households example, with a reduction of between approx. $850 and $1 000 per year. Once the capital cost of the battery and the loss of export income is taken into account, the Stay at Home Household is still marginally worse off on an annual bill comparison, while the Working Household is marginally better off reflecting the different usage patterns of these customers.

- In order to test what level of subsidy would be required for the cost of a battery system to be able to be repaid within a six year period, Frontier tested a much higher subsidy - 65 per cent of system costs or up to $7 500. Even under this scenario, only some, generally higher usage, customers would be better off over that period.

- Essentially what this indicates is that even when a very generous scheme is contemplated, customers are generally not financially better off over a reasonable investment period.

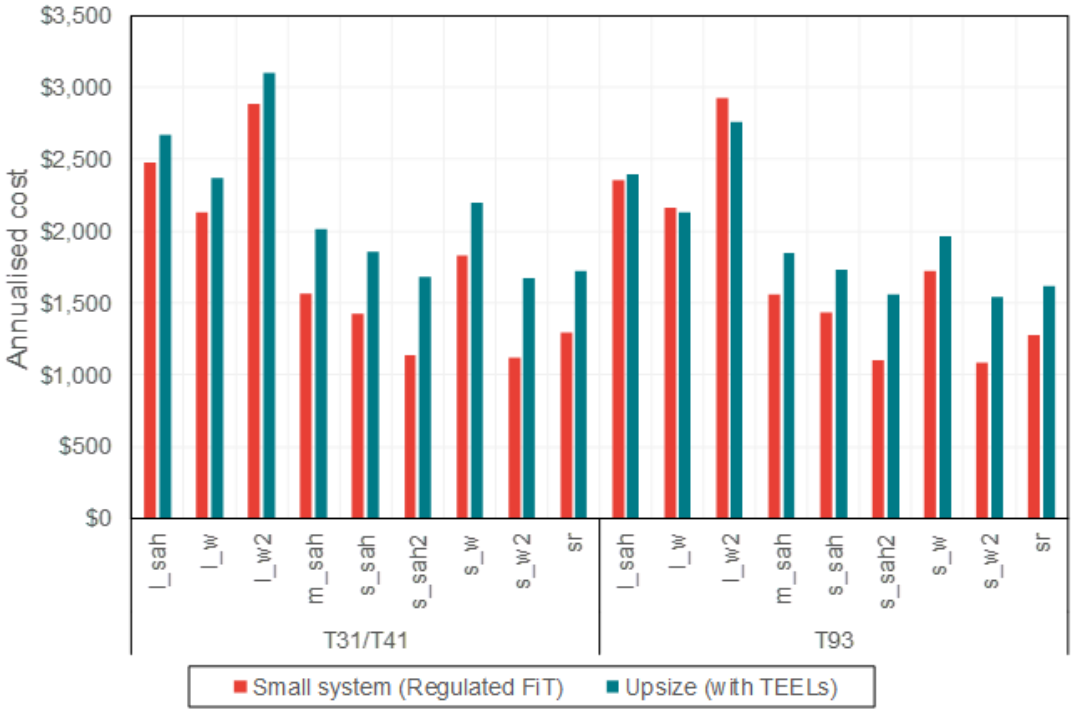
- Anecdotally, the Committee understands that this is a similar finding to that identified in other States, however in Tasmania it is more pronounced as the solar resource is more limited and because peak seasonal and daily demand and peak seasonal and daily solar output are not correlated, limiting the benefits that can be achieved from adding a battery.

Upsizing from a small system

- Some early adopters of solar may have installed a small system that is not the most efficient system for their needs and have not upgraded in order to maintain access to the Transitional FiT Rate (upgrading a system would mean a customer reverts to the Regulated FiT Rate). With the Transitional FiT ceasing, these customers may now consider upgrading.

- Frontier's modelling considered a scenario where these customers consider upgrading to a system more suitable to their needs (from a 25 per cent of consumption system to an 80 per cent of consumption system) and add a battery under a 50 per cent subsidy scheme with the capital cost of the total upgrade funded through a 3 year interest free TEELS loan.

- The chart below compares bill outcomes for a customer staying with their existing small system (red bars) compared to someone upgrading and adding a battery (blue bars) and models outcomes from both a T31/41 and a T93 perspective:



- The results demonstrate that larger users are likely to be indifferent or slightly better off in respect to their electricity bill outcomes over 10 years when on T93, whereas smaller users are likely to be worse off (i.e. the upgrade will not pay its way within a 10 year window compared to doing nothing). All users were worse off on T31/41.

Summary

- The economic case for installing solar batteries is weaker in Tasmania than in other States.

- On a purely financial basis, the modelling demonstrates that there is little justification for most customers to purchase a battery in order to seek improved bill outcomes over a 10 year period, even when a substantial subsidy is provided.

- Despite this, some customers will still be interested in installing a solar battery as a way to maximise self-consumption of solar energy and a certain level of subsidy would assist these people to make that choice.

- In addition, battery prices are expected to continue to fall, making the financial case likely to be more attractive over time.

Summary of findings

Based on the information available, the Committee has reached the following conclusions:

1. Under the COAG agreement, FiT customers were to receive a 'fair and reasonable' value for their exported electricity. In addition, it was generally accepted that the five year grandfathering period would provide sufficient compensation to those that had installed solar prior to the closing of the Transitional FiT.

   Therefore the Committee concludes that there is no justification to continue the Transitional FiT rate.

2. Generating electricity from solar for direct use reduces the cost of electricity to the consumer by offsetting the full retail cost had the electricity been sourced from the network. This provides the maximum benefit to the consumer and ensures that other users do not subsidise their use.

   Therefore the Committee notes that the primary customer benefit from solar is offsetting own use, not reselling to the grid.

3. It is generally acknowledged that improving energy efficiency will provide financial savings through reducing energy bills. There are a range of simple low cost alternatives which will reduce energy consumption. The adoption of these, including being mindful of and reducing unnecessary use can offer more cost effective benefits than investments in solar PV/battery storage.

   Therefore the Committee concludes that improvements in energy efficiency within the home is a more cost effective way to reduce household electricity costs.

4. It is acknowledged that the simultaneous export and import of electricity in dual metered premises is a disadvantage to solar customers. A number of customers can only offset the usage against a single tariff either T31 or T41.

   Therefore the Committee concludes that to improve customer benefits from solar, household metering arrangements that allow customers to offset all of their usage with the output from solar PV are desirable.

5. The five year grandfathering period for those on the Transitional FiT is enshrined in legislation and was publically announced.

   Therefore the Committee notes that those that installed systems following the announcement of the closure of the Transitional FiT and prior to the closing of the scheme, should have been aware that they would only receive five years of this rate.

6. The retail cost of electricity is comprised of a number of components, not just the cost of generation. The relevance of all these costs need to be considered in determining a suitable feed-in tariff. This had not been appropriately taken into account in a number of submissions.

Therefore the Committee notes that there appears to be a high degree of misunderstanding in the community about how retail tariffs are set and the costs of grid supply to the premises.

7. Data shows that the abolition of the Transitional FiT for new customers has not reduced the uptake of solar and the industry continues to perform without any additional assistance.

Therefore the Committee notes that the number of solar installations is continuing to grow even with the fair and reasonable tariff.

8. Given advances in technology and the increased take-up of solar and batteries both nationally and internationally, the financial attractiveness of installing solar is continuing to increase.

Therefore the Committee notes that the cost of solar installations and battery installations are continuing to fall.

9. It is acknowledged that the cost of installing solar may be prohibitive for those most in need in the community, noting that the majority of solar users are middle income home owners.

Therefore the Committee concludes that there is a need for an incentive to enable those in the community that are most disadvantaged to reduce their electricity costs through energy efficiency initiatives such as solar.

10. ToU FiTs are relatively new in mainland jurisdictions and have not been adequately considered in the Tasmanian context. They may offer benefits to solar users but this has yet to be confirmed.

Therefore the Committee notes that a move to introduce ToU export tariffs may be desirable, but should be the subject of an investigation by the Tasmanian Economic Regulator to determine its suitability and appropriateness in the Tasmanian context.

11. Solar generation provides less than 1 per cent of total generation in the State. In addition, the Government has a target to be 100 per cent self-sufficient in renewable energy generation by 2022. Additional windfarms are being developed and new energy security measures have been put in place in accordance with the Tasmanian Energy Security Taskforce recommendations. Therefore, the State does not have an energy security issue for the foreseeable future.

Therefore the Committee concludes that solar provides little benefit to the State's energy security.

12. Peak solar generation does not occur at the time of the Tasmanian system peak so solar offers little benefit in reducing the need for network augmentation to meet maximum demand. The Committee notes that there may be some isolated distribution network benefits from increased solar penetration but also notes that over-voltage issues may occur in certain situations when solar generation in an area is high.

Therefore the Committee concludes that there are only marginal benefits to increased solar on network operations and in some cases may result in additional costs.

In order for a customer to maximise the benefits of solar and to reduce their household electricity costs, it would appear to be beneficial:

- For some customers (depending on their usage pattern) to move from Tariff 31/41 to Tariff 93 (Time of Use) to enable all electricity consumption to be offset by solar prior to exporting surplus to the network.
- Consider options to improve energy efficiency around the home.
- For those with small solar installations, consider upgrading to higher capacity.
- For those with large solar installations, consider adding battery storage.

It should be noted that individual circumstances will differ across households and therefore consumers will need to weigh up the costs and benefits for their specific circumstances.

Potential actions for consideration by Government

To ensure that those that have installed solar are suitably rewarded and to incentivise further installation of solar in Tasmania, the Committee presents the following potential actions that could be undertaken for consideration by Government. It should be noted that each action will require funding to implement and it is noted that no Budget funding is currently provided. While the cost of the existing Transitional rate is met by Tasmanian Networks, the 2018-19 Budget was prepared on the basis that this funding ceases from 1 January 2019.

