University of Tasmania *Future Energy*

Submission to the Tasmanian Government Solar Feed-in Tariff Review

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About *Future Energy*

Future Energy was established as an interdisciplinary energy research group at the University of Tasmania in early 2017. Our goal is to engage with energy institutions and cultures in order to produce high quality research that interrogates and clarifies options for future energy provision in Tasmania, and beyond. We currently have just under forty active members, and meet regularly. We have run several well-attended external events, including a public panel discussion (April 2017), an industry stakeholder workshop (Aug 2017), and an Environment and Energy Workshop (Dec 2017). The main purpose of *Future Energy* is to bring together UTAS scholars working on energy governance, markets, culture, and technologies from a range of disciplinary perspectives. *Future Energy* includes core expertise from economics, law, engineering, geography, marine science, architecture, ICT, social sciences and the humanities.

This *Future Energy* submission into the Solar Feed-in Tariff review is informed by the expertise and collective views of our members, drawn from across the disciplines. We base our submission upon consideration of the various historical motivations for implementing feed-in tariffs, the prevailing wholesale market conditions today, regulatory settings and retail energy mechanisms, the cost trajectory experienced by solar PV and closely-related technologies (for example, batteries), our understanding of distributed energy production in the community and in households, and our knowledge and understanding of the expected changes that are occurring and likely will occur in international, national and also the Tasmanian energy system.

Our Submission

Submission Overview & Summary

One of the difficulties in recommending or designing policy is that there are often many competing objectives. A feed-in-tariff policy is probably best suited to targeting a limited number of objectives, and should be just one of a suite of policy instruments that an overall energy strategy is comprised of. We recognise this challenge in presenting our submission.

In our considered view, a well-designed feed-in tariff scheme today should fulfill two primary objectives:

1. To ensure, as far as is practicable, equity
    a. between relevant transacting parties, namely solar generation owners, energy retailers and network businesses, for both new and existing solar PV systems;
    b. between all Tasmanian energy consumers, as far as is possible via the FiT mechanism itself. Specifically, a FiT designed for energy consumers owning solar generation should not result in consequences that directly disadvantage those energy consumers without solar generation.
2. To help shape the uptake in new photovoltaic (PV) systems and other associated technologies (smart inverters, batteries, electric vehicles, flexible loads) such that they

have minimal or no adverse impacts on the electrical power system and so that they provide benefits to the electrical power system in the future.

Our main recommendations, explained in detail in our response to review questions, are as follows:

I. *Premium* feed-in tariffs are no longer required in Tasmania in order to stimulate the residential PV market, owing to the now favourable economics of rooftop PV;

II. The FiT should be set at a value which reflects <u>all</u> of the savings the retailer would make when purchasing solar exports (as opposed to purchasing them from the generator or energy market plus paying for that energy to be delivered), in order to ensure equity between transacting parties. This value is not easy to calculate. Calculation will require more detailed modelling and transparency of methods, in order to demonstrate [economic/financial] equity;

III. The financial savings a retailer makes when purchasing solar exports fluctuates daily, weekly and seasonally. We therefore recommend a Time-of-Export (ToE) FiT that reflects the changing value of distributed rooftop PV to the retailer, network and power system at these different times. This Time-of-Export FiT will act to incentivise household installation of battery storage and controllable, flexible demand.

IV. We recommend that the detailed settings for a FiT, in whatever form it takes, are first rigorously tested via modelling, to ensure that the financial impact on Tasmanian households are well understood prior to finalisation and implementation, and that equity (as described in 1a and 1b above) is achieved.

V. Our recommended change in FiT policy must be delivered hand-in-hand with a thoughtful, informative, transparent and well-executed public education campaign. Such a campaign should be targeted at all stakeholders, including solar and non-solar households, as well as installers.

