Submission on SA Power Networks 2020-2025 Regulatory Proposal

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23 May 2019

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Special thanks to Renewable Energy Policy Group for its contributions to this submission.

The Prosumer Tariff

> *The rise of the 'Prosumer' introduces a new tariff for the residential class and recognises the change in our customer base where we now have customers who both produce and consume energy through our network.* -SAPN Tariff Structure Statement 2020-2025, p 41

What's in a name?

DNSPs can generally name their tariffs whatever they choose, from boring acronyms like "RSR+OPCL" to exciting, appealing names like "Lifestyle Tariff" (an EnergyQLD offering).

The name *Prosumer Tariff* is problematic, however, because it is misleading and potentially biasing to future analysis. The tariff is neither restricted to prosumers, nor is it a required for uptake by any prosumer. I believe that many prosumers will prefer to be on the cost reflective Residential Time of Use Tariff, as it appears to offer stronger price signals with clearer, simpler and more certain rewards for efficient peak usage.

SAPN points out that the Prosumer Tariff should also suit some non-prosumers, including specifically *households with less energy-intensive air-conditioning needs such as evaporative air-conditioning* (TSS, 40). SAPN notes that has no control over which tariff customers choose, so there could be a disproportionately high rate of efficient non-prosumers taking up the Prosumer Tariff in the future. There is another group of customers who benefit from the tariff structure. The Prosumer Tariff's low usage price should also appear attractive to the heaviest energy users. If this tariff is adopted primarily by non-prosumers, the name will be entirely misleading.

A critical peak price signal?

Consumer choice of tariff can lead to self-selection bias and other issues when interpreting future results and setting efficient prices. If the Prosumer Tariff attracts disproportionate numbers of households with little or no air conditioning, as SAPN predicts, future analysis must control for the fact that these customers are expected to have below-average energy consumption during network peak times (heatwaves) *a priori*, rather than as a response to the tariff's claimed 'critical peak price signal'. The Prosumer Tariff should also attract some of the heaviest residential energy users, who receive the most benefit from the low usage price. When a tariff attracts both the most efficient and least efficient consumers, it is very important to ensure that prices are cost-reflective in order to prevent cross-subsidies and allocate charges fairly.

Average Demand is just kWh

The Prosumer Tariff includes a Demand charge which is calculated as the highest daily *average demand* over the 4-hour peak interval, monthly from November to March. By now, the AER should be fully aware that Demand charges are equivalent to usage charges when there is a single demand window per peak interval, like in the Prosumer Tariff. It is simpler mathematically and intuitively for customers to work with usage (kWh) rather than average demand (kW). Is it necessary to introduce this confusing term? It obscures the enormous kWh price on peak days, as shown below. I believe that consumers should be presented with the clearest, simplest information possible.

$$Average\ Demand\ (kW) * Peak\ Interval\ (h) = Peak\ Usage\ (kWh)$$

$$1\ kW * 4h = 4\ kWh$$

The formula can be rearranged to calculate the effective usage rate for the proposed 'average demand' charge (kW rate taken from Table 17.8, p 41 of the TSS):

$$\$22\ per\ kW = \$22\ per\ 4\ kWh = \$5.50\ per\ kWh$$

The Average Demand charge applies on whichever day of the month a customer uses the most peak energy, each month from November to March. This charge applies in addition to all usage charges in effect at that time, and in addition to the fixed supply charge. Reducing consumption on the day of the customer's maximum usage can lower the total average demand charge, but only to the level of the customer's next-highest day for the month (any more would be helping the network but receiving no reward for the extra effort). Reducing consumption during actual network peak days is not necessarily enough to reduce the average demand charge; one must stay below that level during all non-peak days for the month as well. Attaining rewards for efficient behaviour under the Prosumer Tariff may be much more difficult than it appears. Rewards are not aligned with network benefits.

Will negative Demand count toward average Demand?

At any given time, there is no meaningful difference in network benefits between reducing consumption and increasing energy fed into the grid. Solar customers currently receive no standard payment from DNSPs for energy fed into the grid, thus credit for negative Demand would not cause any kind of double-payment issue. In order to ensure that Prosumers are doing everything possible to help reduce network congestion, proportionate rewards for discharging batteries should be offered regardless of the customer's momentary Demand. Things also get confusing for consumers with 3-phase power. If energy is being used on one phase but exported on another, will those phases be averaged or will only the consuming phase be counted for the 'average demand' calculation?

