APVI Submission to the AER's Issues Paper: ***Tariff Structure Statement Proposals, SA Power Networks*** (March 2016)

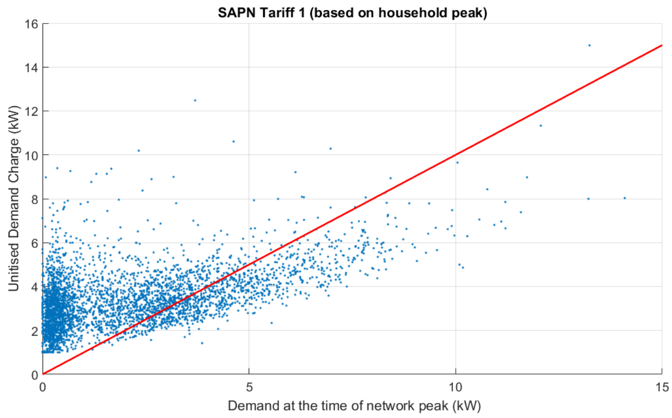
3 May 2016

Summary of APVI Response

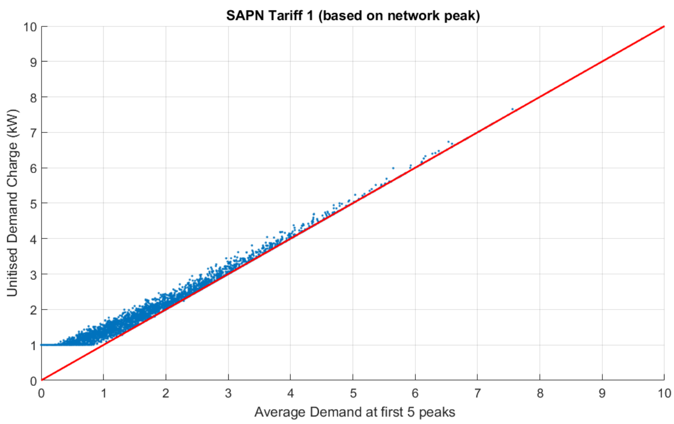
The **first section** of this submission assesses SAPN's Low Voltage Residential Actual Demand Tariff in terms of its cost-reflectivity, then discusses some consequences of its design, and modifies that design to improve its cost-reflectivity.

The key points are:

- SAPN's demand tariff results in a low correlation between the customers' payments and the costs they impose on the network. See figure below.



- Thus, households are likely to be charged for network augmentation at times when their demand is not affecting the cost of augmentation.
- Households are also being incentivised to reduce demand at the wrong times and hence have limited impact on reducing network expenditure.
- This results in a dead weight loss where, according to the data used here, a reduction of 1kW in the network annual peak requires a net annual reduction of about 200kW by the average customer, and a 'loss' of about 320kWh.
- Applying the demand charge to the customers' demand at the time of the network monthly peaks only during summer and winter results in a much better correlation between the customers' payments and the costs they impose on the network – especially when applied to the top 5 network peaks and with the 1kW min capacity charged separated out from the spring and autumn months. See figure below.



- From the customer's point of view this tariff would look very similar to SAPN's current demand tariff but would apply only over the summer and winter months.

The **second section** of this submission addresses the AER Issues Paper's questions. In summary:

AER Question: (2): The charging windows should be based on the anticipated constraints of the section of the network that serves those customers. However, this has to be balanced against the need for simplicity in designing tariffs.

AER Question: (3): The tariff statement does sufficiently inform stakeholders when the network is likely to be under most stress, but as discussed, it does not then justify the timing of the charging windows.

AER Question: (4): Combining the fixed and demand charge components means that large customers, either (i) never pay the fixed charge or (ii) the demand charge is less proportional to their demand peaks than it is for smaller customers. Thus, our position is that they should be kept separate.

AER Question: (5): Our work indicates that it is preferable to apply the demand charge over an average demand longer than the normal 30 minute period. However, the averaging period should extend prior to the network demand peak to help reduce transformer heating, not simply be an average of either side.

AER Question: (6): Only the 'threshold' customers could require greater protection. However, given that it is another 2 years until the 'transitional' demand-based tariff would be in place, this should be enough time for customers to adjust.

AER Question: (7): Given that demand tariffs are designed to send a strong price signal to customers regarding their contribution to network costs, it makes sense to target customers based on their likely contribution to those costs. The threshold of 20MWh/annum and alterations such as new major appliances > 25amps and changes to three phase 44 power may well justify moving the customer to a transitional demand charge. A new inverter approval is most likely associated with a solar PV system and/or a battery system, which will, if anything, probably reduce a customer's peak, so it makes no sense to target them with a demand charge tariff.

AER Question: (8): Customers will understand the proposed triggers and thresholds for being assigned a demand tariff if they make sense, but not if they are applied because a household installs a technology that reduces SAPN's income.

AER Question: (9): As discussed, this is a complicated issue and depends on SAPN's load profile. If SAPN has a summer then winter peaking network then it is likely that a demand tariff applied all year is not necessary and will be inefficient.

AER Question: (10): Offering additional opt-in tariffs would seem to be a good idea because it means that SAPN will be able to assess the impact of these different tariffs on customer load, as well as customer interest in different types of tariff structures.

AER Question: (18): Assuming that the demand charge is designed properly, it may be appropriate to increase the tariff over a shorter period than six years. If the demand charge is effective in reducing the summer peaks, equal summer and winter demand charges may then be more appropriate than higher summer rates.

Background Information on SAPN's Cost-Reflective Pricing

This section provides background information on cost-reflective pricing and how well SAPN's tariffs meet the AEMC's cost-reflectivity criteria. The APVI's answers to the AER Issues Paper's questions then reference this background information.

The APVI has analysed SAPN's Low Voltage Residential Actual Demand Tariff proposed for 2017/18 using the load data from 3,876 households from the Smart Grid Smart City (SGSC) database for 2013. Although the SGSC households are based in NSW, their load profiles should not be too dissimilar to those in South Australia.

The aggregated load profile of the SGSC database, which is a proxy for the load profile of the network that serves them, peaks in summer at 6pm on Fri 18 Jan. As shown in Figure 1, about half of the individual houses actually peak in winter, with only 31% peaking in summer. A larger percentage of South Australian household loads may peak in summer, but analyses of these large datasets illustrate that, at an individual level, household loads peak throughout the year and also throughout the day. We do know that SAPN has a summer peaking network, and that the 2014/15 system peak was on 7 Jan 2015.

Attachment A shows the annual load profile of one of SAPN's residential substations, and it can be seen that it is very similar to that of the SGSC data – except that it has more peaks in February.

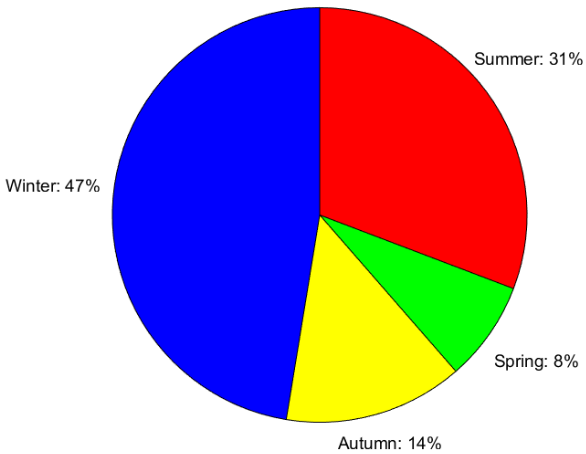


Figure 1. Season of Household peak

SAPN's Demand Tariff charges customers based on their monthly peak demand during a specified daily period – not their demand at the time of the network peak (which is what determines the network peak, and therefore the cost that households impose on the network).