The actions are not mutually exclusive and are aimed at addressing specific issues and could be adopted as a package.

Action 1:

Incentivising the uptake of Solar - Solar Home Battery Scheme (time constrained)

A grant to assist solar users to install batteries. This could be capped at either:

- $6 000 or 50 per cent of the purchase price of a solar storage battery system, or
- the subsidy is scaled in line with the size of the battery system ($500 per kWh of battery storage capacity) being installed and capped at a maximum of $6 000 per battery installed.

The balance of the purchase price of the battery system could be funded by an interest free loan from TEELS, which could be extended by two years until April 2021 with the size of the loan available increased from $10 000 to $15 000.

Indicative Cost: Should the grant scheme receive 1 000 applicants the approximate cost would be around $6 million.

Implementation: The Department of State Growth will be responsible for administering and developing the Grant Scheme. The Scheme would operate for a maximum of two years.

The Grant would only be available for 'smart' solar inverters and smart batteries as these technologies are communications capable and can offer potential benefits to the network with final specifications for eligible battery system to be developed.

To ensure equity, the scheme would be open to all solar users.

Action 1A:

Incentivising the Uptake of Solar - Solar Home Battery Scheme (unlimited)

A grant to assist solar users to install batteries. This could be capped at $1 000.

The balance of the purchase price of the battery system could be funded by an interest free loan from TEELS, which could be extended by two years until April 2021 with the size of the loan available increased from $10 000 to $15 000.

Indicative Cost: Should the grant scheme receive 5 000 applicants the approximate cost would be $5 million.

Implementation*:* The Department of State Growth will be responsible for administering and developing the Grant Scheme.

The Grant would only be available for 'smart' solar inverters and smart batteries as these technologies are communications capable and can offer potential benefits to the network with final specifications for eligible battery system to be developed.

To ensure equity, the scheme would be open to all solar users and would not be time constrained. By not time constraining the scheme, uptake is likely to be spread over a longer period than Action 1, thereby mitigating the risk of issues around the installation of meters.

Action 2:

2 Year Extension of the Tasmanian Energy Efficiency Loans Scheme (TEELS)

The scheme allows Tasmanian residents and small businesses the opportunity to apply for a loan with a zero per cent purchase interest for 36 months for eligible energy efficient products up to a value of $10 000.

Indicative Cost: Indicative costs provided by Westpac regarding the cost of running the scheme are $750 000 per annum.

Implementation*:* - State Growth is currently in discussions with Westpac in relation to extending the scheme by two years and increasing the size of the loan from $10 000 to $15 000. The current scheme expires in 31 April 2019. An extended TEELS would run to May 2021.

Action 3:

Equitable Access to Solar - Housing Tasmania Incentive

As those most in need of assistance in meeting the cost of electricity will be clients of Housing Tasmania, funding could be provided to Housing Tasmania to consult with community housing providers to develop a scheme to install solar PV systems on public and community housing. This will help ensure more equitable access to solar.

Indicative Cost: To be determined through consultation with Housing Tasmania.

Implementation*:* - Housing Tasmania to work with relevant stakeholders to develop a strategy for deployment of solar PV on public and community housing. Implementation period - 2019-2020.

Action 4:

Better Feed-in Tariffs - ToU Pricing

ToU Feed-in Tariffs have been introduced or are being considered by a number of jurisdictions. The effectiveness of ToU tariffs has not been determined in the Tasmanian context. Therefore, the Tasmanian Economic Regulator could conduct an investigation into the feasibility of introducing a ToU tariff regime for the export of solar electricity into the grid.

Cost: To be determined.

Implementation: The Tasmanian Economic Regulator could undertake an investigation in 2019 into a future ToU regime with full consultation with the State's Energy businesses and other key stakeholders to determine its feasibility and appropriateness of such a policy.

Action 5:

Minimising Electricity Costs - Energy Efficiency Audits

Circumstances for individual consumers will differ. Therefore it may not be obvious to the consumer the best way to minimise their electricity costs. Accordingly a free Energy Efficiency Audit program could be developed to provide advice to consumers on their best option to reduce costs which may be the installation of solar or may be improving the energy efficiency of the premises.

Cost: To be determined.

Implementation: The Department of State Growth in conjunction with Aurora Energy would establish a panel of suitably qualified companies to provide audits.

Appendix 1 – Solar Feed in Tariff Review Terms of Reference

Terms of Reference

A Committee comprising the Director of Energy Planning, and representatives from the Department of State Growth, and Department of Treasury and Finance has been tasked with reviewing the current arrangements for the Solar Feed-in Tariff (FiT) in Tasmania.

The Committee will undertake community consultation and review the:

- comparison of other jurisdictions' FITs
- trends in the costs of household solar installation
- cost of Aurora's sources of energy (Hydro Tasmania's energy price)
- stakeholder input and other data on the rate of FiT that would incentivise new residential and business solar installations and suitably reward those who have installed solar
- wider Government policy objectives in relation to reliability and affordability of electricity
- alternative incentives to support solar
- impact on the budget
- impact on system stability and any resulting costs.

Following community consultation, a report will be prepared for consideration by the Minister for Energy and the Treasurer that recommends options that will suitably reward those that have installed solar and incentivise further installation of solar in Tasmania.

Appendix 2 - FiT rates in Other Jurisdictions

	Regulated Solar FiT 2018-19 (c/kWh)	Benchmark rate 2018-19 (c/kWh)	Historical feed in tariffs (c/kWh)	Solar/Battery Incentive Programs
ACT	Not regulated		ACT Small-Scale Feed-in tariff 0–10 kW[9] – 50.05 0-30kW1 July 2010 – 13 July 2011 (approved)[10] – 45.7 Ends 20 years from connection	Next Generation Energy Storage began in April 2016 with $6.6 million of funding to date. Homes and businesses eligible for $825 per kWh of Sustained Peak Output installed for a battery system connected to a new or existing solar system. For the average household system, this equates to around $4000, however, this may vary significantly depending on the system installed. Over 800 battery storage systems installed to date.
NSW[11]	Not regulated	7.5 (single rate) 6.9-20.9 (time dependent rate)	NSW Solar Bonus Scheme 20[12]-60[13] Ended 31 Dec 2016	-
NT	25.67[14]		-	Smart Energy Grants provide up to $1 000, on a 50-50 co contribution basis, to help home owners of residential or investment properties undertake energy efficiency ,measures, including solar panels and solar battery storage. The program was announced in November 2017 with a total of $4.5 million in funding.
Qld[15]	9.369[16] (regional rate)		Queensland Solar Bonus Scheme 44[17] Ends 1 July 2028	As part of Affordable Energy Plan funding of $21 million over 3 years has been allocated to no interest loans for solar panels and battery storage. Program commenced in June 2018.
SA	Not regulated		Solar Feed in Scheme 16[18]-44[19] 16c ended in Sep 2016 and 44c ends in 2028	Home Battery Scheme launched in September 2018 to provide loans at competitive interest rates for battery storage devices. Loan amount linked to capacity of battery – $600 per kWh for concession and $500 per kWh up to a maximum of $6 000.
Tas	8.541			-
VIC[20]	9.9 ('single rate') 7.1 - 29 (time variable rate)		Premium Feed-In Tariff for Solar 60 Ends 2024 Transitional Feed-In Tariff for Solar (< 5 kW) 25 Ended 31 Dec 2016 Standard Feed-In Tariff (< 100 kW) 1-to-1	Rebates are available for systems installed form 19 August 2018 to 30 June 2019, eligible households will only have to pay 50 per cent of the cost of a solar panel system. The Package will provide a 50 per cent rebate on the cost of a solar PV system, up to a maximum rebate of $2,225. Not-for-profit community housing providers will also be eligible to apply for a rebate on behalf of their tenants.

			Ended 31 Dec 2016	$40 million program to assist 10,000 households to install battery storage, with loans of up to $4 838 (linked to battery size).
WA[21]	7.135 (Synergy) 7.14 - 51.41 (variable by		Western Australia Solar Feed in Tariff	-

9 Installed 1 March 2009 – 30 June 2010

10 1 July 2010 – 13 July 2011 (approved)

11 IPART (2018) Solar feed-in tariffs: The value of electricity from small-scale solar panels in 2018-19 – Draft report.

12 28 Oct 2010 – 28 April 2011

13 1 Jan 2010 – 27 Oct 2010

14 https://www.jacanaenergy.com.au/photovoltaic_pv_solar_systems/solar_buyback_rates

15 Queensland Competition Authority (2018) 2018-19 Solar feed-in tariff – Determination; Brisbane, Qld.

16 Queensland Government Gazette No. 22 Feed in tariff for exported photovoltaic (PV) electricity in regional Queensland May 2018

17 1 June 2008 – 9 July 2012

18 1 Oct 2011 – 30 Sep 2013

19 1 July 2008 – 30 Sep 2011

20 Essential Services Commission (2018) Minimum electricity feed-in tariffs to apply from 1 July 2018: Final Decision.

21 Department of Treasury Frequently Asked Questions: Solar panels and electricity prices

	location, Horizon)[22]		20[23]-40[24]	

22 Poruschia et al (2018) Revisiting feed-in tariffs in Australia: A review: Renewable and Sustainable Energy Reviews 82 (2018) 260–270

23 1 July 2011 – 31 July 2011

24 1 July 2010 – 1 July 2011

ANALYSIS ON FEED-IN TARIFF TRANSITION

frontier economics

Prepared for the Department of State Growth (Tasmania)