Residential Time of Use tariff

I believe that the Residential Time of Use tariff, with two daily peak intervals, offers broadly reasonable, cost-reflective pricing which is simple enough for consumers to understand. This structure appears suitable for use as a default 'cost reflective' tariff, noting my recommendation that adjustment to the peak time window could improve cost reflectivity. Credit to SA Power Networks for the work it has put into creating this innovative tariff. This tariff structure is a forward step in the transition to 100% renewable electricity. It offers strong, clear incentives for investment in home battery storage and for increased midday consumption.

Peak Times

There will need to be ongoing discussion about peak window definitions over the long term, as usage patterns change over time. I support the proposal to have a morning peak price, despite the fact that morning peaks are less problematic than peaks in the afternoon and evening. Long-term support for a morning peak would depend on how demand shifts over the next few years, as DER and EVs transform the way consumers use energy.

It is important to keep the peak interval wide enough to cover all significant cost-driving peaks, which can occur at different times on different segments of the network. The effects of having too narrow a peak interval can include serious infrastructure problems like overloading assets, as well as long-term inefficiencies like unnecessary capital investment in peak infrastructure (due to stimulating too much load shifting to just outside the peak window, creating a new peak). The most serious consequences can be managed by "shoulder" pricing. Priced between peak and off-peak rates, the shoulder rate is typically used to smooth inefficient price jumps at boundaries. [NB: Some DNSPs, including SAPN, use the term more broadly, and have called off-season peak usage and Demand rates "shoulder", despite not being connected to a peak.]

Though there is no acute energy security risk in setting the interval too wide, doing so leads to two inefficient effects worth noting:

First, expanding the peak interval spreads peak revenue collection over more hours, driving down the peak price level required to collect sufficient revenue. This 'dilutes' consumer price signals for shifting loads and reducing peak consumption, meaning that it offers them less reward for each kWh removed from the peak, but offers a longer window of opportunity for earning rewards. Whenever there are too many hours built into the peak interval(s), it follows that there must be too few hours in the complementary off-peak interval. This causes the off-peak price to be higher than its efficient level in order to collect sufficient revenue, amplifying the diluting effect of a peak price which is too low. The signal to shift load is primarily the difference between peak and off-peak price. If the peak price is too low and the off-peak price is too high, the combined effect is a muted signal for load-shifting.

Second, too wide a peak interval makes it costly and difficult to shift loads from it. I applaud SAPN for addressing much of this issue by splitting the peak into separate morning and evening intervals, with a 'Solar trough' off-peak rate midday. I support this double-peak ToU structure, as it allows customers to easily shift both morning and afternoon loads into the midday 'solar trough'.

My concern regarding SAPN's proposed peak definition is that the evening interval is too long. I question the efficiency of extending the evening peak to 1AM. The decision does not appear to be justified by supplied demand profiling, and will cause unnecessary delays in important tasks like charging EVs. Given the benefits to the network of slow-charging EVs in households, one would expect DNSPs to facilitate consumer investment in slow-charging technology by providing an off-peak interval long enough to complete the job. This is particularly important where the DNSP can control the load, for example to stagger start times, as this further reduces the number of effective off-peak hours available each night.

The Hot Water Spike

SAPN has no obligation to mitigate market effects caused by the daily spike in demand from off-peak controlled load (OPCL) water heating, which occurs every night around midnight CDT. Furthermore, its proposed solution, extending the peak time until 1AM, is of questionable value. Proportionally, the spike would be smaller if demand were higher at the time it occurs. Therefore, one could argue that DNSPs should be *stimulating* demand at midnight (with an off-peak rate) in order to get the "smoothest" demand profile at that time. The rise of VPPs will add another way for the market to address this predictable, daily demand spike as one of its value streams. Demand response is a very cheap and very effective way to address short, cyclic, predictably-sized demand spikes such as this.

I agree with SAPN that the start of the off-peak time should not be at the precise time of the OPCL spike, but I believe SAPN has extended the peak time too far into the night, and this will lead to the inefficiencies described previously. Perhaps ending the peak 30 minutes *before* the hot water spike would better encourage efficient behaviour by facilitating more load shifting? That beneficial effect would be compounded by the higher efficient kWh price which comes with reducing the number of peak hours, strengthening the price signal for both load shifting and curtailment.