Figure 2 compares each household's demand charge under SAPN's Demand Tariff to each household's demand at the time of the network peak. The demand charge component of these tariffs has been 'unitised' – meaning that the monthly demand charges have been converted to an equivalent kW value.[1] We do this so that there is a more direct visual correlation between what a customer pays

[1] The net annual demand charge was taken to be $1/kW but the summer peaks were given a higher weighting because of the higher summer demand charge. The unitised value for the summer demand charge was obtained by dividing the summer

and the costs they impose on the network, and because it makes different demand tariffs easier to compare.

All the households above the red line would receive a demand charge that is greater than their demand during the network's annual peak. This means that most houses are likely being charged more than they should be (generally those who are less responsible for the network peak).[2] This is a clear 'dead weight loss' – meaning that consumers are paying more than they should for a given good or service and so are consuming less than their optimum.

Thus, households are likely be charged for network augmentation at times when their demand is not necessarily affecting the cost of augmentation. This means that households may be incentivised to reduce demand at the wrong times and hence have limited impact on reducing network expenditure. The one caveat to this is that, over time, the original summer peaks could be reduced to the extent that the winter peaks become the new peaks. In this case, winter demand charges could be justified. This is discussed below. Of course, the inverse applies to a winter peaking network.

The correlation coefficient between payments under the demand charge and responsibility for the network peak is very low, at 0.533. The correlation coefficient measures how well one variable (the unitised demand charge) correlates with another (the customer demand at the time of the network peak).[3]

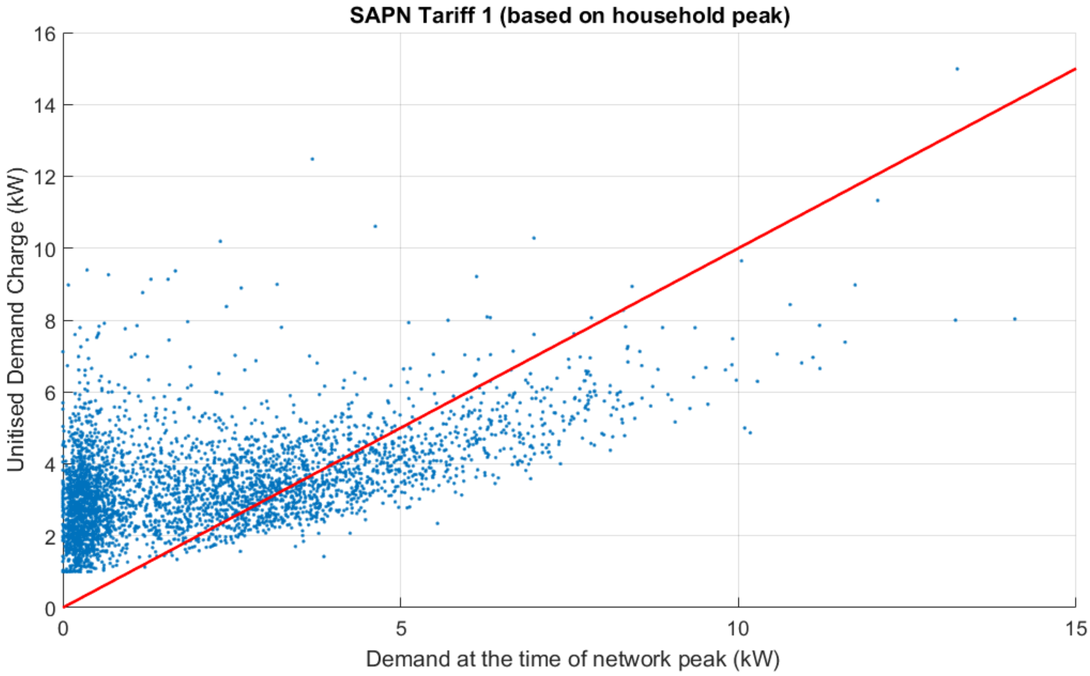


Figure 2. Unitised Demand Charge vs Demand at Time of Network Peak

demand charge rate by the annual average of the demand charge rates, then dividing again by 12 to obtain a monthly value. The non-summer demand charge was calculated in the equivalent way. The addition of all the monthly demand charge rates equals 1.

[2] Houses below the red line (generally those who are more responsible for the network peak) are being charged less than they should be.

[3] We are currently working on a better measure of the cost-reflectivity of a tariff. Although the correlation coefficient may indicate how well the unitised demand charge and the customer demand at the time of the network peak are correlated, it does not necessarily indicate how close the unitised demand charge is to what it should be for a cost-reflective tariff.

This has an important implication for networks. If a demand charge is applied over a considerable period of time, households have a stronger incentive to install load control devices such as batteries – rather than just undertaking behavioural responses. Batteries are likely to be programmed to limit a household's peaks throughout the entire demand charge period, but not necessarily to minimise demand at the time of the network peak. As a result, although they may reduce a customer's bills, they may not be particularly effective at reducing the network's annual peak (or peaks). If a customer cannot afford a battery, they may choose some other form of control, such as having their grid connection capacity capped at a certain level. However, as above, this would mean their demand was being restricted when it is not necessarily affecting the cost of augmentation, resulting in a significant dead weight loss.

One way to quantify this dead weight loss is to calculate the reduction in the customers' peaks that is required to obtain a certain reduction in the network peak. Figure 3 show this analysis for SAPN's Demand Tariff. The left hand y axis shows the total reduction in average customer demand caused by it being capped at certain kW levels (x axis). The right hand y axis shows the corresponding reduction in the network peak – averaged per customer. The network calculations allow for the fact that, as one peak is reduced, another will become the peak, and so it must be reduced as well. Thus, the total peak reduction equals the old peak minus the new peak (which is most likely on a different day and a different season).

It can be seen that a reduction of 1kW in the network annual peak requires a net annual reduction of about 200kW by the average customer. Another way to quantify this dead weight loss is to add up all the kWh a customer 'loses' because of the cap (or didn't lose but only because they paid for a battery). In this case, SAPN's demand charge tariff results in 320kWh being 'lost' for every 1kW network reduction.