VI. We recommend a re-framing of the language used in describing and discussing Feed-in Tariffs in the public sphere and in media, reflecting both the shift from FiTs being seen as a public and community cost to them becoming a public and community benefit, and also reflecting the nature of contemporary energy markets and the time-varying value of energy. We suggest extending the ‘feed in’ tariff language, recommending the use of terms such as ‘system hungry’ or ‘high-value’ periods (higher payment FiT) and ‘system full’ or ‘low value’ periods (lower payment FiT), to aid communication to households about the change to FiT;

VII. To ensure the FiT is restructured and set in keeping with other energy policies in the State, i.e. that it is part of a co-ordinated policy approach, attentive to the equity and electricity system change objectives stated above.

Responses to the Review Questions

1. What changes could be made to current Feed-in Tariff arrangements (for example, a different Feed-in Tariff rate structure) to provide incentive to install rooftop solar generation and appropriately reward consumers that have already installed rooftop solar generation?

We support having a Feed-in Tariff in place which provides appropriate incentives for Tasmanian households and businesses to install rooftop solar generation, and which rewards equally existing and new owners of rooftop solar. We believe that this can be achieved via a single FiT tariff arrangement, applied equally to all consumers with solar PV installed.

The average overall cost of electricity generated by rooftop solar PV installed in Tasmania today (assuming an appropriate installation) is now generally well below retail energy tariffs. Cost of generation differs markedly from one customer and system to the next, driven chiefly by a customer's individual financial settings, system capital cost and location of installation, but is typically in the range of 7 - 14 c/kWh for Tasmanian households[1], for a system installed today. The cost of generation will be usually above, though perhaps not by much, the prevailing average wholesale energy price. Hence, ***artificially inflated incentives (eg. 'premium tariffs'), designed primarily to stimulate market activity, are no longer required*** in order for an existing energy consumer to make a rational decision to install an appropriate sized PV system on their property. We recognise of course that the up-front capital requirement can still be a significant barrier for many households, and also that there are many other aspects which form part of the decision-making process.

For customers with PV systems installed under the Transitional FiT scheme, we suggest that there is also no longer a need for any separate tariff once that tariff scheme expires on 31 December 2018. This premium FiT was appropriately put in place to stimulate uptake and local sector activity at a time when installed system costs were considerably higher. However, the period of time over which this tariff has now been applied is such that for practically all reasonably designed and priced systems installed at the time, the accrued benefits should have already justified the capital expense incurred. Furthermore, owners of existing PV systems can now readily upgrade their systems to include features such as battery storage and smart energy management, which many new systems today may feature to take advantage of contemporary tariff structures. Therefore decision-making for new and existing customers are not, in fact, markedly different. In other words, ***a single FiT scheme can now safely and equitably be applied for all new and existing solar customers***.

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[1] The average cost of electricity generated by a rooftop PV system over its financial life, calculated using the discounted Levelised Cost of Energy (LCOE) method. For reference, a 7 c/kWh cost of PV generation corresponds to a 5 kW system installed for a price of $6,000, financed at a rate of 5% per annum over 25 years and generating 1360 kWh/kW installed capacity. 14 c/kWh corresponds to a 5 kW system installed for a price of $7,500, financed at a rate of 10% per annum over 20 years and generating 1220 kWh/kW installed capacity.

It is our view that the FiT scheme can and should be changed from current arrangements, so as to stimulate further uptake of solar generation in a genuinely equitable fashion, while also preparing Tasmania for a future where prosumers and distributed, intelligent energy technologies feature highly in the energy system. Such a FiT scheme must, in our view, come as close as is practicable to meeting the dual objectives of ensuring equity (between parties in a solar export transaction, between owners of old, new and future solar PV systems, and between all Tasmanian energy consumers) while encouraging technologies such as battery storage and smart devices and loads which can add value to solar generation and provide benefits to the electricity network and power system.

An appropriate FiT should neither force the energy retailer to incur additional costs nor provide any net financial benefit to them. It should thus be ***set at a value which reflects <u>all</u> of the savings the retailer would make when purchasing distributed rooftop solar exports*** rather than purchasing them from the generator or energy market plus paying for that energy to be delivered. This will include wholesale energy procurement costs plus transmission use of system charges; it could also potentially include any fraction of distribution use of system charges which may not apply if it were recognised that a reduction in demand at critical network assets typically results. Any additional minor savings or expenses, if there are any, in the cost of retailing (eg. energy procurement costs, market fees, financial hedging and instruments, metering & settlement) should also be included. Savings in marginal network losses (which vary with time and location, but are typically around 5 - 8%) should also be reflected in the export tariff paid. Setting of an export tariff or tariffs based on this approach requires careful analysis, being updated on a regular basis, of the full energy value chain.