The Solar Sponge

In a future with high penetration of Solar, the storage of surplus energy while the sun is shining will be a key to efficient use of this clean and abundant energy resource.

Projected outcomes for Solar vs Non-solar customers indicate that though consumers on average would save a few dollars from adopting the Time of Use tariff, which includes the "Solar Sponge" off-peak rate in the late morning to mid-afternoon.

SAPN analysis indicates that Solar customers would end up paying more than they currently pay, whilst non-solar customers would pay less under the Time of Use tariff with the Solar Sponge. This appears to be a poor outcome for solar customers, but that may have more to do with price levels than tariff structure. On the Solar Sponge tariff, the benefits of Solar are paid non-solar customers via the tariff's low midday usage price. This should help mitigate concerns that the benefits of solar are being captured by those customers who can afford to invest, driving up prices for those who can't afford solar. Observe that, if not for solar, consumers would be paying peak network prices midday and networks would be building additional infrastructure to satisfy ever-increasing peak demand, driving prices higher still. Battery storage and VPPs add value to local energy generation by facilitating efficient use and distribution of each resource. Local distribution also avoids use of the transmission and sub-transmission network, avoiding long-run costs and minimising line losses.

SAPN's projection of customer outcomes on the residential Time of Use tariff appears to assume no behavioural response, so its estimates be considered worst-case scenarios. Solar customers can mitigate some or all of these increased costs through changing behaviour and investment. The move to more cost-reflective pricing will incentivise customers to use energy efficiently, provided that consumers understand how to respond, are able to respond, and that they find the potential rewards worth the effort.

Increasing Fixed Charges

Some of the increased costs for Solar customers on the Residential Time of Use Tariff can be attributed to increasing fixed costs in all proposed tariff prices. Fixed costs may be given a variety of names, including “standing charge”, “supply charge”, “monthly/daily charge”, “per NMI charge”, and “minimum Demand charge”. Increasing fixed charges is not justified by appeals to cost reflectivity, since it should be the “anytime usage” charge that should inflate to recover residual costs above and beyond the long-run marginal costs in an efficient manner. A high proportion of fixed charges is problematic in a high DER penetration future because customers whose reliance on the grid is minimal will be incentivised to just leave the grid. These are the same customers with sophisticated enough storage and generation facilities to be self-sufficient, so it follows that they could be helping the grid through trading energy on the network. Keeping customers on the grid improves energy security and prevents individual customers from unexpected complications arising from using a purely self-generated power supply.

For customers who cannot escape the grid, fixed charges are equivalent to a flat tax. Fixed charges are demand-stimulating because they allow for lower usage charges. For any monopoly, demand-stimulating pricing is equivalent to bias against small customers.

LV Network Transformer Monitors vs Smart Meters for PQ data

> *The transition to the more advanced metering required to enable new tariffs also has the potential to significantly enhance SA Power Networks’ capability to monitor and manage power quality at the customer premises. This will be key to enabling ongoing integration of new distributed energy resources, as well as creating new opportunities to achieve operational efficiencies and improve customer service levels.*
>
> *-SAPN Tariff and Metering Business Case, September 2014, p13*

> *In the proposed contestable market, we will require access to the network functions provided by third-party smart meters, both to preserve services such as hot water load control that exist today when our own meters are replaced with third-party smart meters, and to ensure that the network benefits that smart meters will enable can be accessed as these meters are rolled out.*
>
> *-SAPN Tariff and Metering Business Case, September 2014, p41*

> *This will ensure that a market-led smart meter rollout is not impeded and, as customers take on smarter meters, we will be able to access the power quality data, event alarms, control and diagnostic functions that these meters can provide, and make use of these to provide improved reliability and quality of supply and more efficient operation of the network. Without this access, network benefits would not be realised, and a significant portion of the value of the community’s investment in smarter meters would be lost.*
>
> -SAPN Tariff and Metering Business Case, September 2014, pp44-45

As the broader population of smart-capable meters grows under our new and replacement program, we acquire, over time, a fleet of end-point telemetry devices distributed across the state that can be enabled specifically for remote power quality monitoring at low cost.

-SAPN Tariff and Metering Business Case, September 2014, p50

Through this process we will progressively build a new, broad-based monitoring capability that will extend across the urban LV network, at lower cost than installing additional grid-side monitoring devices.