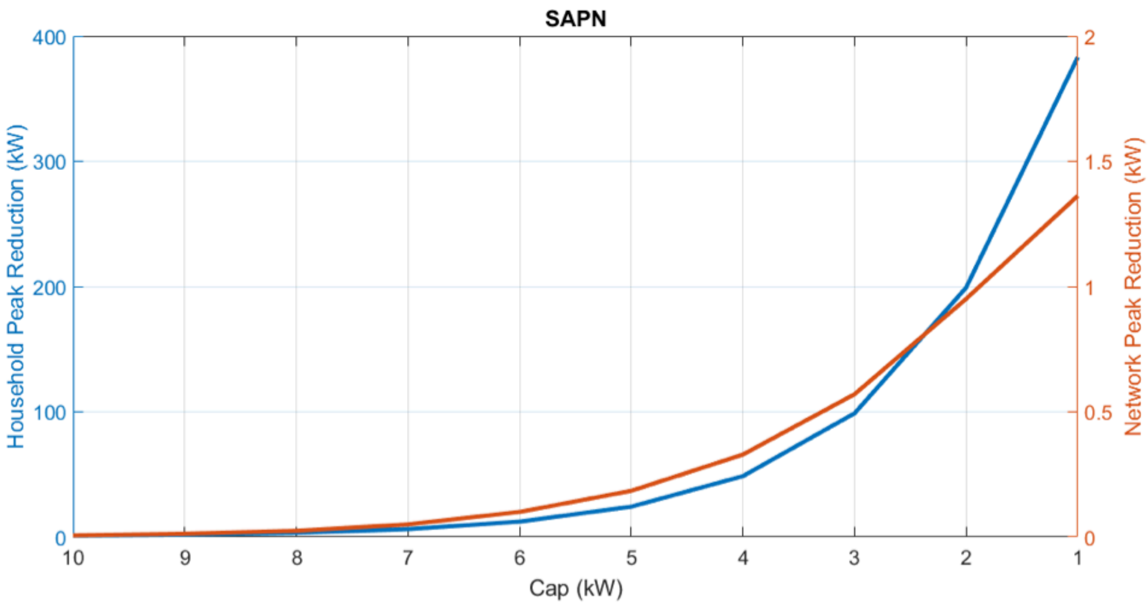


Figure 3. Household Peak Reduction vs Network Peak Reduction

Figure 4 shows that, as the cap (demand charge) is applied to fewer and fewer days (first removing the smallest peak day, then the next and so on) and so becomes more focused on the peak demand days, the amount of kW 'lost' to the customer reduces – at an increasing rate as you approach the annual peak day. This is an argument for both (i) reducing the number of months over which the demand tariff is applied, and (ii) focusing the demand charge periods onto the network's peak days not the customer's peaks.

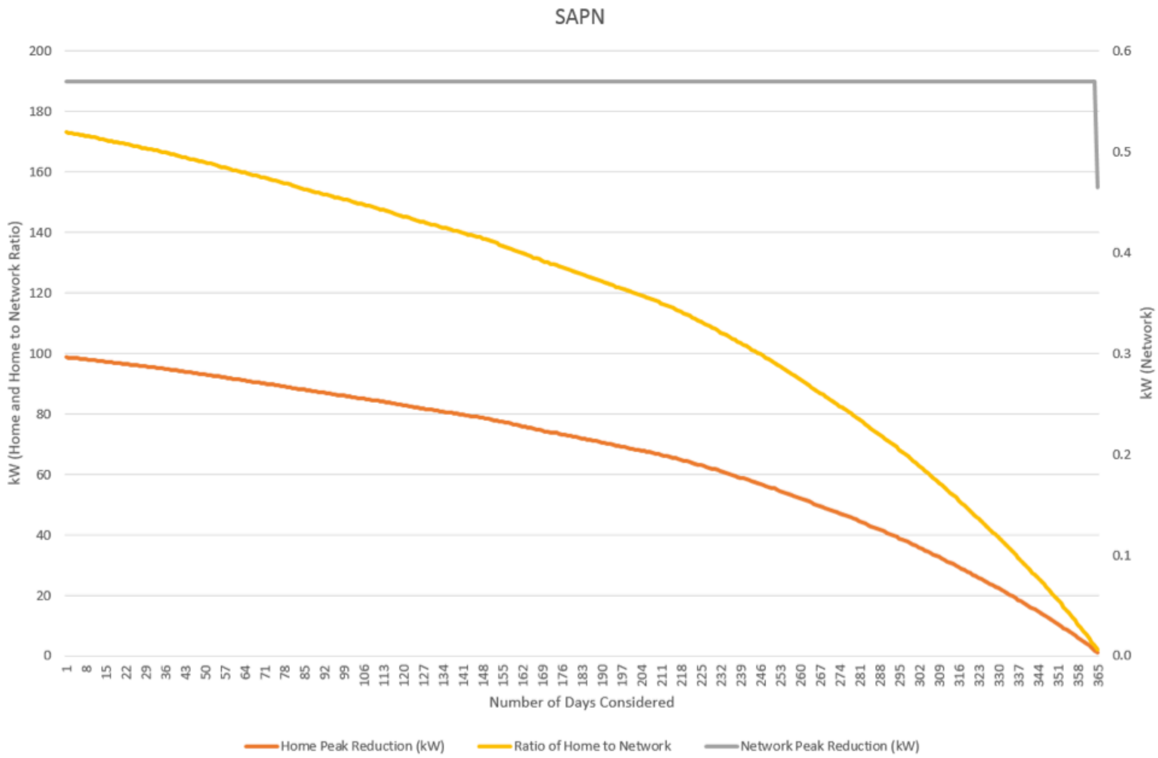


Figure 4. Impact of Number of Demand Charge Days on kW 'lost'

However, there is also an argument for increasing the number of periods over which the demand charge is applied, but only when the demand charge is applied to the times of the network peaks, not the customer peaks. This is because comparing the unitised demand charge to a single network peak doesn't take into account the fact that if that peak is reduced, then the next peak will be the problem - and so networks need to set their tariffs in anticipation of that occurring.[4]

In addition, applying the demand charge to a single annual network peak is likely to lead to 'bill shock' for some households. In a particular year a household may, for some reason, have unusually high demand during the network's annual peak. Taking an 'averaging' approach can therefore reduce the impact of such events.

Figure 5 shows the effect of increasing the number of peaks over which the impact of the demand charge is assessed. The first (red line) point on the x axis shows the correlation coefficient from Figure 2 (0.533; which assesses the correlation between the customers' unitised demand charges based on SAPN's demand charge tariff, which uses the customers' monthly demand peaks), and their demand at the time of the network's annual peak. The first (blue line) point shows the correlation coefficient, but for when the customers' unitised demand charges are based on the customers' demand at the time of the network peak. The next point on the x axis again shows these correlation coefficients, but this time compared to the customers' average demand at the time of the two highest network peaks, and so on.

It can be seen that, as more peaks are included, the correlation coefficient initially increases. This is because the demand charge is higher in the summer months and so including more summer month peaks increases the correlation with the total impact of the demand charge. As winter peaks are included, where the demand charge rate is lower, the correlation decreases, then as more autumn, spring and then summer peaks are included, the correlation increases again.

[4] Of course, if the network has been built to meet the larger summer peaks then the smaller winter peaks won't matter – unless peak demand as a whole increases, OR, you want to decrease the size of the network.

It can also be seen that the correlation coefficient is higher when the demand charge is based on the customer demand at the time of the network peak, not on the customer peak.[5]

Note that this is not an argument for applying the demand charge to all months – only to those months where peaks are likely to occur, which in this case is summer and winter. As stated above, this analysis has been performed using data from the Sydney area. From Appendix A it appears that SAPN's summer peaks are certainly greater than their winter peaks, and so they are justified in having the summer rate higher than their non-summer rate. It appears that their autumn and spring peaks are quite low, and so no tariff should be applied in those seasons at all.