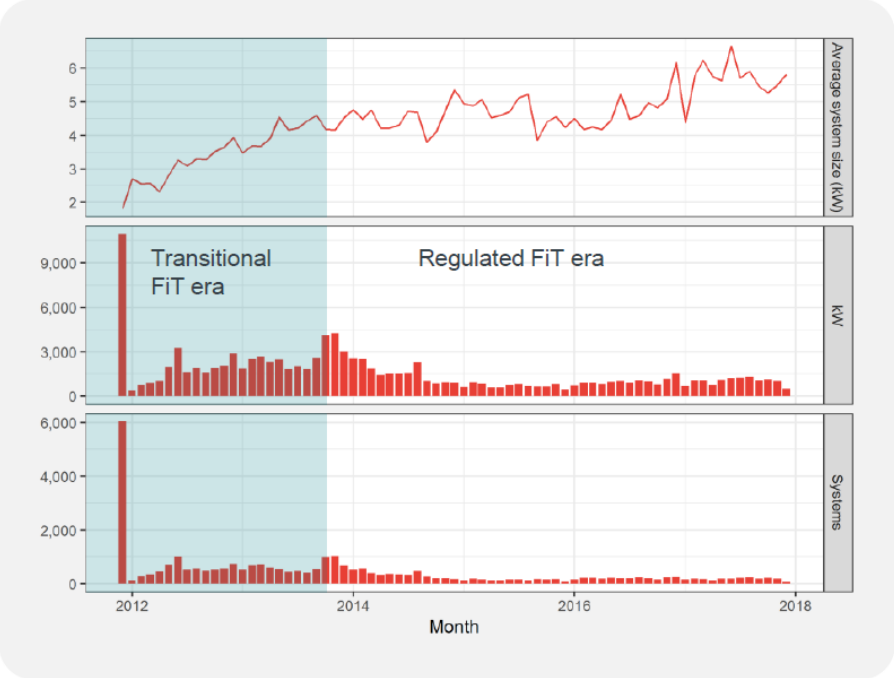
24th September 2018

CONTENTS

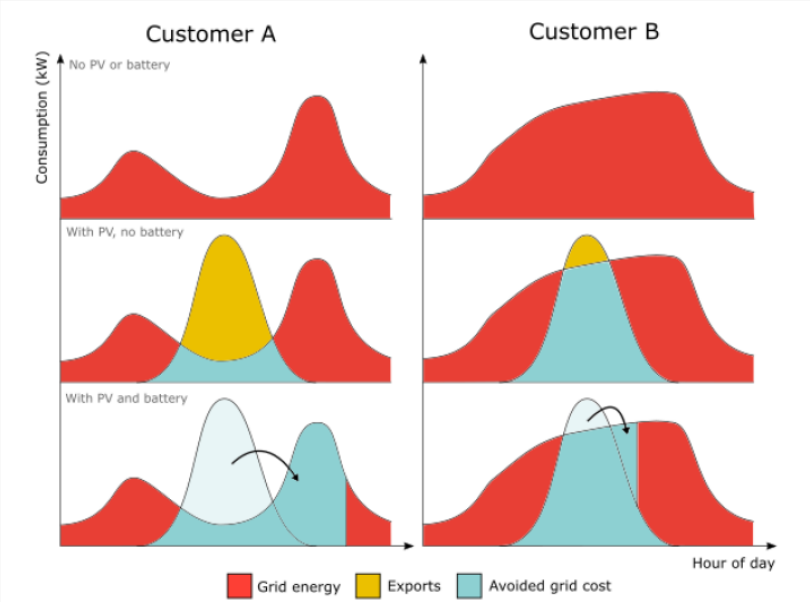
1. Background

HISTORICAL UPTAKE TRENDS IN TASMANIA

- Tasmania has relatively low solar PV penetration
  - Lower capacity factors
  - Smaller sunlight window
  - Smaller STC rebate than most other regions (due to above)
- However, Tasmania has higher than average system sizes – likely due to higher than average electricity consumption and lower capacity factors
- Transitional FiT (T-FiT) has had a big impact on the quantity (kW and systems) installed
- T-FiT systems are smaller than non T-FiT systems, on average



CONSUMPTION PATTERNS AND EMBEDDED GENERATION AND STORAGE ECONOMICS



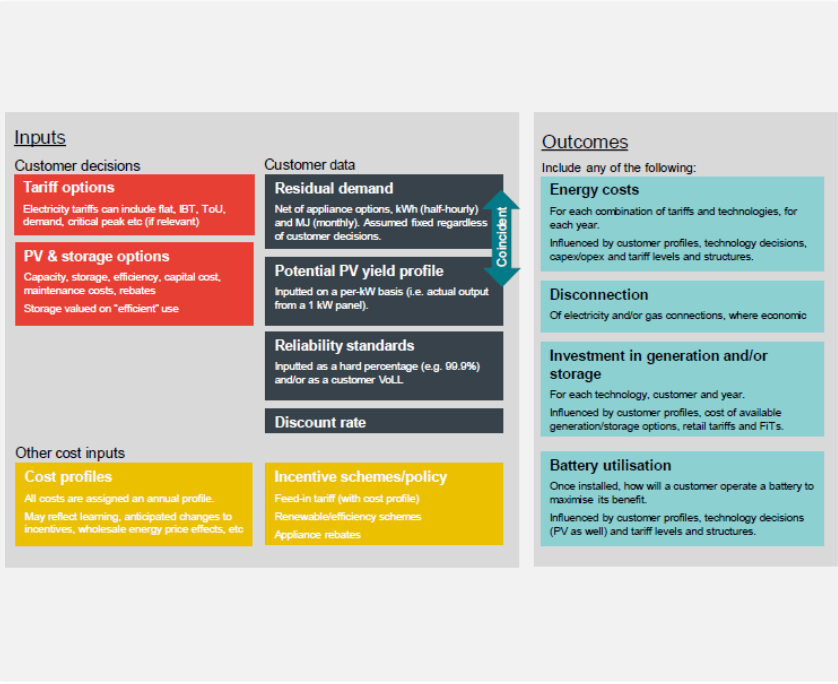
- Customer consumption patterns are a key driver of the economics of embedded generation and storage (EGS)
- Customers installing PV and/or storage may benefit from:
  - **Avoiding retail tariffs** by self-generating electricity with PV
  - **Receiving FiT revenue** from excess generation exported
  - **Arbitraging** or time-shifting consumption and/or generation from low price periods to high price periods
- Customer economics of adding storage to solar PV trades off export value against avoided grid costs:
  - If avoidable costs (i.e. retail tariffs) are high and FiTs are low, batteries are more attractive
  - If avoidable costs are low and FiTs are high, standalone PV is more attractive
- But this interacts with customer characteristics:
  - **Customer A** is a 'working household' archetype
  - **Customer B** is a 'stay at home' archetype

Customer A is much more likely to benefit from adding storage.

2. Methodology and input assumptions

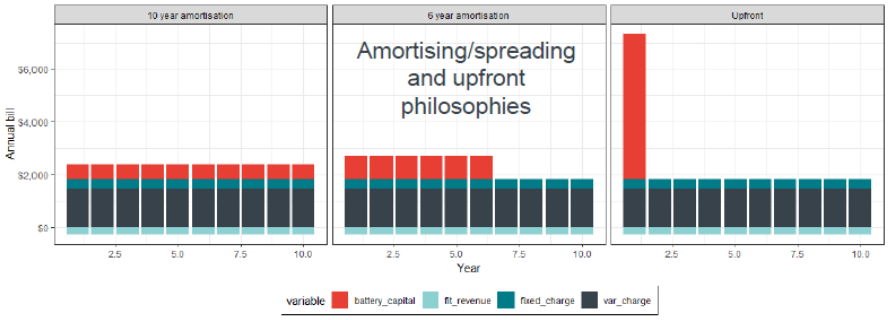
SWITCH CUSTOMER MODEL

- *SWITCH* was built to assess the economics of EGS for a given customer, assist forecasting EGS uptake, and investigate disconnection
- *SWITCH* is designed to assess economics under different tariffs, technology costs and technical parameters, demographic and economic assumptions - and handle large numbers of actual or representative customers with different load and generation profiles
- *SWITCH* has two key components:
  - An operating component to infer optimal battery utilisation, given import/export tariffs, load and generation profiles
  - A financial component to calculate present values of different technology mixes



ASSESSING CUSTOMER IMPACTS

- PV and storage systems are investments with upfront capital and install costs
- Customers may think about how they incur these upfront capital costs in different ways:
  - As a one-off up front payment
  - In relation to a 'payback' period – i.e. 'it pays itself off after *x* years relative to my existing arrangement' where *x* is the payback period
  - Amortised over the life of the asset (or over an acceptable/desired/enforced payback period)
- How customers think about these costs will affect what they consider their bill impacts to be
- In this analysis, we present bill impacts of storage capital costs as amortised over **6 years** (which seems to match customer behaviour) and **10 years** (which is the assumed life of a battery)
- We assume customers will assess bill impacts based on the continuation of today's tariffs (rather than based on a forecast of future tariff changes)