A FiT which influences demand profiles via adoption of new technologies (battery, smart devices and loads) relates to shaping an energy system that supports the integration of distributed solar in the longer term. Such an arrangement both reflects the time varying value of delivered energy, and also provides incentive to energy prosumers to shift load towards periods of solar generation, or alternatively to shift generation (via energy storage) to periods of peak load, thus reducing system and network peak demand. While a flat, time-invariant FiT, coupled with naturally higher retail energy tariffs (ToU or otherwise) can encourage use and uptake of such technologies as battery storage[2], it is our view that a more effective and equitable arrangement is for exports themselves to be valued and priced accordingly. Hence, ***we propose the introduction of a Time-of-Export (ToE) Feed-in Tariff***, where a lower export tariff is in place during periods of generally lower system demand (the middle of the day, and overnight) and a higher export tariff is in place during periods of generally high demand (morning and evening peak periods). Tasmania's existing ToU retail tariff already recognises the higher cost to procure and deliver energy to customers during peak periods, while at the same time being designed to reduce demand on the network during peak periods, so as to reduce

[2] Recent international evidence that ToU tariffs are driving battery uptake, Smart Energy International (2018) see reference list for article.

overall network costs by reducing need for network investment; a ToE FiT tariff is arguably a natural extension of that pricing regime. An appropriate and equitable ToE FiT design and rates should encourage installation of appropriately sized smart PV systems and associated load shaping behaviour.

We note that a Time-of-Export FiT (or 'Time-varying feed-in tariff') has recently been implemented in Victoria on a voluntary basis - retailers can choose whether to offer a time-varying tariff and/or a flat tariff to consumers, and consumers can choose between those offered[3]. There would of course be quite clear similarities between this and any ToE FiT introduced in Tasmania, but we stress the importance of tailoring any such scheme to the Tasmanian context. It would also need to be carefully examined whether a voluntary scheme in Tasmania, with its single dominant energy retailer, would have the desired impact on solar generation uptake.

Setting of tariffs according to time of export requires not only careful analysis of the energy value chain, but also would benefit from detailed modelling of impacts on a range of typical Tasmanian energy consumers and PV system owners. In the same way that a Time-Of-Use retail tariff requires the installation of a digital interval meter to register consumption in each tariff period, an interval meter covering exports would also be required for a prosumer (at a cost to the retailer or the prosumer) to move onto a Time-of-Export FiT. A time of export tariff may be required to be more flexible, recognising that as the uptake in solar generation increases over the coming decade the impacts and benefits of shaping energy consumption and generation also changes. A well-designed FiT scheme should be designed to be able to accommodate this.

Finally, any changes to the current FiT arrangements should be coupled with **a public communication strategy/educational campaign that clearly communicates the FiT**[4][5]. Explaining FiT(s) clearly and simply to current, potential and future solar generating entities (including individual property owners, community groups and other organisations) we see is an important aspect of any FiT program.

An honest and reliable public campaign should accompany new FiT policy, demonstrating that Tasmania is leading the way for a reliable, affordable and sustainable energy system. It should emphasise the fairness and simplicity of the Time of Export FiT, which pays energy users a fair amount for supporting the network and system, while reducing overall costs for all energy users.

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[3] Essential Services Commission, Victoria. 2018-19 'time varying' minimum feed-in tariff is between 7.1 cents and 29 cents per kilowatt hour, with a flat rate of 9.9c/kWh.
https://www.esc.vic.gov.au/electricity-and-gas/electricity-and-gas-tariffs-and-benchmarks/minimum-feed-tariff?_ga=2.13869239.1649376800.1533199370-1779898230.1516419897

[4] As recommended by the recent ACCC Retail Pricing Inquiry-Final Report, for "improved customer engagement" (p.149) and 'comparator websites' managed by government for "awareness raising and education campaigns" (p.150, ACCC (2018).