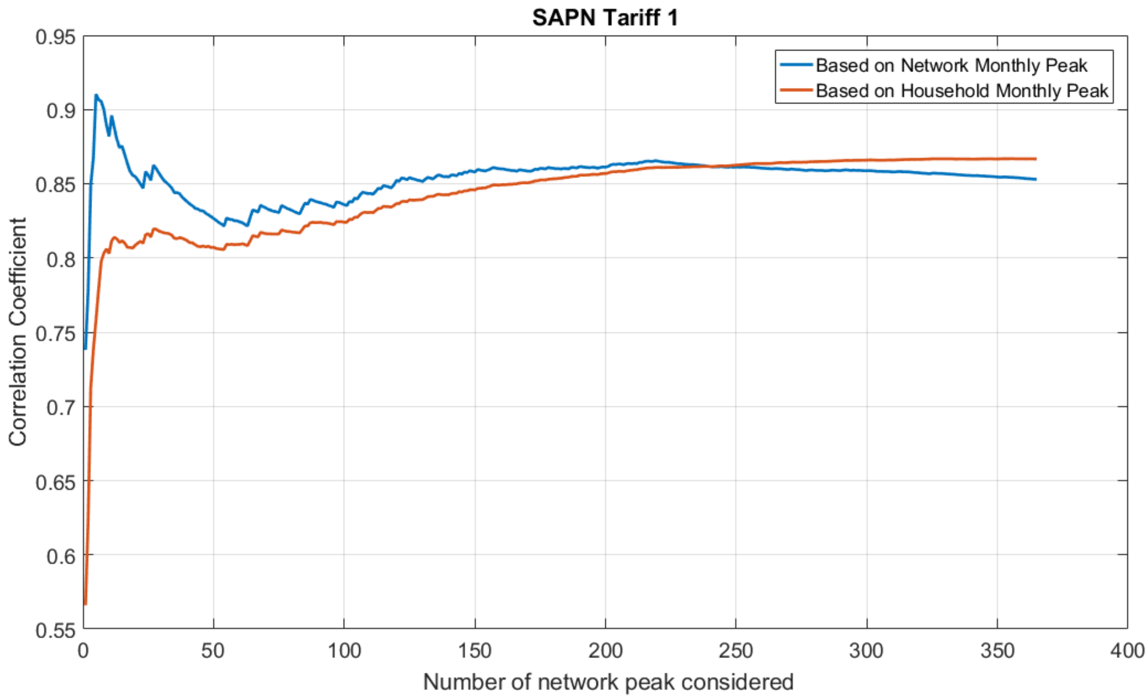


Figure 5. Impact on Correlation Coefficient of Increasing the Number of Peak Days

Figure 6 shows the impact of applying SAPN's demand charge only to the summer (Dec – Feb) and winter (June – Aug) months. As expected, this shows that the correlation coefficient is initially higher (peaking when 5 network peaks are considered) but then becomes lower than in Figure 5 – because the winter demand charge is half the summer demand charge, and including only the summer and winter months accentuates this effect.[6]

[5] When the correlation coefficient is based on the full demand tariff, and so includes the variable (kWh) charges, it is lower, being around 0.85 when 5 networks peaks are considered – but is still higher than the correlation coefficient when the demand charge is applied to the household demand peaks.

[6] Again, when the correlation coefficient is based on the full demand tariff, it is lower, being around 0.83 when 5 networks peaks are considered – but is still higher than the correlation coefficient when the demand charge is applied to the household demand peaks.

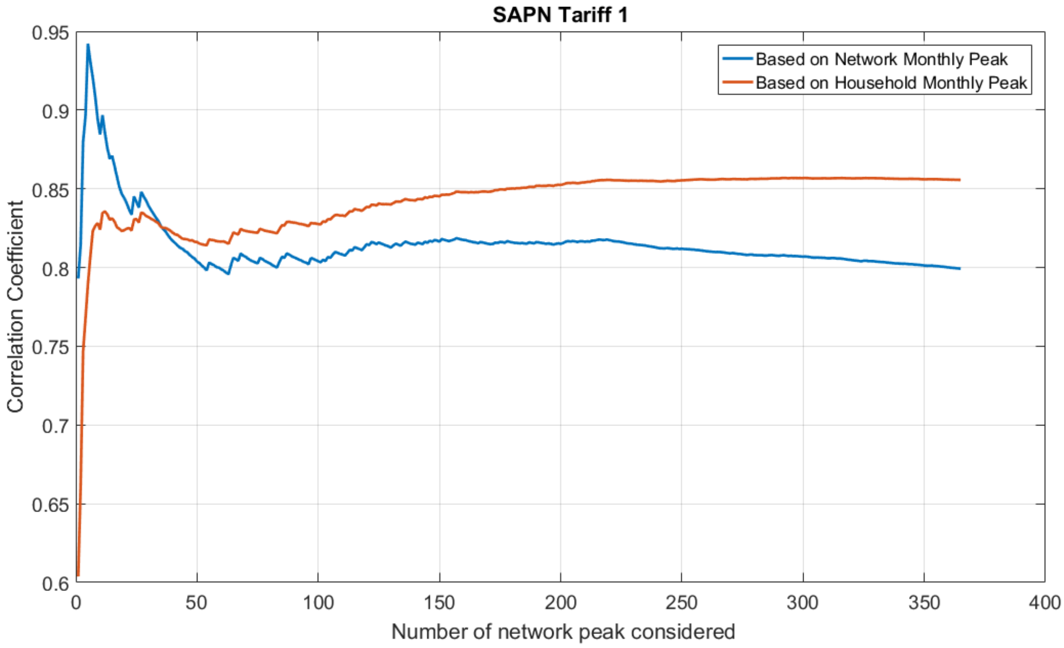


Figure 6. Impact on Correlation Coefficient of Increasing the Number of Peak Days – only summer and winter months

Figure 7 then shows the same chart as in Figure 2, but it assumes the demand charge is applied to the customer's demand at the time of the network's monthly demand peaks and only in the summer and winter months. It can be seen that there is a better correlation between the demand charge and the customers' demand at the time of the network peak, with the correlation coefficient at around 0.793 (compared to 0.533 for Figure 2).

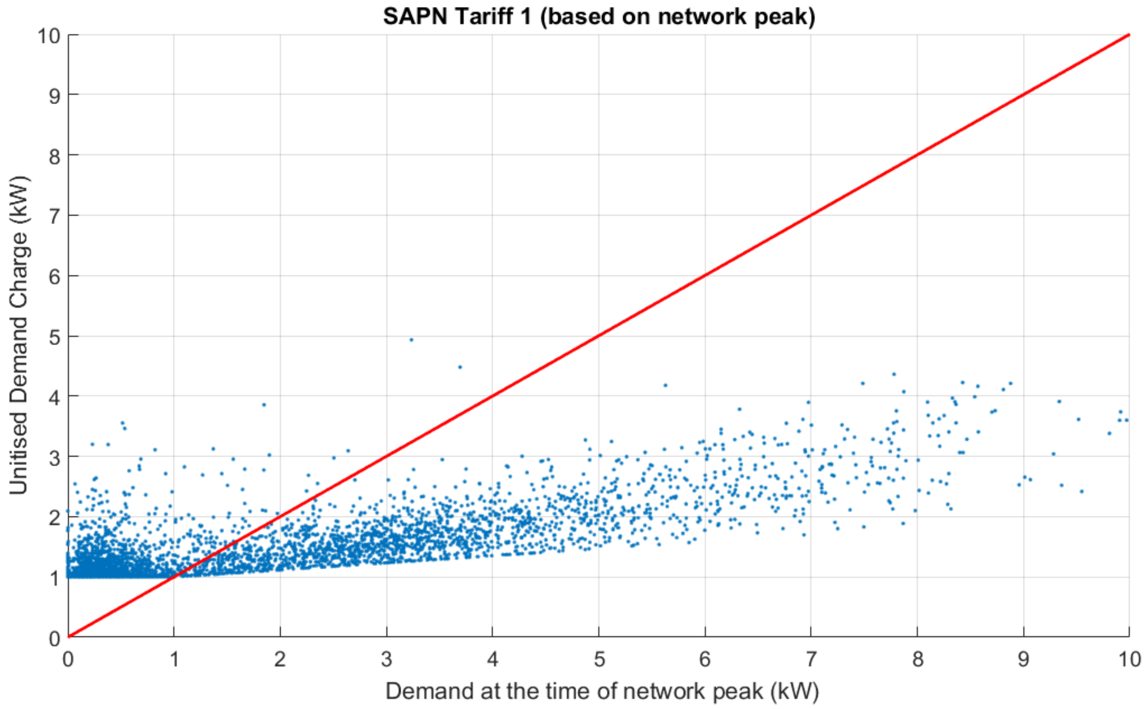


Figure 7. Unitised Demand Charge based on Customer Demand at Time of Network Peak vs Demand at Time of Network Peak – only summer and winter months

One way to take into account the fact that if the highest network peak is reduced, then the next peak will become the problem, is to assess the demand charge with respect to the customer demand at the time of a number of the highest peaks – not just the highest.