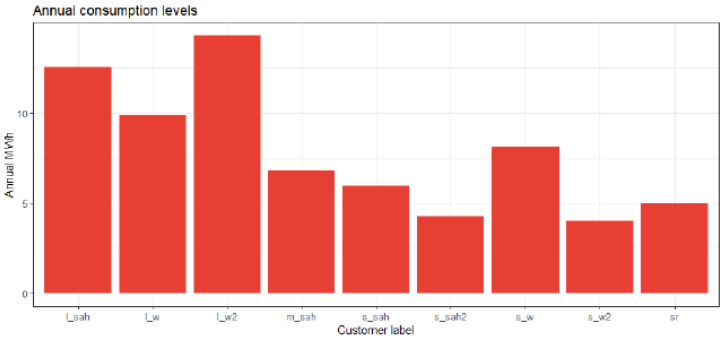
CUSTOMER TYPES PROVIDED BY TASNETWORKS

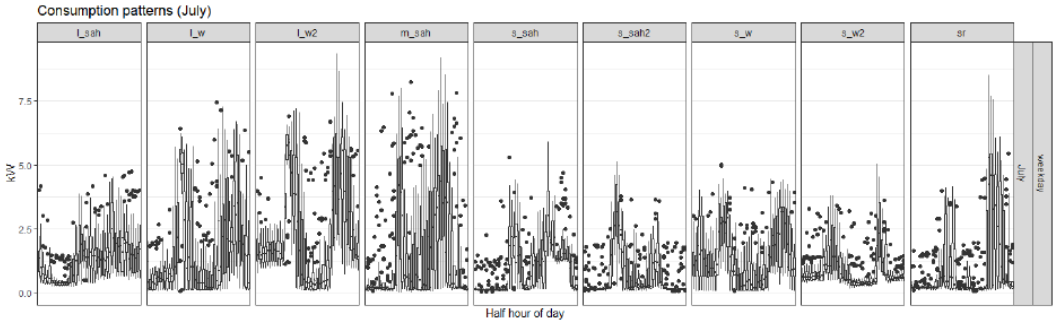
- TasNetworks provided five customers representative of customer archetypes, and six customers representative of consumption groups
- Two customers overlapped (representative of both archetype and consumption group), leading to 9 unique customers in sample:

Customer	Archetype	Consumption group	Archetype representative	Cons. group representative	Label used in the following analysis
1	Large Stay at Home Households	Stay at Home – Large	✓	✓	**l_sah**
2	Small Working Households	Working - Medium	✓	✓	**s_w**
3	Large Working Households		✓		**l_w**
4	Small Stay at Home Households		✓		**s_sah**
5	Singles / Retirees		✓		**sr**
6	Singles / Retirees	Stay at Home – Small		✓	**s_sah2**
7	Singles / Retirees	Stay at Home – Medium		✓	**m_sah**
8	Small Working Households	Working – Small		✓	**s_w2**
9	Large Working Households	Working – Large		✓	**l_w2**

CUSTOMER TYPES PROVIDED BY TASNETWORKS

- TasNetworks customers' span both usage patterns (archetypes) and consumption sizes
- We requested non-solar customers from TasNetworks, as the solar samples they had were net metered rather than gross metered
  - To perform battery consumption modelling, we require underlying consumption and generation profiles, rather than the net of the two
- To infer solar PV generation patterns, we have used APVI data over the same period, which is originally derived from local rooftop PV readings sent to the website pvoutput.org
- Our view is that the combination of these data sets provides a robust set of realistic consumption and generation patterns, for a mix of representative customers, against which to assess tariffs, costs and policy options





Full booklet of customer consumption data provided as separate PDF

BATTERY COST ASSUMPTIONS

- Battery quotes vary in practice – we have used public information from SolarQuotes
- Retrofitting batteries on existing systems will likely require the addition of a 'hybrid inverter', which can increase costs (the exception is where customers pre-empt battery installation and buy a more expensive battery-compatible inverter at PV install, which has only been available recently)
- In the following analysis, we have applied a 50/65% subsidy to **battery and inverter components** only, except where specified
  - With a % subsidy scheme of this kind, installers may cross-subsidise PV system/inverter/install costs to extract more from subsidy
- The batteries that we have chosen for comparison are commonly advertised in Australia and we believe would be suitable for use in Tasmania (although some battery models – particularly the Powerwall 2 – have reportedly long wait times for delivery)

Battery	Price	Inverter price (retrofit)	Install cost	Specs	Total cost
LG Chem RESU 6.5	$5,807	$3,000	$1,000	4.2kW, 5.9kWh, 95% efficient	$9,807
LG Chem RESU 10	$7,655	$3,000	$1,000	5kW, 8.8kWh, 95% efficient	$11,655
Tesla Powerwall 2	$9,600	- (AC coupled)	$1,000	5kW, 13.5kWh, 90% efficient	$10,600

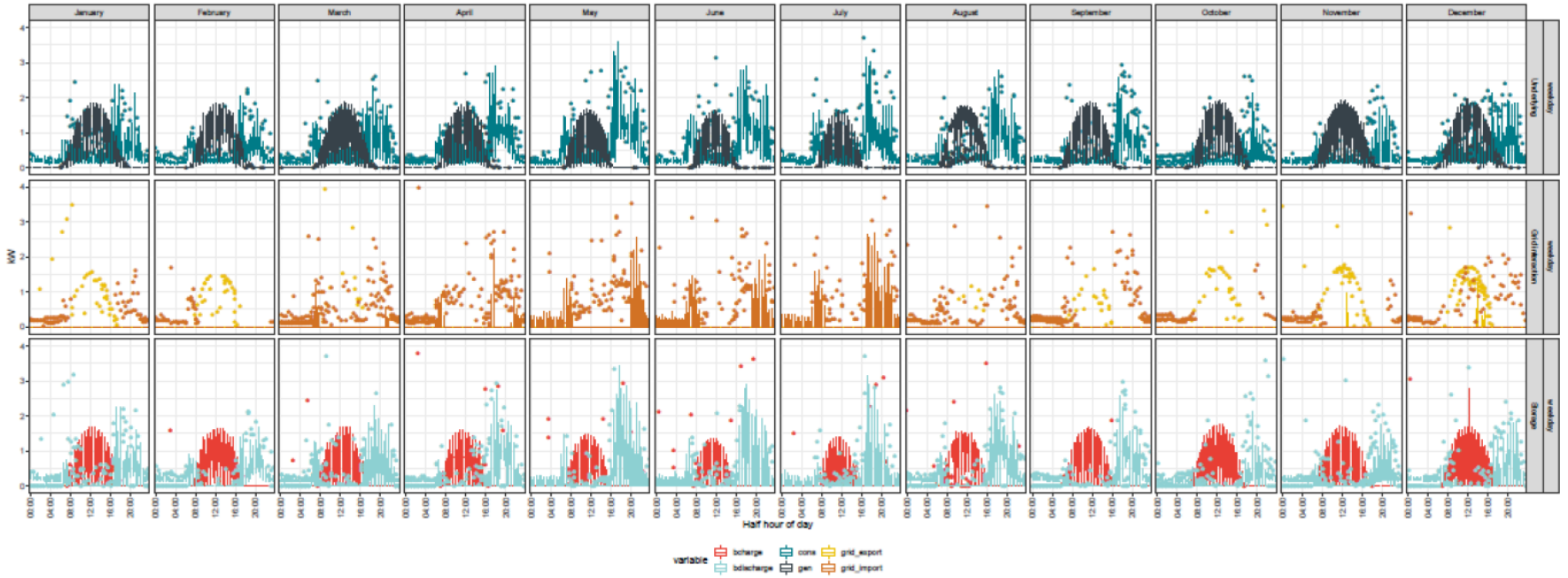
OUR MODELLING – SCENARIOS AND SENSITIVITIES

Scenario/Sensitivity	Values taken	Description
Customer archetype/consumption group	TasNetworks' customer profiles	Consumption profiles. Affects benefits from feed-in tariff/addition of storage
Import tariff	T31/T41, T93 Customers on T31/T41 assumed to have a 45%/55% blend of consumption respectively	T31 = flat tariff T41 = heating/hot water T93 = ToU tariff
Export tariff	Transitional FiT, Regulated FiT	Transitional FiT = 28 c/kWh Regulated FiT = 8.5 c/kWh
PV size	Sized to generate 0%, 25%, 50%, 80%, 100%, 125%, 150% of consumption	Different PV sizes to test effects of different subsidies
Storage	6.5kWh or 10kWh LG Chem Resu, Tesla Powerwall 2	Three different battery sizes modelled per customer, best picked for results
Storage subsidy	0%, 50% (to $5k), back-calculated	Different levels of subsidy (or none at all) being examined

3. Results

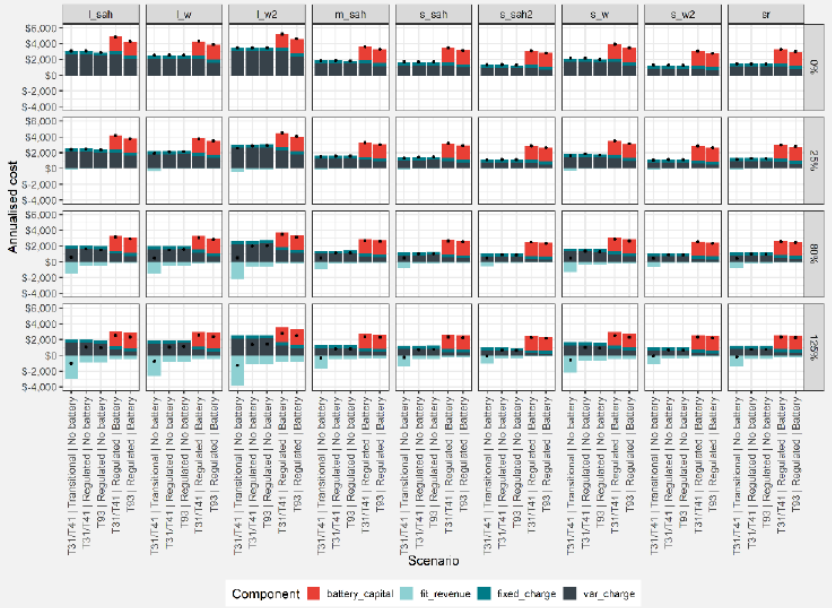
OPTIMAL BATTERY OPERATION

SWITCH calculates optimal battery operation profiles for actual customer profiles under different generation size, tariff and battery scenarios. A full booklet of detailed summaries is included as a PDF.