[5] As recommended by the Finkel Review in order that consumers can "understand and compare prices" (p.20, Finkel et al, 2017).

Ensuring ongoing, easy access to clear, simply set out information will support consumer decision-making about FiT. This is important because FiT affects choices about purchase and management of solar photovoltaics (and batteries). Better guidance related to FiT for the public would assist to overcome some of the confusion/misunderstanding about FiT(s) we see regularly in the community.

Clear communication will significantly support 'orderly governance' as called for by the Finkel review.

2. *Would those changes be likely to result in any other indirect or unintended impacts (beneficial or otherwise)?*

There are potentially a number of indirect and unintended impacts of any change to tariff policy. We recommend that the detailed settings for a FiT, in whatever form it takes, are first ***rigorously tested via modelling, to ensure that the financial impact on all typical Tasmanian households are well understood*** prior to finalisation and implementation.

An important indirect or unintended potential impact of changes to FiT (to time-of-export or any other multi-faceted tariff approaches) is increased customer/householder confusion. UTAS social research currently in progress on Bruny Island, through an ARENA-funded project (2016-19; 'The Bruny Island Battery Trial'[6]) has revealed the difficulty households experience understanding changes in tariffs and different payment types. This emerging finding is supported by other studies elsewhere. Clear communication programs can ameliorate confusion and benefits of a communication program are clear - reduction, hopefully elimination in misunderstanding and/or confusion about FiTs.

It is well-researched that households with solar PV have significantly lower bills than those without; driven by rising electricity costs and falling solar PV costs[7][8]. But an indirect benefit of a fair and equitable ToE FiT might be a reduction in electricity bills for all consumers, including those without solar PV and including vulnerable households, one of the key objectives of the ACCC Report[9]. An appropriate ToE FiT which targets reduction in demand when energy market

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[6] ARENA's CONSORT Smart-battery trial on Bruny Island Tasmania; https://arena.gov.au/projects/consumer-energy-systems-providing-cost-effective-grid-support-consort/

[7] The AEMC notes that "More people are investing in or considering solar PV, batteries and other options to reduce usage" AEMC (2018),Consumer confidence in energy retailers drops to new lows. https://www.aemc.gov.au/news-centre/media-releases/consumer-confidence-energy-retailers-drops-new-lows

[8] Australian Energy Council (2018) Solar Report January 2018. P.3 https://www.energycouncil.com.au/media/11188/australian-energy-council-solar-report_-january-2018.pdf

[9] "The ACCC estimates its recommendations, if adopted, will save the average household between 20 and 25 per cent on their electricity bill, or around $290-$415 per annum...some of the most vulnerable in our community are...having difficulty paying their bills," Mr Sims said in a media release on release of the

prices are highest could, given high enough volume of participants, in turn lead to a reduction in wholesale prices that are applied to all consumer tariffs. Tasmania has a higher proportion of low income households than other Australian States[10] , making any moves to aid social equity in Tasmania particularly beneficial.

A Time-of-Export FiT could have unintended consequences in the way that smart technologies operate and interact with tariffs. For example, it is possible to envisage scenarios where ToU retail tariffs and ToE FiT tariffs are both set at rates which encourage battery systems to store energy when retail tariffs are low and export again when export tariffs are high. Such action may have the desired effect of reducing net demand at peak times, but does so at the expense of the requirement of ~ 15% additional energy generation (owing to battery efficiency losses) - which may be objectionable philosophically and which may not encourage appropriate solar uptake. Such a scenario is unlikely to become a problem until such time that battery systems become considerably lower in cost.