Thus, Figure 8 shows the same chart as in Figure 7, but it compares the unitised demand charge to the average household demand at the time of the top 5 network peaks. These peaks were chosen because they resulted in the highest correlation coefficient in Figure 6. They include the peaks above 6,410 kW in the chart in the APVI's answer to Question 9 below. It can be seen that there is an even better correlation between the demand charge and the customers' demand at the time of the network peaks, with the correlation coefficient at around 0.942. Of course, these 5 peaks were chosen ex post (after the fact), but analysis of a selection of different SAPN substation load profiles should identify the number of peaks that is suitable to apply as an average.

Figure 9 then shows the same chart as Figure 8 but for SAPN's normal demand charge tariff (based on household demand peaks and for every month). The correlation is much lower (0.789), with a greater vertical spread in the data points (meaning a greater variation in demand charges between customers who impose the same costs on the network).

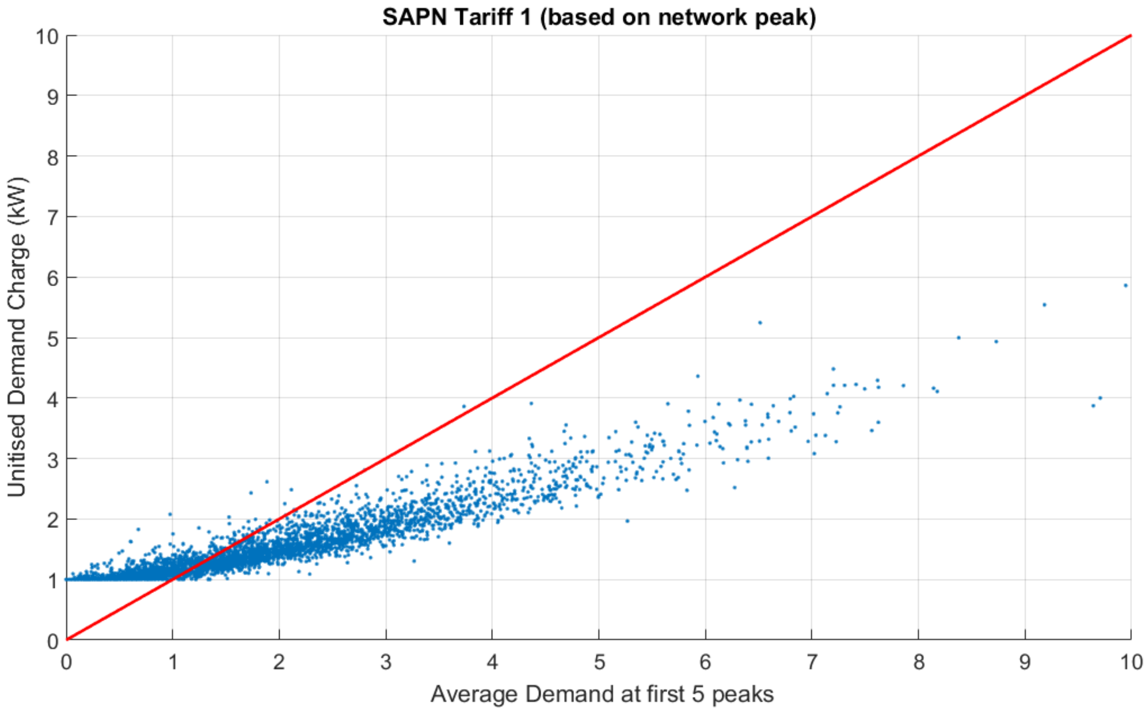


Figure 8. Unitised Demand Charge based on Customer Demand at Time of Network Peak vs Average Demand at Time of 5 Highest Network Peaks – only summer and winter months

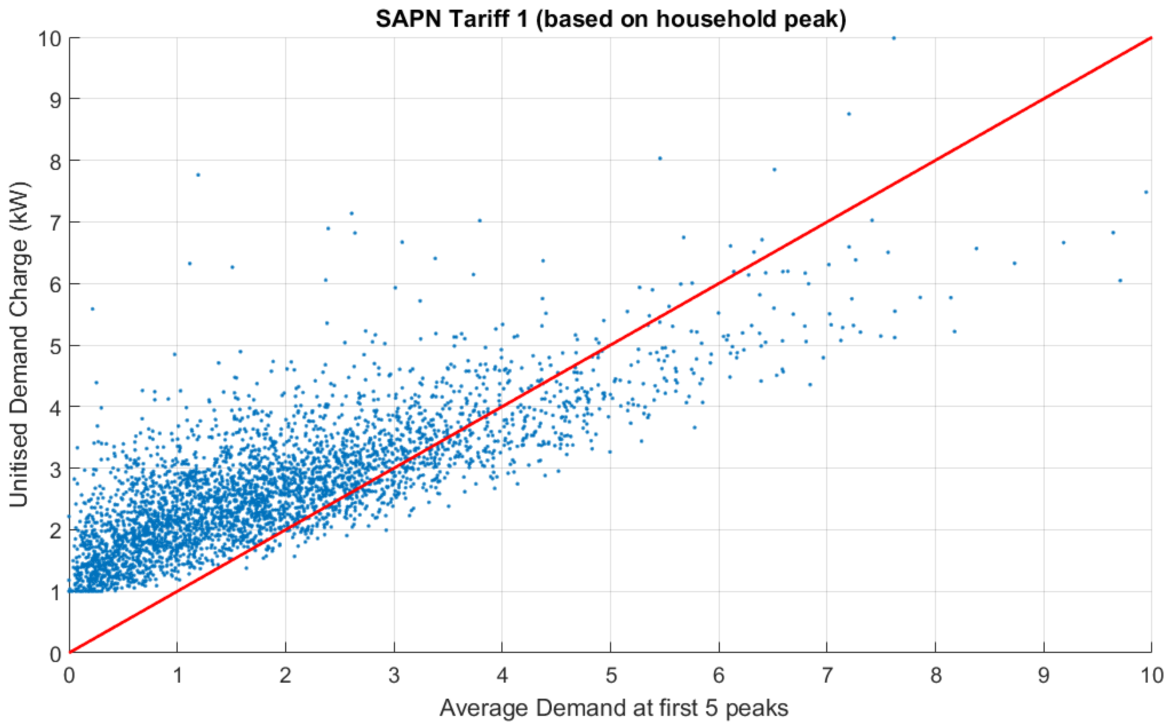


Figure 9. Unitised Demand Charge vs Average Demand at Time of 5 Highest Network Peaks – SAPNs standard demand tariff

It can be seen that in Figure 8, as the customer demand increases, it appears that the unitised demand charge does not increase as much as it should as customers place higher demands on the network. This is because the fixed daily charge has been incorporated into the demand charge as the 1kW minimum for all 12 months. Removal of this min 1kW charge from the autumn and spring months (when the demand charge component doesn't apply), results in the chart in Figure 10, which has a much better correlation (0.942).