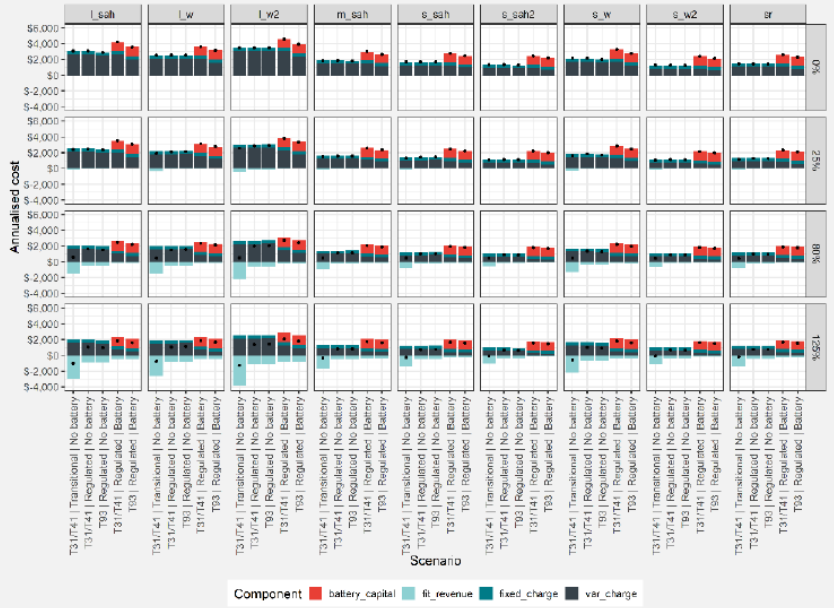
BILL IMPACTS – NO BATTERY SUBSIDY, 6 YEAR

- Guide for *x-axis*: **Tariff | FiT | Battery (Y or N)**
- *Y-axis* is the annualised cost – dots are net annualised cost after accounting for FiT
- The *horizontal* facets show each TasNetwork customer type
- The *vertical* facets show different sized PV systems (where the % number corresponds to % of annual consumption generated)
- The results with no battery subsidy and a 6 year payoff show:
  - For all customers, shifting to T93 reduces electricity bills (although for customers with larger PV systems this will not outweigh the effect of moving from the Transitional FiT to the Regulated FiT)
  - For all customers, installing a battery increases the annualised cost – this is because of the high capital cost of batteries
- For example, for customer l_sah, with solar PV generating 80% of annual consumption:
  - On the regulated FiT with no battery, shifting from T31/T41 to T93 reduces annualised cost from $1,619 to $1,521
  - On T31/T41 and the regulated FiT, installing a battery increases annualised cost from $1,619 to $3,167
  - On T93 and the regulated FiT, installing a battery increases annualised cost from $1,521 to $2,890



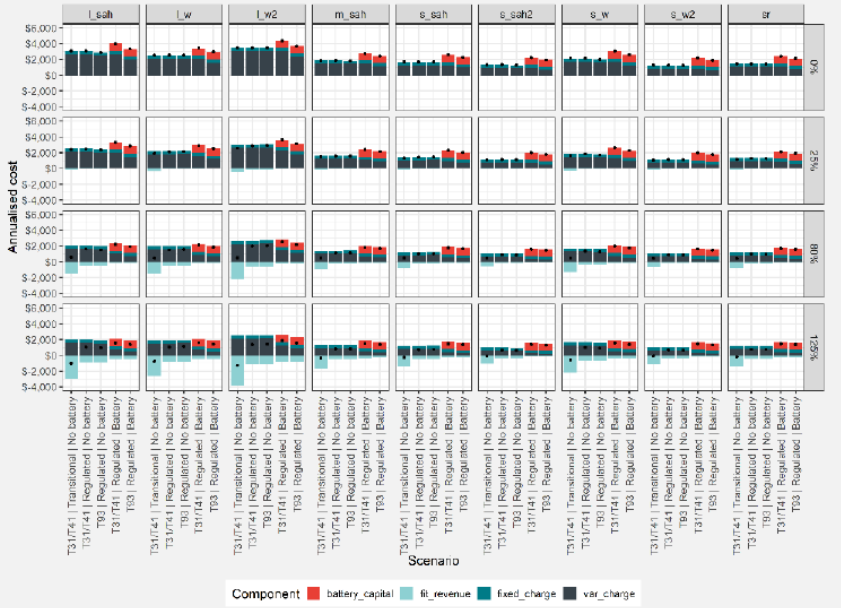
BILL IMPACTS – NO BATTERY SUBSIDY, 10 YEAR

- Guide for *x-axis*: **Tariff | FiT | Battery (Y or N)**
- *Y-axis* is the annualised cost – dots are net annualised cost after accounting for FiT
- The *horizontal* facets show each TasNetwork customer type
- The *vertical* facets show different sized PV systems (where the % number corresponds to % of annual consumption generated)
- The results with no battery subsidy and a 10 year payoff show similar outcomes as for no battery and a 6 year payoff:
  - For all customers, shifting to T93 reduces electricity bills (although for customers with larger PV systems this will not outweigh the effect of moving from the Transitional FiT to the Regulated FiT)
  - For all customers, installing a battery increases the annualised cost – although the difference is smaller with a 10 year payoff
- For example, for customer l_sah, with solar PV generating 80% of annual consumption:
  - On the regulated FiT with no battery, shifting from T31/T41 to T93 reduces annualised cost from $1,619 to $1,521
  - On T31/T41 and the regulated FiT, installing a battery increases annualised cost from $1,619 to $2,454
  - On T93 and the regulated FiT, installing a battery increases annualised cost from $1,521 to $2,176



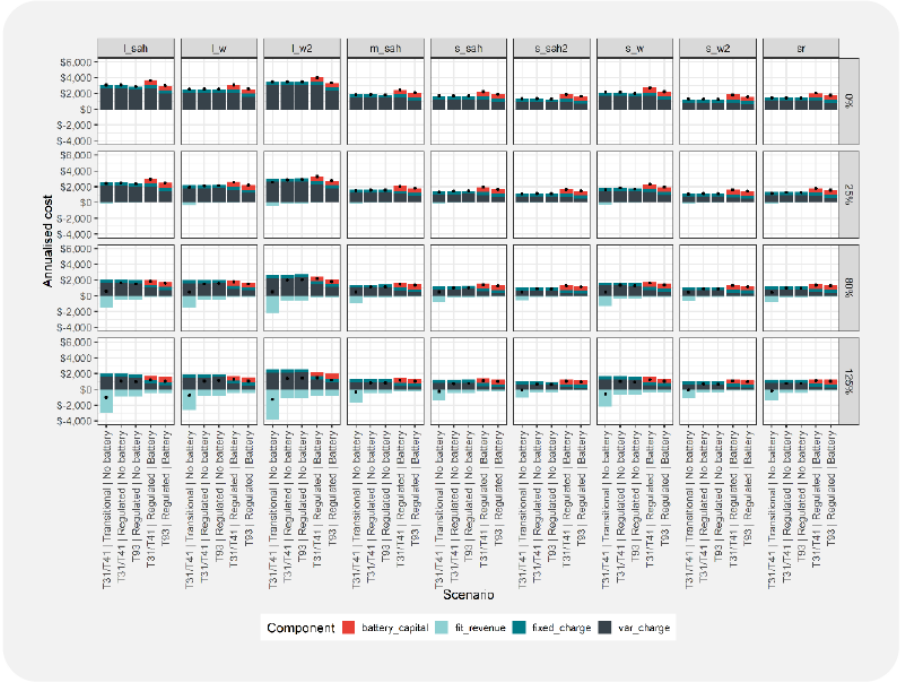
BILL IMPACTS – WITH 50% BATTERY SUBSIDY, 6 YEAR

- Guide for *x-axis*: **Tariff | FiT | Battery (Y or N)**
- *Y-axis* is the annualised cost – dots are net annualised cost after accounting for FiT
- The *horizontal* facets show each TasNetwork customer type
- The *vertical* facets show different sized PV systems (where the % number corresponds to % of annual consumption generated)
- Subsidy modelled includes 50% discount (up to $5k) on system and 3 years interest free loan under TEELS
- The results with a battery subsidy and a 6 year payoff show:
  - For all customers, shifting to T93 reduces electricity bills (although for customers with larger PV systems this will not outweigh the effect of moving from the Transitional FiT to the Regulated FiT)
  - For all customers, installing a battery increases the annualised cost – although the difference is smaller with a subsidy
- For example, for customer l_sah, with solar PV generating 80% of annual consumption:
  - On the regulated FiT with no battery, shifting from T31/T41 to T93 reduces annualised cost from $1,619 to $1,521
  - On T31/T41 and the regulated FiT, installing a battery increases annualised cost from $1,619 to $2,220
  - On T93 and the regulated FiT, installing a battery increases annualised cost from $1,521 to $1,942