Another possible unintended consequence might be that the behaviour of smart devices themselves, when exposed to tariff structures which contain step-changes in rates, create new demand peaks. A large fleet of uncoordinated smart energy devices, if their operation is driven primarily by time-based tariffs, will tend to behave in a highly-correlated fashion. Battery systems may all start exporting at the commencement of a high export tariff period, and flexible loads may be shifted to coincide at the start of lower import tariff periods, when under other circumstances the batteries will have served local loads for far less correlated net demand. Again, this scenario is unlikely to be an issue until a very large number of battery systems or smart devices is present in the system. However, this scenario does highlight well the critical need for coordination of distributed resources, alongside appropriate tariff settings, particularly as uptake of solar and associated technologies increases. This is certainly the view held by a number of author's of this submission (who are active researchers on the CONSORT Bruny Battery Trial[11]) and is it also the prevailing view of the NEM market operator AEMO and the Energy Networks Association[12]. FiT design should, at the very least, have a clear view to this future.

2018 ACCC report
https://www.accc.gov.au/media-release/accc-releases-blueprint-to-reduce-electricity-prices

[10] "Tasmanian household disposable income was...the weakest outcome since 2013-14, largely reflecting a decline in real terms in total wage and salary income, together with a (surprising) decline in income from social security benefits." (p.7, The Tasmania Report, 2017)
http://www.utas.edu.au/__data/assets/pdf_file/0011/1055693/Tasmania-Report-Saul-Eslake-2017.pdf

[11] ARENA's CONSORT Smart-battery trial on Bruny Island Tasmania;
https://arena.gov.au/projects/consumer-energy-systems-providing-cost-effective-grid-support-consort/

[12] The need for appropriate coordination of distributed energy resources is a key aspect of AEMO/ENA's Open Energy Networks consultation paper and project.
https://www.aemo.com.au/-/media/Files/Electricity/NEM/DER/2018/OEN-Final.pdf

Negative indirect or unintended impacts of changes to the FiT tariff can be ***mitigated by early policy impact assessments and having a coherent policy framework with the appropriate suite of supporting policies***. For example, uncontrolled installation of household batteries, where the network does not have visibility of these batteries, is one potential unintended impact. This can be mitigated by inclusion of smart battery measures/conditions in order for households to be eligible for the Time-of-Export FiT. In other words, integrating current planning around a smart battery policy in Tasmania with the FiT reforms.

3. *What contribution does rooftop solar generation make to Tasmania's energy security?*

Rooftop solar generation, if considered on its own and in isolation from the remainder of the Tasmanian system and without being coupled to emerging technologies, may be thought to make minimal contribution (or potential contribution) to Tasmania's energy security. Solar generation currently occurs, generally speaking, in an uncontrolled manner when the sun is shining and this does not as a rule coincide with times of peak energy demand in the state. But rooftop solar provides diversity in energy generation in Tasmania. Although rooftop solar represents only a small proportion of Tasmania's energy generation[13] (less than 1% of the state's generation[14]), it has the potential to grow significantly. Tasmania's solar insolation, while lower generally than most locations on mainland Australia, is still very good and is on a par, or better, than many locations globally. Therefore, our solar conditions can support solar generation. Rooftop solar does already, and can increasingly, play an important role in making an indirect contribution to the state's energy security.

Adding more solar generation to Tasmania's energy system should be regarded as a positive move which provides a strategic advantage for the state's energy security in the long run. This is particularly so given Tasmania's mix of existing generation and energy storage technologies (hydro schemes and generators), and especially with Tasmania's position with respect to the wider National Energy Market (NEM) and the changes taking place within the NEM. The addition of solar generation in Tasmania (or any new renewable generation) improves the state's energy security by reducing dependency on energy imports and by moving

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[13] See the AER report p.31
https://www.aer.gov.au/system/files/AER%20State%20of%20the%20energy%20market%202017%20-%20A4.pdf

[14] Solar PV is growing rapidly, but from a low base. In 2016-17 residential solar PV generation was 73GWh, compared to the entire Tasmanian generation of 10,120GWh. See the Energy in Tasmania Report 2016-2017, p.5
http://www.economicregulator.tas.gov.au/Documents/Energy%20in%20Tasmania%202016-17%20Report.pdf

one step close to energy self-sufficiency[15]. Furthermore, increasing solar generation also results directly in additional available capacity of long-term stored energy in Tasmania's hydro generation system. This increases the amount of energy that is available for flexible or opportunistic dispatch, which is significant for Tasmania's power system security, and which also allows greater benefits of participation in the mainland NEM. Flexible dispatch will also become more desirable in the Tasmanian system as market settlement rules change to accommodate the need for increased flexibility[16]. Hence, additional solar capacity directly results in an equivalent additional quantity of energy that might be used to meet NEM demand. The value of the stored energy can potentially be considerably higher (at some times of the year) than at the time it is generated.