The final step is to alter the demand charge tariff so that instead of it being based on the customer's demand at the time of the monthly network peak, it is based on the customer's demand at the time of the network's 5 annual peaks. This results in the chart in Figure 11, which shows a very good correlation between what the customer pays and the costs they impose on the network, with a correlation coefficient of 0.993. This is of course expected because the demand charge is applied to the customers' demand at the time of the highest network peaks, and then we are comparing this to the network's 5 highest peaks. However, it shows that this is how to achieve a highly cost-reflective tariff. The small amount of scatter is caused by the 1kW minimum still being applied to the summer and winter months.

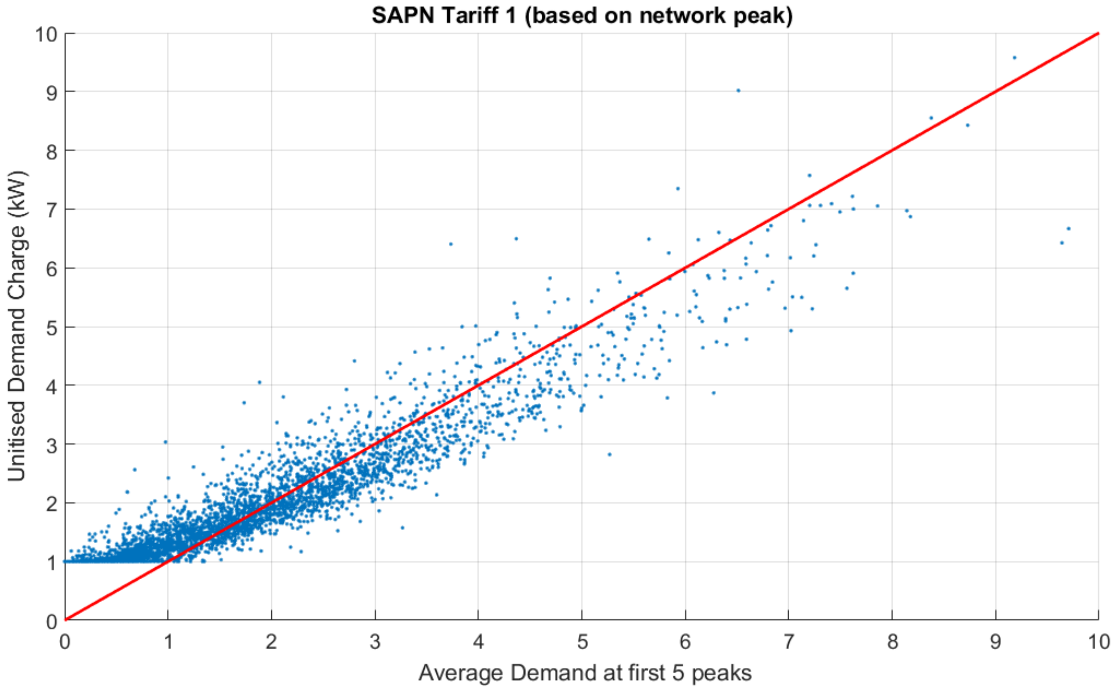


Figure 10. Unitised Demand Charge based on Customer Demand at Time of Network Peak vs Average Demand at Time of 5 Highest Network Peaks – only summer and winter months, with min 1kW charge removed

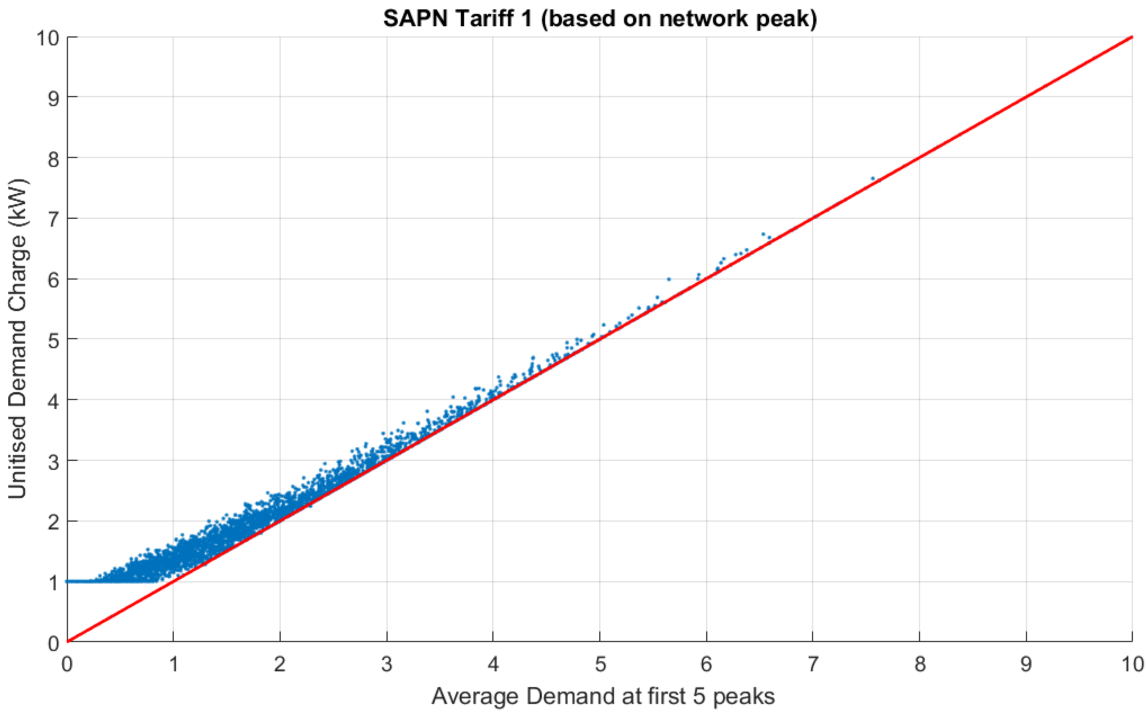


Figure 11. Unitised Demand Charge based on Customer Demand at Time of Network Peak vs Average Demand at Time of 5 Highest Network Peaks – only summer and winter months, with min 1kW charge removed, with demand charge applied to customer demand at network's 5 annual peaks

Thus, it appears possible to improve SAPN's demand charge tariff. Of course, this sort of analysis would need to be performed using SAPN load data. It would need to:

- take into consideration the need to minimise the number of peak days assessed, for example by focusing only on summer and winter months (to reduce the amount of kW and kWh 'lost' to the customer, and so minimise the dead weight loss),
- yet also allow sufficient network peak days to be assessed (to reduce the chance of bill shock and make the tariff more relevant to multiple network peak periods - although this is entirely dependent on the level of demand response), and
- adjust the level of the demand charge as well as the variable and fixed components.

But what does the customer 'see'?

A further level of complication is how to translate the final demand charge structure into a retail tariff. This may not be as complicated as it seems. Analysis of the SGSC data shows that all the top 35 peaks are in either summer or winter, and all bar one are between 5.30pm and 7.30pm. This is not necessarily the case for all networks, but it is likely for residential areas.

Figure 12 shows the network's annual peak demand day for an average household (ie. the network's load profile), as well as the summer average. As is currently the case, the household would only be presented with a 'demand charge window' during which the demand charge may be applied – for example only in the summer and winter months. If the peak was expected to occur in the 6pm to 6.30pm period, the 'window' could be fairly broad - from 3.30pm to 7.30pm (in order to capture a demand peak at a different time and to spread any demand response over a wider area to help flatten the peak).[7] This sets the price signal that the household 'sees'. However, the 'demand charge period', which determines the cost faced by the household, would only be applied over a shorter time and to an average of the household's demand during, for example, the top 5 network peaks, over the 2 hour period (4.30 to 6.30pm) discussed above.