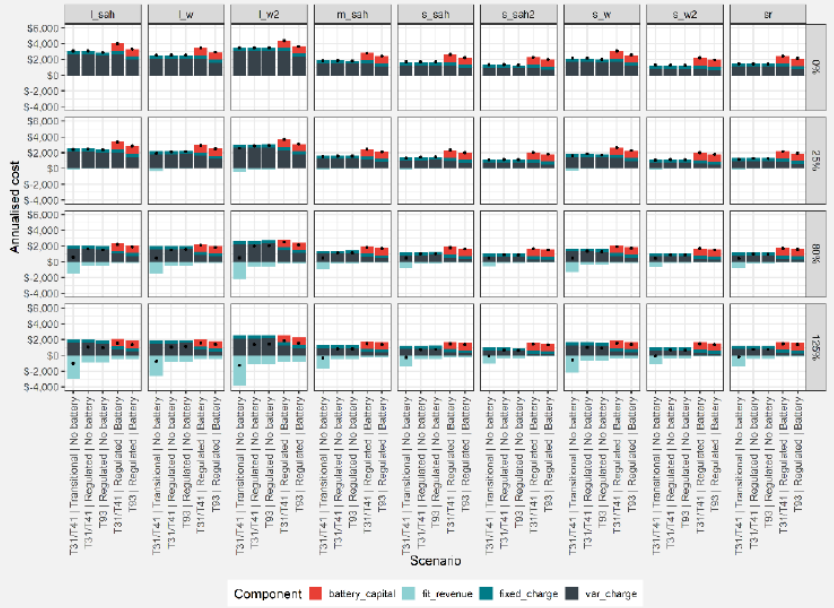
BILL IMPACTS – WITH 50% BATTERY SUBSIDY, 10 YEAR

- Guide for *x-axis*: **Tariff | FiT | Battery (Y or N)**
- *Y-axis* is the annualised cost – dots are net annualised cost after accounting for FiT
- The *horizontal* facets show each TasNetwork customer type
- The *vertical* facets show different sized PV systems (where the % number corresponds to % of annual consumption generated)
- Subsidy modelled includes 50% discount (up to $5k) on system and 3 years interest free loan under TEELS
- The results with a battery subsidy and a 10 year payoff show:
  - For all customers, shifting to T93 reduces electricity bills (although for customers with larger PV systems this will not outweigh the effect of moving from the Transitional FiT to the Regulated FiT)
  - For *most* customers, installing a battery increases the annualised cost; for large customers with large PV installing a battery can reduce the cost
- For example, for customer l_sah, with solar PV generating 80% of annual consumption:
  - On the regulated FiT with no battery, shifting from T31/T41 to T93 reduces annualised cost from $1,619 to $1,521
  - On T31/T41 and the regulated FiT, installing a battery increases annualised cost from $1,619 to $1,859
  - On T93 and the regulated FiT, installing a battery increases annualised cost from $1,521 to $1,581



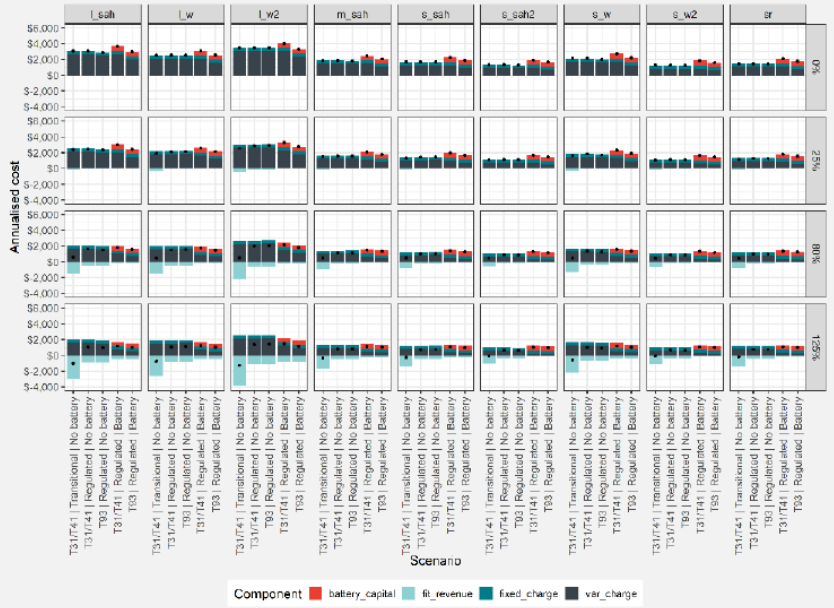
BILL IMPACTS – WITH $500/KWH BATTERY SUBSIDY, 6 YEAR

- Guide for *x-axis*: **Tariff | FiT | Battery (Y or N)**
- *Y-axis* is the annualised cost – dots are net annualised cost after accounting for FiT
- The *horizontal* facets show each TasNetwork customer type
- The *vertical* facets show different sized PV systems (where the % number corresponds to % of annual consumption generated)
- Subsidy modelled includes $500/kWh discount (up to $5k) on system and 3 years interest free loan under TEELS
- The results with a battery subsidy and a 6 year payoff show:
  - For all customers, shifting to T93 reduces electricity bills (although for customers with larger PV systems this will not outweigh the effect of moving from the Transitional FiT to the Regulated FiT)
  - For all customers, installing a battery increases the annualised cost – although the difference is smaller with a subsidy
- For example, for customer l_sah, with solar PV generating 80% of annual consumption:
  - On the regulated FiT with no battery, shifting from T31/T41 to T93 reduces annualised cost from $1,619 to $1,521
  - On T31/T41 and the regulated FiT, installing a battery increases annualised cost from $1,619 to $2,187
  - On T93 and the regulated FiT, installing a battery increases annualised cost from $1,521 to $1,910



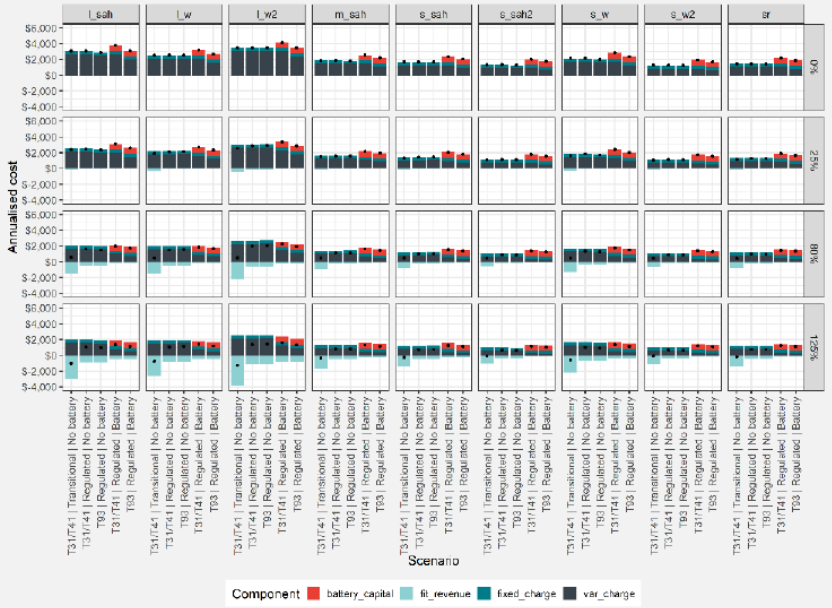
BILL IMPACTS – WITH $500/KWH BATTERY SUBSIDY, 10 YEAR

- Guide for *x-axis*: **Tariff | FiT | Battery (Y or N)**
- *Y-axis* is the annualised cost – dots are net annualised cost after accounting for FiT
- The *horizontal* facets show each TasNetwork customer type
- The *vertical* facets show different sized PV systems (where the % number corresponds to % of annual consumption generated)
- Subsidy modelled includes $500/kWh discount (up to $5k) on system and 3 years interest free loan under TEELS
- The results with a battery subsidy and a 10 year payoff show:
  - For all customers, shifting to T93 reduces electricity bills (although for customers with larger PV systems this will not outweigh the effect of moving from the Transitional FiT to the Regulated FiT)
  - For *most* customers, installing a battery increases the annualised cost; for large customers with large PV installing a battery can reduce the cost
- For example, for customer l_sah, with solar PV generating 80% of annual consumption:
  - On the regulated FiT with no battery, shifting from T31/T41 to T93 reduces annualised cost from $1,619 to $1,521
  - On T31/T41 and the regulated FiT, installing a battery increases annualised cost from $1,619 to $1,838
  - On T93 and the regulated FiT, installing a battery increases annualised cost from $1,521 to $1,561



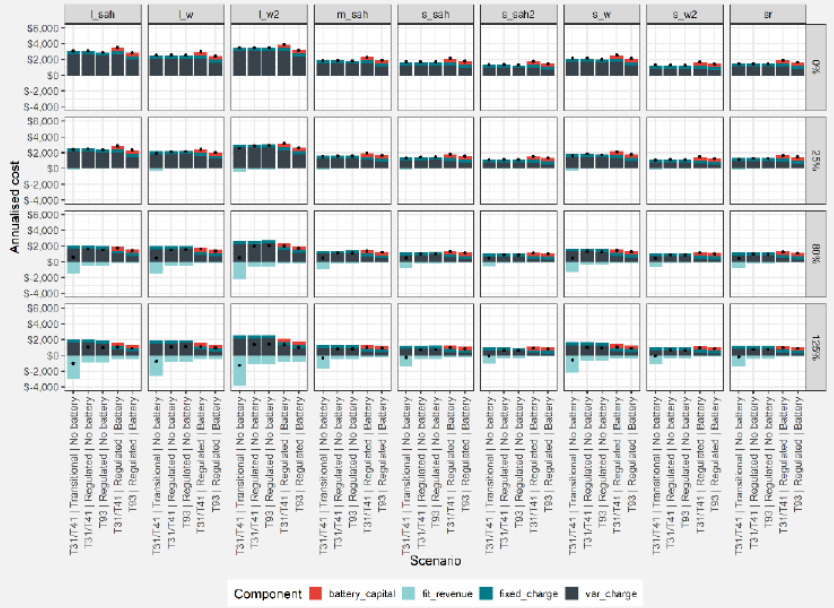
BILL IMPACTS – WITH 65% BATTERY SUBSIDY, 6 YEAR