Furthermore, rooftop solar has the ability [potential] to provide network security at a local level, in supporting the local distribution network. Crucial here though is ensuring that rooftop solar is 'active', ie. visible to the network, via a smart inverter or similar household-network interface device.

The value of rooftop solar PV to Tasmania's energy security can be further enhanced by the encouraging and supporting the uptake of technologies which add flexibility to distributed solar generation. Battery technologies, photovoltaic technologies and smart loads are capable, or will be, of responding rapidly to the needs of the broader power system and thus adding critical system security functionality which is currently only provided by conventional generators.

4. What are the social and environmental benefits and costs of rooftop solar generation? What is the value of these benefits and costs?

The social benefits of rooftop solar include lower electricity bills for those that have been incentivised to take up solar, plus potentially at least a modest reduction in bills for other energy consumers[17], provided that FiT tariff scheme and settings are arranged appropriately. Increasing generation from solar provides the system benefit of zero marginal cost generation of electricity. The statewide social benefit of Tasmania continuing to lead in renewables should not be underestimated either, with many Tasmanians likely to feel proud of the state's position as a leader in renewables particularly if 100% plus of our energy demand comes from renewable sources.

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[15] Tasmania is currently still a net importer of energy: Office of the Tasmanian Economic Regulator, "Energy in Tasmania report 2016 - 2017," 2018, Available: http://www.economicregulator.tas.gov.au/Documents/Energy in Tasmania 2016-17 Report.pdf.
[16] The 5 minutes settlement, favouring fast-response technologies, will favour some hydro generation plants, smart-solar and battery technology. It should further incentivize solar PV and batteries in the NEM. AEMO (2017).
[17] The Energy Security Board's scenario modelling for the National Energy Guarantee policy development found significant household bill savings resulting from increased presence of solar and wind generation in the NEM.

A central social cost for rooftop generation is the barrier to entry, or ability to pay for the upfront/capital investment; and that this barrier is higher, proportionately, for the most economically disadvantaged Tasmanians. The social cost of cross-subsidisation of *premium* FiTs by all consumers, via increased costs on their electricity bills, we note as being currently an issue, but we also recommend that future FiT settings be made to ensure this is eliminated after the Transitional tariff ends on 31 December 2018. The perceived inequity associated with FiTs will be removed and should be clearly communicated as such. Other social costs could include poorer quality of energy supply if the deployment of high penetration rooftop solar generation is not managed well, and potential visual amenity impacts for some.

Environmental benefits include lower emissions, especially if solar generation is displacing generation from fossil fuel generation in Tasmania or in Victoria, and consequently lower environmental impacts. Environmental benefits of solar technology (and energy storage technology) are only realised if they are displacing energy generation from other sources with non-zero emissions and environmental impact. With installations of solar generation in Tasmania at a larger scale there will be the potential to manage other energy resources (such as hydro) in a more sustainable way - greater consideration of river biota for example (peak solar will often coincide with periods of lower water flows).

One potential key environmental cost is the future issue of managing the ‘end-of-life’ or recycling process for solar energy generation hardware and associated technologies. We do note that solar photovoltaic modules, at least for the dominant silicon technology, are produced from non-toxic, abundant and at least partly recoverable materials and thus the cost of end of life may become a monetary cost but ought not be an environmental one. But we recognise that residential lithium-ion batteries, manufactured from more scarce resources, may have some environmental costs associated with the limited resources used in manufacture, life cycle and end of life considerations.