Note that this will still result in a fair amount of dead weight loss because the demand charge window is being applied to all the summer and winter months. The only way to avoid this is to use more of a critical peak charge where the customer is notified of a peak event beforehand.

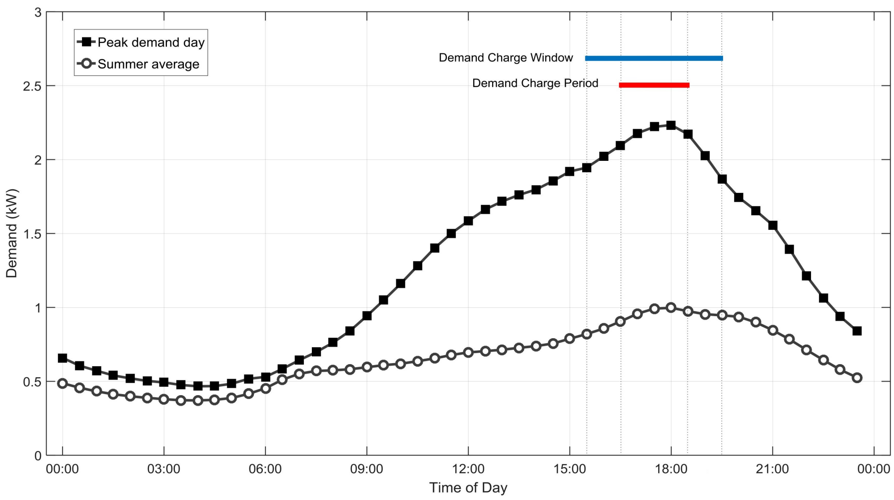


Figure 12. Sumer Peak and Average Demand Days, with Demand charge Window and Period

[7] All the SGSC top 20 peaks occurred between 5.30 and 7.30pm.

Of course, as discussed in the AEMC's Rule Determination 'National Electricity Amendment (Distribution Network Pricing Arrangements) Rule 2014', in addition to cost-reflectivity, fairness is an important criterion when designing tariffs. Fairness applies not only to allocation of the short-term costs (LRMC) to those most responsible for them, but also allocation of historical responsibility.

Allocation of these sunk or 'residual' costs is another ongoing area of research for the APVI. Whereas the above discussion relates to the structure of the tariff, the allocation of residual costs relates more to how the network operator's costs are assigned to the different components of that structure – while minimising distortions to the forward looking price signal and therefore distortions in consumer behaviour. We have not addressed this area of research in this submission, although we have in our submission to Ergon's and Energex's TSSs.

Responses to AER Issues Paper Questions

General issues

AER Question: (2): What are the advantages and disadvantages of using the times, days and months of anticipated constraints on network assets to set charging windows for a demand tariff, as opposed to observations of past demand on the network as a whole?

APVI Response

If the aim of the demand charge tariff is to signal to customers the times when it is most expensive to use the network, then the charging windows should be based on the anticipated constraints of the section of the network that serves those customers. However, this has to be balanced against the need for simplicity in designing different tariffs for customers in different sections of the network. Once the optimal tariff structure has been designed, then it should be possible to alter the size of the different components of that tariff for different substations and locations.

AER Question: (3): Does the tariff statement sufficiently inform stakeholders on the times, days and months when the network is likely to be under most stress and therefore the ideal timing of the charging windows?

APVI Response

The tariff statement does sufficiently inform stakeholders on the times, days and months when the network is likely to be under most stress. However, as discussed above, it does not then justify the timing of the charging windows.

AER Question: (4): What are the advantages and disadvantages of the proposal to have a minimum level of demand in demand based tariffs instead of including a direct fixed charge component?

APVI Response

The fixed charge is meant to cover the fixed costs of supply, which are independent of usage, and the demand charge component is meant to cover costs related to demand peaks. Combining them means that large customers (who in each month always have a demand peak above the threshold), either (i) never pay the fixed charge or (ii) the demand charge is less proportional to their demand peaks than it is for smaller customers. Thus, our position is that they should be kept separate.

The impact of incorporating payment for the fixed charge into the demand charge can be seen when Figure 8 and Figure 10 are compared, where Figure 10 demonstrates a much better correlation between what the customer pays and the costs they impose on the network.

AER Question: (5): What are the advantages and disadvantages of calculating a demand tariff over a narrow 30 minute period as opposed to two hours as SA Power Networks intends to explore?

APVI Response

Our work indicates that it is preferable to apply the demand charge over an average demand longer than the normal 30 minute period.[8] Although the AER states it would serve to further average and weaken a price signal that itself is already highly averaged, the price signal that the customer receives, and which influences their behaviour, is more the demand charge window, not the half hour peak, since most households would have little idea of when their own demand peak is.

As SAPN indicates, a longer charging period will help to reduce bill shock for customers, but it can also help to charge customers more fairly based on their actual contribution to network constraints.

Networks are not just a static piece of equipment, but themselves have characteristics that change over time in the short term. As network demand increases, components such as transformers heat up, and it is the heat build-up that eventually results in a capacity constraint. Thus, it is not so much an instantaneous peak that limits the network but more the 'area under the curve' that results from the peak demand and the time over which it occurs. In this case, a price signal should also be directed prior to the peak – which will not only help to pre-cool transformers, but should also help to direct demand to later in the day, when it is cooler.

Thus, the averaging period should extend prior to the network demand peak, not simply be an average of either side of the network demand peak.

Networks also need to signal to households a period over which the demand charge may be applied. For a given section of the network, it should be possible to identify a period during the day (say 5 hours) that spans the network's likely demand peaks. From the household's point of view, this approach should be no more complicated than the demand charges currently available.

Figure 13 (which is a repeat of Figure 12 above) shows the network's annual peak demand day for an average household, as well as the summer average. As is currently the case, the household would only be presented with a 'demand charge window' during which the demand charge may be applied – for example only in the summer and winter months, or possibly all year. If the peak was expected to occur in the 6pm to 6.30pm period, the 'window' could be fairly broad - from 3.30pm to 7.30pm (in order to capture a demand peak at a different time and to spread any demand response over a wider area to help flatten the peak). This sets the price signal that the household 'sees'. However, the 'demand charge period', which determines the cost faced by the household, would only be applied over a shorter time and to an average of the household's demand during, for example, the top 5 network peaks, over the 2 hour period (4.30 to 6.30pm) discussed above.

[8] We have not incorporated this into the work described above because the benefits of pre-cooling of transformers etc is a demand-response and so wouldn't show up in the 'static' modelling used here.

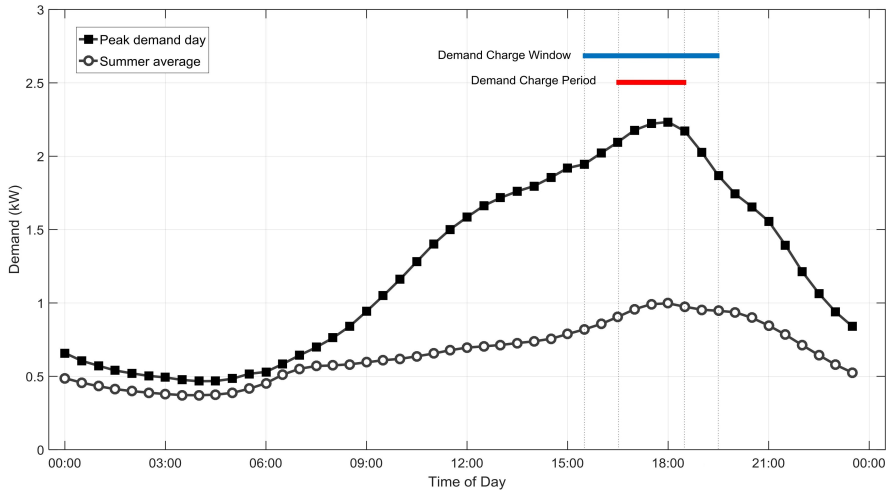


Figure 13. Sumer Peak and Average Demand Days, with Demand charge Window and Period

Proposed mandatory tariffs

AER Question: (6): Do existing customers require greater protection from tariff change impacts compared to new customers or customers making new investments (such that they might require a new smart meter)?