-SAPN Tariff and Metering Business Case, September 2014, p50

These meters will form a key part of the overall platform that will enable the ongoing management of power quality through 2020 and beyond. While we will use grid-side monitoring to target specific areas with immediate issues, particularly at the start and end of HV feeders and at the transformers feeding LV sections, the progressive deployment of communications-enabled meters will establish, through the 2015-20 period, the broad-based monitoring platform we require to manage power quality issues across the urban LV network over the long term.

-SAPN Tariff and Metering Business Case, September 2014, p50

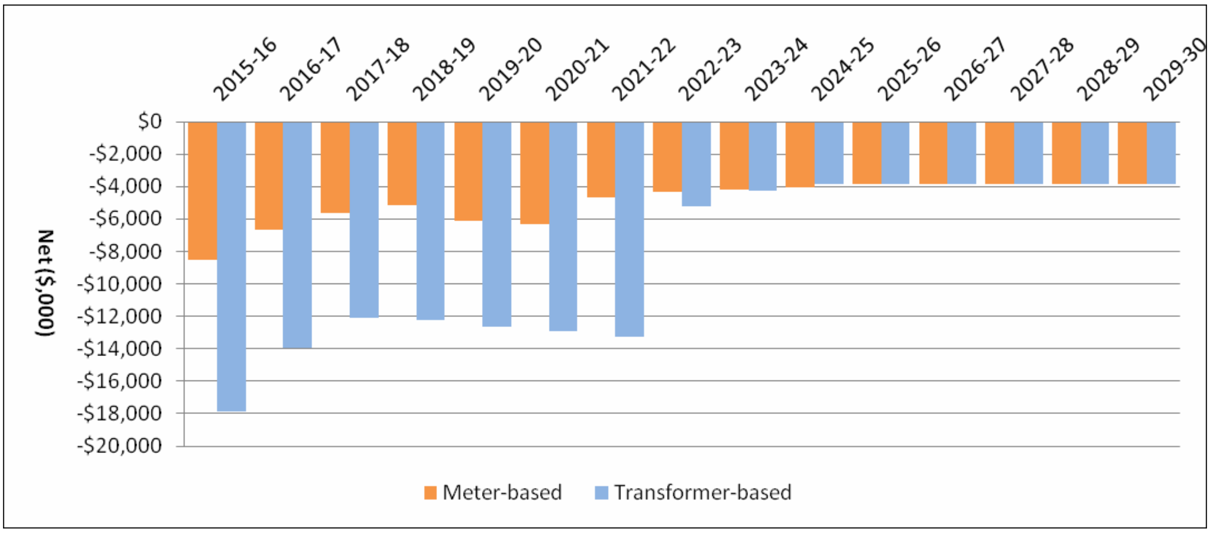
In our target areas we will aim to establish meter-based monitoring at three customer premises per LV feeder (mid-point and two extremes). This will give enough data performance points to effectively monitor LV network performance.

-SAPN Tariff and Metering Business Case, September 2014, p50

We have examined the cost to implement an alternative grid-side monitoring solution using dedicated devices installed on each LV feeder in our target areas, instead of using communications-enabled meters.
Per-unit cost is $3,185 per device on average, including field installation costs. This assumes the same grid-side monitors as specified for other transformer monitoring initiatives, or equivalent. Devices will be predominantly pole-mounted, and start-of- feeder devices will be co-located with the LV transformer where possible.

-SAPN Tariff and Metering Business Case, September 2014, p56

The estimated net cost (15 year NPV) of this option is significantly higher that our preferred meter-based approach, at ~$86 million, as shown in Figure 14 below. This is because the per-unit capital cost of field equipment is higher, and the additional operational savings that can be achieved through smart meters are not realised.



Reproduction of "**Figure 14 – meter-based vs. grid-side cost comparison (CAPEX + OPEX)" Note the Y-axis shows value, the inverse of cost, thus appears negative.**

-SAPN Tariff and Metering Business Case, September 2014, p57

Business tariffs

Thank you to SAPN for protecting most small businesses from mandatory Demand Tariffs.

Consumer engagement

Thank you to SAPN for the opportunity to sit on its Renewables Reference Group for the past two years. It has been humbling and overwhelming to get to meet and engage with so many incredible people. SAPN's regulatory proposal reflects several changes which were driven by consumers and stakeholders through this successful engagement process. The proposal has been made much better thanks to the work of advocates, the AER, the Consumer Challenge Panel, and SAPN.

Best regards,

John Herbst