5. *Do the community benefits of incentivising further solar installations outweigh the costs of providing those incentives?*

We remark that there are many different ways of defining and calculating costs and benefits – what is included and what is not - and so it is difficult to answer this question. Our view generally is that a well-designed FiT scheme should not impact negatively upon Tasmanian energy consumer costs, and that the financial, environmental and social benefits available to the broad community of fair incentives for installing well-managed rooftop solar will outweigh any social and environmental costs associated with doing so.

We note again that early premium FiTs which paid PV system owners rates at or in excess of the prevailing retail energy tariff and which allowed energy retailers to pass on associated costs, did result in some increase in retail rates to all consumers (impacting especially those without access to a solar generation). The ACCC explicitly pointed to this in their recent report[18], referencing the high cost to Tasmanian householders. As noted previously, we do not believe that there is any requirement now for a premium tariff, and indeed a key part of new FiT design is to ensure equity between solar generation owners and all Tasmanian consumers, and therefore that should be no such comparable cost of providing incentives for rooftop solar uptake in future.

6. *Are there alternative mechanisms (other than changes to Feed-in Tariffs) that could be used to incentivise and reward the installation of rooftop solar generation?*

We recommend that changes to FiT are not implemented alone, but are introduced as part of a more comprehensive policy package. This includes:

- 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. We see this, or some similar measure, as a being vital for encouraging installation of solar generation by rental property owners and low-income households in particular.

- Requirements for smart batteries, smart devices to have suitable data monitoring and connectivity capabilities (in order for households to be eligible for the Time-of-Export FiT), making sure any new battery installations are visible and useable to the network;

- Consideration of community scale solar farms to provide benefits to lower income neighbourhoods and to those energy consumers without access or ability to install solar generation in their own right.

7. *Is there potential for rooftop solar systems, smart metering and battery storage systems to help manage or limit peak demand?*

There is certainly excellent potential for rooftop solar, smart metering, battery storage and flexible loads to help manage or limit peak demand. This can be true at both local network level and at power system level. The potential for peak demand reduction is becoming better and better understood as various trials progress around Australia and globally. However, the ability

[18] ACCC report on reducing energy costs, including analysis of costs of premium Feed-in Traiffs: https://www.accc.gov.au/system/files/Retail%20Electricity%20Pricing%20Inquiry%E2%80%94Final%20Report%20June%202018.pdf

for these technologies to achieve that peak reduction is very much dependant upon both the technology type and details of the technology itself, and also on the means by which is it operated.

The value of rooftop solar generation in terms of providing network peak demand reductions or system level security is, for current PV technology on its own, minimal or even non existent. Indeed, in a worst-case scenario of high penetration PV without associated technologies or operating regimes, there can even be an additional cost to the network or system, with network augmentation potentially required to prevent solar generation exceeding physical network limits and as resources required (eg. provision of reserve capacity) to manage solar generation at system level become significant. However, this need not be the case if rooftop solar is fitted with smart inverter nd intelligent operating regime which is responsive to external signals or which responds to system conditions. Certainly the addition of battery storage enables a vastly improved capability to manage or limit peak demand.

A FiT which is either combined with a Time-of-Use retail tariff, or alternatively a Time-of-Export FiT in its own right, will generally incentivise solar and battery systems to export (or meet local loads) during peak periods, often corresponding to network or system peaks. But it is important to note that the presence of such a tariff regime on its own will certainly far from guarantee that peak demand is reduced in each instance it occurs. And it also doesn't eliminate the possibility of undesirable consequence of correlated but uncoordinated behaviour of many such systems.

To really achieve reliable peak demand reduction and to effectively manage the system with high penetration of intermittent renewables, a high-degree of advanced distributed resource coordination will thus be required. There is thus potential for new business models to manage and limit peak demand via coordination of solar generation combined with smart battery systems. There is currently considerable activity in Australia, both within network businesses, PV and battery vendors and aggregators, and also in research institutes. Research tells us that a successful implementation of coordination of smart energy resources owned by households will require a concerted awareness raising and public campaign to educate consumers and installers in order to encourage uptake and acceptance.