- Guide for *x-axis*: **Tariff | FiT | Battery (Y or N)**
- *Y-axis* is the annualised cost – dots are net annualised cost after accounting for FiT
- The *horizontal* facets show each TasNetwork customer type
- The *vertical* facets show different sized PV systems (where the % number corresponds to % of annual consumption generated)
- Subsidy modelled includes 65% discount (up to $7.5k) on system and 3 years interest free loan under TEELS
- The results with a battery subsidy and a 6 year payoff show:
  - For all customers, shifting to T93 reduces electricity bills (although for customers with larger PV systems this will not outweigh the effect of moving from the Transitional FiT to the Regulated FiT)
  - For all customers, installing a battery increases the annualised cost – although the difference is smaller with a subsidy
- For example, for customer l_sah, with solar PV generating 80% of annual consumption:
  - On the regulated FiT with no battery, shifting from T31/T41 to T93 reduces annualised cost from $1,619 to $1,521
  - On T31/T41 and the regulated FiT, installing a battery increases annualised cost from $1,619 to $1,983
  - On T93 and the regulated FiT, installing a battery increases annualised cost from $1,521 to $1,705

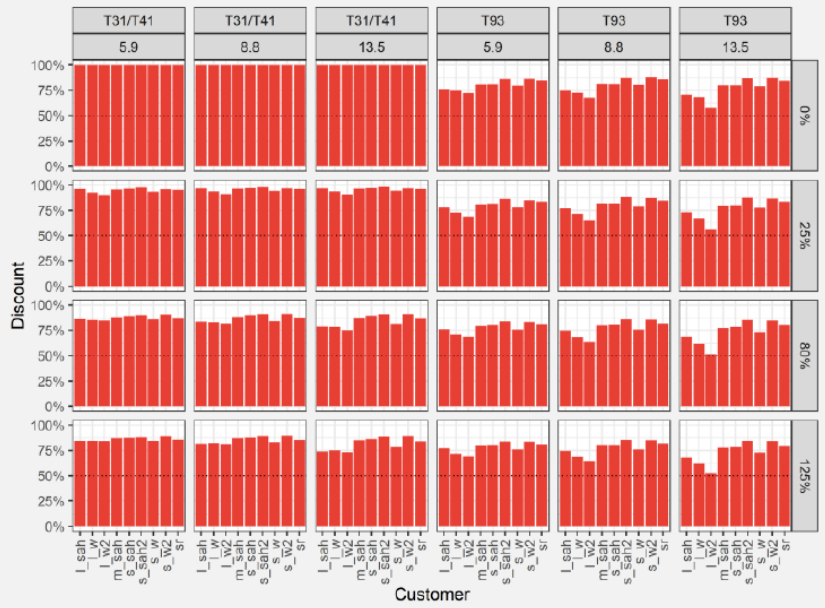


BILL IMPACTS – WITH 65% BATTERY SUBSIDY, 10 YEAR

- Guide for *x-axis*: **Tariff | FiT | Battery (Y or N)**
- *Y-axis* is the annualised cost – dots are net annualised cost after accounting for FiT
- The *horizontal* facets show each TasNetwork customer type
- The *vertical* facets show different sized PV systems (where the % number corresponds to % of annual consumption generated)
- Subsidy modelled includes 65% discount (up to $7.5k) on system and 3 years interest free loan under TEELS
- The results with a battery subsidy and a 10 year payoff show:
  - For all customers, shifting to T93 reduces electricity bills (although for customers with larger PV systems this will not outweigh the effect of moving from the Transitional FiT to the Regulated FiT)
  - For *most* customers, installing a battery increases the annualised cost; for large customers with large PV installing a battery can reduce the cost
- For example, for customer l_sah, with solar PV generating 80% of annual consumption:
  - On the regulated FiT with no battery, shifting from T31/T41 to T93 reduces annualised cost from $1,619 to $1,521
  - On T31/T41 and the regulated FiT, installing a battery increases annualised cost from $1,619 to $1,710
  - On T93 and the regulated FiT, installing a battery decreases annualised cost from $1,521 to $1,433



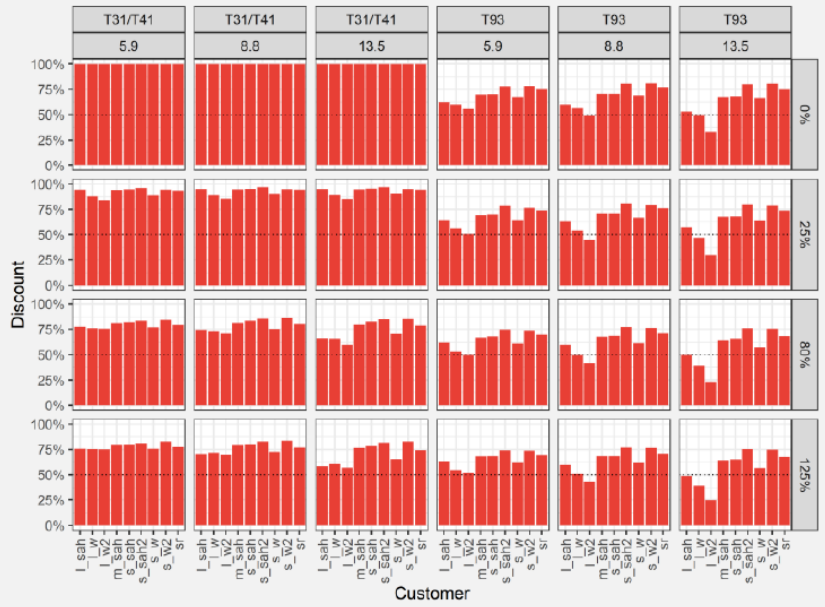
BACK CALCULATED SUBSIDY – 6 YEAR PAYBACK



- The *x-axis* shows each TasNetwork customer type
- The *horizontal facets* show retail tariff (T31 or T93) and battery size (3 options, with different sizes in kWh)
- The *vertical facets* show different sized PV systems (where the % number corresponds to % of annual consumption generated)
- Columns show the discount required on full battery system to meet parity with existing annualised cost under the **regulated** FiT, over a 6 year period
- The dotted line marks the point of the 50% subsidy (ignoring the $5k cap, which would slightly reduce subsidy on Resu 10)
- The results for a 6 year payback show:
  - Required discount is greater than 50% for all customers and all circumstances that we consider
  - Required discount is highest for customers on T31/T41 – customers on T93, in contrast, can use a battery to arbitrage between peak and off-peak periods, reducing the required subsidy
  - Required discount is highest for stay-at-home households – as discussed above, stay-at-home households have less opportunity to use batteries to store excess solar PV generation

Note: Discount relative to full system *including* install

BACK CALCULATED SUBSIDY – 10 YEAR PAYBACK



- The *x-axis* shows each TasNetwork customer type
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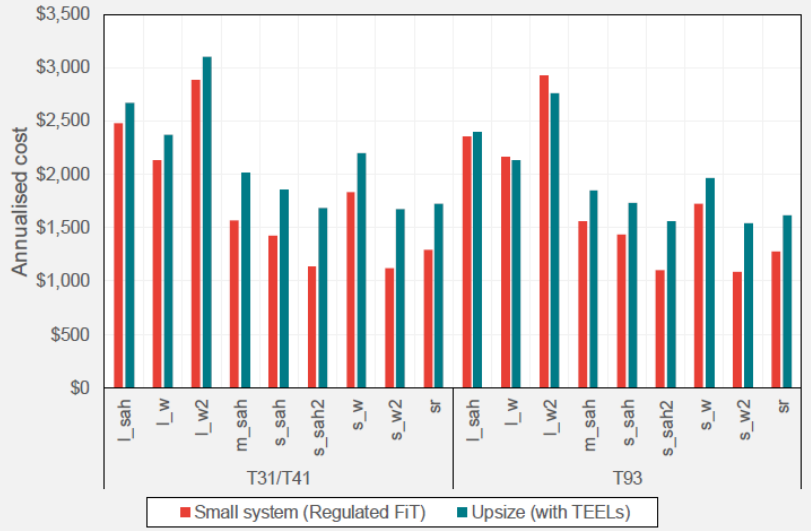
- The *vertical facets* show different sized PV systems (where the % number corresponds to % of annual consumption generated)
- Columns show the discount required on full battery system to meet parity with existing annualised cost under the **regulated** FiT, over a 6 year period
- The dotted line marks the point of the 50% subsidy (ignoring the $5k cap, which would slightly reduce subsidy on Resu 10)
- The results for a 10 year payback show:
  - Required discount is greater than 50% for most customers and most circumstances that we consider – but lower than with 6 year payback
  - Required discount is highest for customers on T31/T41 – customers on T93, in contrast, can use a battery to arbitrage between peak and off-peak periods, reducing the required subsidy
  - Required discount is highest for stay-at-home households – as discussed above, stay-at-home households have less opportunity to use batteries to store excess solar PV generation