8. Are the opportunities to benefit from rooftop solar available equitably across the community?

On the face of it, yes, the opportunities to benefit from rooftop solar are available across the community. However, in reality, a large fraction of the community is simply unable to realise the practical benefits, and this equity of opportunity can only be achieved if active policy measures are introduced to support rooftop solar uptake by vulnerable and 'hard-to-reach' households in particular and by others who are left without access to the solar generation. In some instances it may be necessary to apply direct interventions, targeting support for specific groups of vulnerable consumers.

Solar PV systems are, generally speaking, being taken up less by particularly low-income[19] 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. We note that this is compounded by additional factors and we are also seeing people locked out by poor understanding of both the technology and the costs (including financial payback potential), by lack of skilled installers and advice givers, and by poor quality infrastructure in homes, including poor quality electrical infrastructure.

We recognise then that there are outcomes which may not be easily influenced by FiT policy settings themselves, but which may be nonetheless worthy of consideration in this review process. We therefore suggest some more innovative FiT-related concepts, noting that some of these raise additional questions which we do not (at this time) attempt to answer. We stress that these are all as-yet 'untested' ideas, some of which may be worth closer consideration:

- A cap on paid FiT exports (eg. a cap on export payments per billing cycle / quarter) to further encourage load shaping and/or battery storage, and also to limit supporting very large PV systems (that is, much larger than needed for meeting household demand) in the residential setting (which usually would be associated with higher household incomes). This cap becomes somewhat akin to progressive taxation, where the net revenue on larger systems becomes smaller. This cap could (positively) also encourage moving loads to meet generation (or vice versa) but would need to be assessed carefully as it could also encourage wastefulness in certain circumstances.

- Rental property owners being able to install a system and have it metered separately (to household load) such that all generation is allowed to be exported or paid at the export FiT rate. This particular approach to FiT would remove any benefit to the tenant of the solar generation offsetting energy loads in the home. Or, is some form of shared metering possible? Is there a way to still capture the full benefit of solar generation offsetting load, but share it fairly between the owner and tenant, without impacting the energy retailer? An appropriate shared-metering arrangement could really innovative - lowering the energy costs for the tenant while still providing incentive to invest for the property owner. If done well this could unlock a huge part of the housing market to PV, and provide significant National leadership.

- A particularly low day-time FiT for exports, to both strongly encourage load shaping AND at the same time to produce a financial benefit to retailers which could be mandated to be passed on to all other energy consumers via reduced regular retail tariffs. This would be the equivalent of the old 'Environmental' or 'Renewable' component of the retail price

[19] We recognise however, that low-income households, especially families, spend more of their disposable income proportionately on electricity; and that wealthier households may not be as incentivised to install solar to reduce electricity bills. See reference APVI (2018), [Glenorchy postcode has higher PV capacity installed 2010-2017 than Sandy Bay postcode].

stack (formerly a positive value, owing to higher costs of new renewable technologies) but in this case becoming a negative price contribution.

In each case, considerable modelling would be required to ensure that the outcomes are well-understood and to properly assess the socio-economic impacts.

9. Any other relevant matters that the person or group submitting would like to raise for consideration.

Feed-in Tariffs have been and continue to be an effective tool to both incentivise uptake of and to ensure revenue stability from rooftop solar generation. However, rooftop solar generation is only one of several available new renewable generation technologies.

We point out that a suite of other micro-renewables may be worthy of support in a similar manner, in particular small-scale wind turbines and micro-hydro in rural locations could be supported by a similar mechanism. Solar FiTs have helped the solar installation industry mature in Tasmania, and the same might be achieved at modest cost for other technology sectors.

In our view it could also be worth consideration of policies which facilitate and support deployment of large-scale solar generation in Tasmania. Tasmania, unlike all other Australian states, does not yet have any utility-scale solar farms operating, but there is considerable potential for them to contribute meaningfully to energy targets and energy security in the state. Although solar insolation is not as high in Tasmania as many other locations, and hence the price of competitive bids for a solar farm in Tasmania would likely be accordingly higher, a reverse auction type tender process could secure Tasmanian tax-payers and energy consumers with some of the cheapest new-build energy generation today. We'd encourage this to be investigated further.

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