Note: Discount relative to full system *including* install

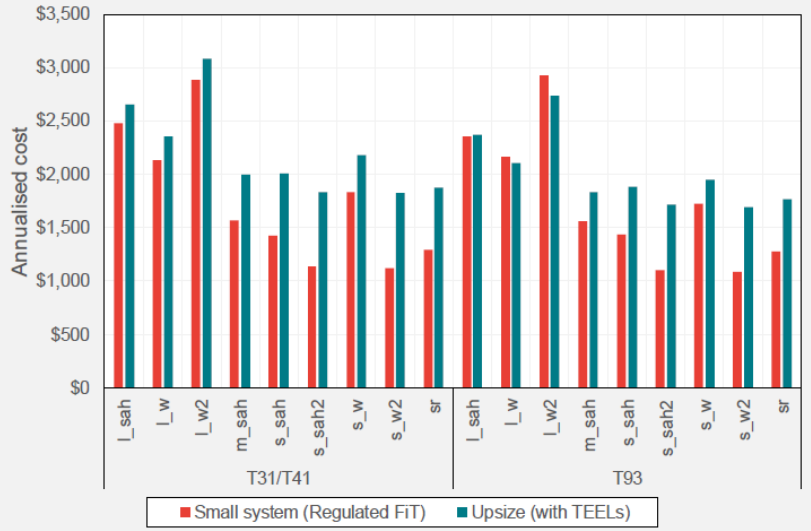
UPSIZING CASE – 50% DISCOUNT

- Upsizing solar PV case modelled:
  - Upgrading from a 25%-of-consumption solar PV system to an 80%-of-consumption solar PV system
  - Solar PV system has current STC rebate and 36 months zero-interest finance under TEELs
  - Battery system has 50% (up to $5,000) discount and 36 months zero-interest finance under TEELs
- Capital costs are amortised over **10 years** to get annual bill
- l_sah, l_w, l_w2 (large customers) generally indifferent or slightly better off with storage on 10 year basis

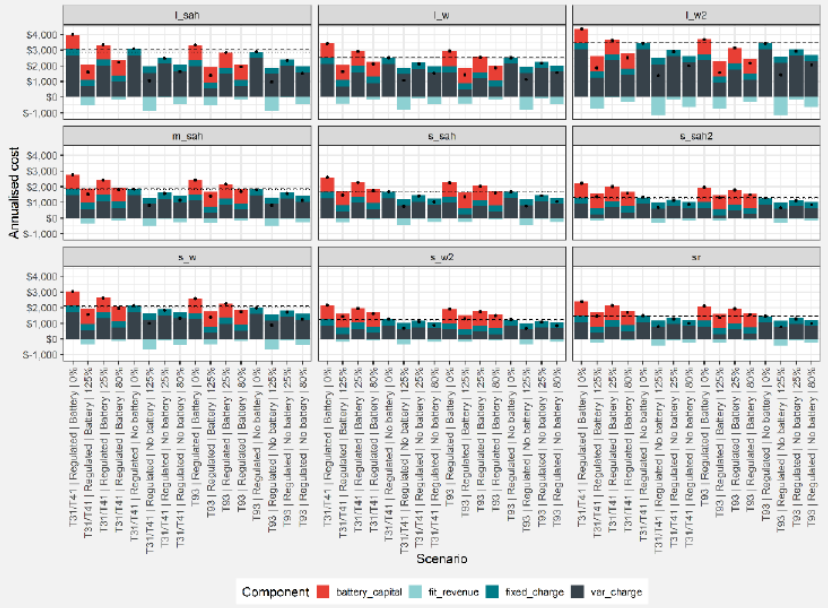


UPSIZING CASE – $500/KWH DISCOUNT

- Upsizing solar PV case modelled:
  - Upgrading from a 25%-of-consumption solar PV system to an 80%-of-consumption solar PV system
  - Solar PV system has current STC rebate and 36 months zero-interest finance under TEELs
  - Battery system has $500/kWh (up to $5,000) discount and 36 months zero-interest finance under TEELs
- Capital costs are amortised over **10 years** to get annual bill
- l_sah, l_w, l_w2 (large customers) generally indifferent or slightly better off with storage on 10 year basis
- Due to the nature of $/kWh subsidy and increasing economies of scale with system size (larger systems cheaper on a $/kWh basis), larger customers fare slightly better in this case compared to the 50% subsidy case and smaller customers slightly worse

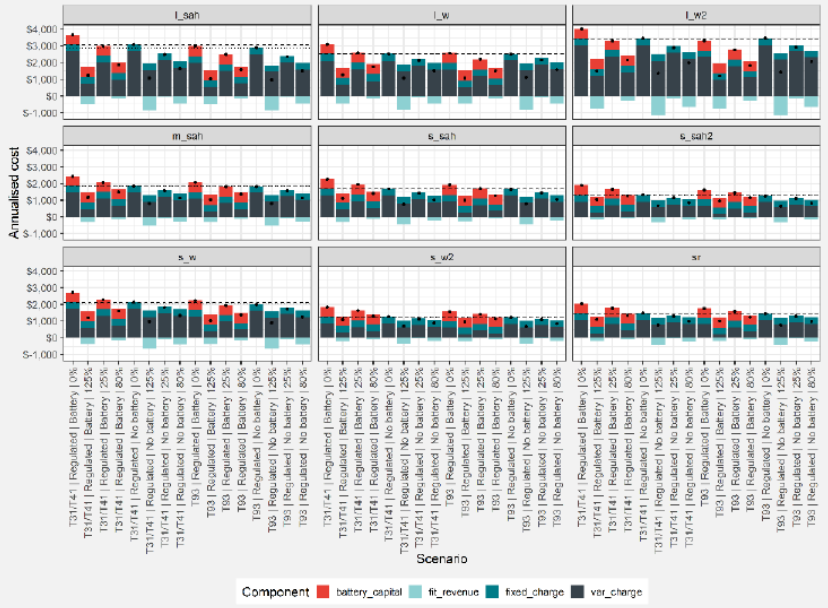


SYSTEM VS NON SYSTEM COMPARISON – 6 YEARS



- Chart shows customer bills under different PV size/storage arrangements per customer
- Each panel is a customer archetype/size representative
- X-axis represents different tariff/battery/PV arrangement
- Y-axis represents annual bills
- Dashed line is no PV, no storage T31/T41 annualised cost
- Dotted line is no PV, no storage T93 annualised cost
- **PV costs here are considered sunk (i.e. not included)**
  - This is not a fair 'new build' comparison as PV costs would need to be included
  - This is a counterfactual scenario – assuming PV is paid off, the customer may be better in PV or PV and storage than just relying on the grid

SYSTEM VS NON SYSTEM COMPARISON – 10 YEARS



- Same comparison but showing 10 year amortisation of battery capital (battery capital is a smaller component of annualised cost)

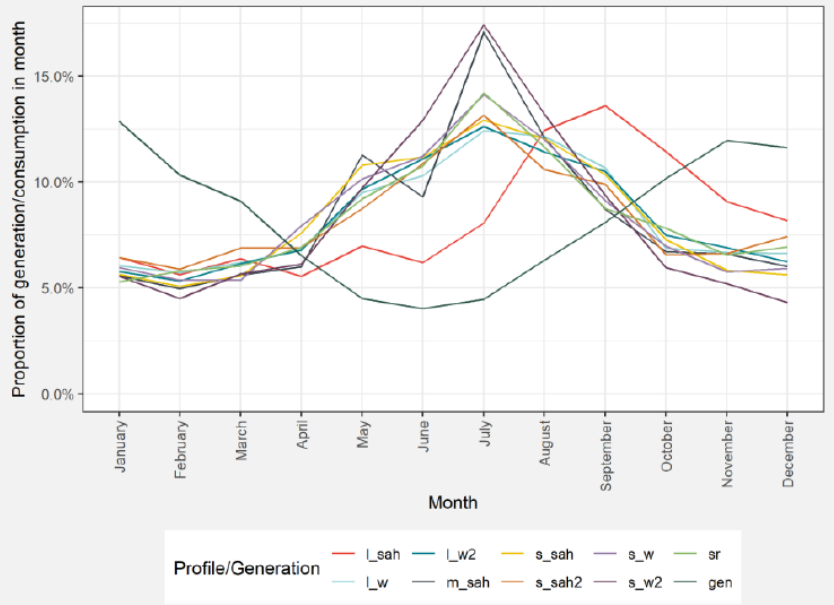
4. Discussion

DISCUSSION

- TasNetworks have provided a rich data set of representative customers
  - These customers represent different archetypes and consumption groups, so the results we see are likely to be representative
  - However, we have no way of extrapolating these to get numbers in Tas population – i.e. what proportion of households are e.g. "medium – stay at home households"
- Our analysis of this data suggests that batteries are financially unattractive for these customers, and even a 50% discount is generally not sufficient to make batteries financially attractive
- We generally find similar results in other jurisdictions, however, there are two things that worsen the economics of batteries in Tasmania:
  - Solar PV generates less in Tasmania than other jurisdictions, reducing the 'excess' generation that can be stored in a battery
  - Solar PV generation is more strongly anti-correlated with demand in Tasmania than elsewhere – with low air-conditioning load (but high heating load) there is less opportunity to store excess daytime generation in summer for use during summer evenings
- However, battery installations may still progress in Tasmania:
  - Customers are unlikely to consider storage on purely on financial grounds – people may install storage for other reasons (e.g. energy independence, green signalling)
  - Battery prices are expected to continue to fall – a $5k subsidy on a cheaper battery may be financially attractive
- A $/kWh subsidy may be more effective:
  - Provide incentive for systems that provide more kWh (which is likely to be of benefit to the electricity network more broadly)
  - Avoid the risk that installers may lump PV/install costs into battery category to obtain more subsidy discount
  - This would change incentives (encourage systems with relatively more kWh, like the Powerwall 2) but would not change our general conclusions

SEASONAL CONSUMPTION AND GENERATION PATTERNS

- Residential energy consumption in Tasmania is highest in winter and lowest in summer
  - This is reflected in our representative customer profiles from TasNetworks
- PV generation is highest in summer and lowest in winter
- The chart on the right illustrates consumption and generation patterns by month (*gen* is the representative generation profile used for all customers)
- Seasonal anticorrelation means systems have lower overall utilisation rates
  - In general, PV and storage systems will have excess energy in summer and shortages of energy in winter
  - This increases the effective cost of systems compared to regions with more correlated generation and consumption
  - Smaller systems will provide higher utilisation rates but cost relatively more (due to economies of scale)
  - In this analysis, we have modelled small, medium and large systems for each representative customer and picked the best



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