APVI Response

As far as we can tell, the following summarises the different categories of customers that could receive the demand charge tariff. It would have been very helpful if SAPN had provided an equivalent simple list.

1. 'Opt-in' Existing customers – full demand charge tariff
2. New customers from 1 July 2018 – 'transitional' demand-based tariff, where the demand charge is set at 40% and the demand component rate is constant throughout the year. In 2021, the demand charge increases to 60%, then 80% in 2022, then 100% in 2023.
3. Altered[9] connections - 'transitional' demand-based tariff as above.
4. 'Threshold' Existing customers more than 20GWh/annum – either 'transitional' demand-based tariff as above, or, if they do not have appropriate metering, a standard usage tariff but with a higher usage charge.

Of these, only the 'threshold' customers could require greater protection. However, given that it is another 2 years until the 'transitional' demand-based tariff would be in place, this should be enough time for customers to adjust.

[9] Alterations include physical supply changes; new inverter approval; new major appliances > 25amps; change to three phase 44 power.

AER Question: (7): What are the advantages and disadvantages of assigning a demand tariff to customers consuming above a threshold or triggering an assignment by having a new/altered connection?

APVI Response

Given that demand tariffs are designed to send a strong price signal to customers regarding their contribution to network costs, it makes sense to target customers based on their likely contribution to those costs.

Threshold customers: There is some correlation between a customer's annual demand and their contribution to the network peak, and so it is likely that high-use 'threshold' customers bear more of the responsibility for the size of the network, and therefore its cost – both in the current year and historically. It therefore makes sense for these customers to be targeted for a demand-based tariff. The threshold of 20MWh/annum is about triple the SA residential average and so it may be appropriate to gradually reduce this threshold over time.

Altered connections: Alterations such as new major appliances > 25amps and changes to three phase 44 power may well justify moving the customer to a transitional demand charge, because these alterations may increase the customer's demand peaks and therefore the costs they impose on the network. A 25amp appliance at 240V has a power rating of 6kW, which is significant.

An alteration, such as a new inverter approval, is most likely associated with a solar PV system (or some other form of distributed generation) and/or a battery system. The most likely impact that they will have on the customer's demand peak is to reduce it, and so it makes no sense to target them with a demand charge tariff. Although an interval meter may be required for a demand charge tariff to be implemented, this does not mean that a demand charge tariff should be implemented just because an interval meter is installed.

If SAPN's intention was to target technologies that really do increase costs to other customers, they would be targeting air conditioners (A/C). A/Cs have been shown to be primarily responsible for the increases in network size and therefore costs to customers, however, unlike solar PV systems, they also increase revenue to networks – both through increased sales and an increased Regulated Asset Base.

The 25amp threshold is equivalent to a 6kW A/C load, which is very large. Reducing both this threshold and the 20MWh/annum threshold, over time, would appear to be a much more appropriate approach to phasing in demand charge tariffs than targeting technologies just because they reduce SAPN's income.

AER Question: (8): Will customers sufficiently understand the proposed triggers and thresholds for being assigned a demand tariff at the time of making a new investment (e.g. solar panels, 3-phase power etc)? What practical challenges might result?

APVI Response

This depends on both how well they are explained, as well as whether they make sense. As above, the triggers and thresholds should be based on whether a customer is likely to increase network costs, not on whether they may decrease SAPN's income. Graphical representations should be used to clearly illustrate the problem and the solutions.

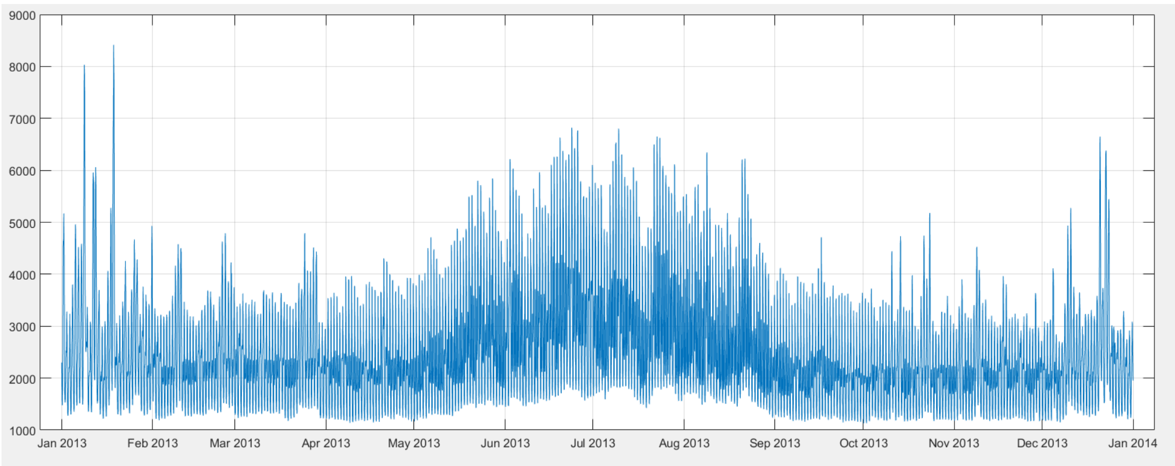
AER Question: (9): What are the advantages and disadvantages of the 'transitional' demand tariff (being assigned to certain customers) not reflecting seasons (that is, not charging higher in summer vs winter)?

APVI Response

This is actually a very complicated issue, and made even harder to answer by the lack of data specific for the SAPN network. The chart below shows the aggregated half hourly demand for the 3,876 households from the Smart Grid Smart City database for 2013.

Although the annual peak is in summer, of the top 50 days, only six days are in summer 1st, 2nd, 5th, 11th, 24th, and 27th). All the rest are in winter. This means that if only the summer days are targeted in the demand charge, and customers respond, the winter days will quickly become the peak days. Of course, if the network has already been sized to meet the summer peaks, the winter peaks will not be a problem – unless demand in general increases, or, if there is a genuine desire to really reduce customer costs and so reduce the size of the network over time.

Thus, depending on SAPN's feeder profiles, they could start with summer demand charges only, then, depending on the customer response, add in a winter demand tariff component. Alternatively, it may be that the transitional demand charge tariff, if appropriately applied to customers most responsible for network peaks, will be sufficient to flatten demand.



Proposed opt-in tariffs

AER Question: (10): What are the advantages and disadvantages of SA Power Networks offering additional opt-in tariffs, including more cost reflective variants of the proposed demand tariff or other tariff designs?

APVI Response

This would seem to be a good idea as it means that SAPN will be able to assess the impact of these different tariffs on customer load, as well as customer interest in different types of tariff structures. Of course, it would be useful if the data were made available to the general public so independent assessment could be carried out.

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AER Question: (11): Are there practical impediments to offering a menu as opposed to a single set of opt-in tariffs?

APVI Response

Again, this depends on both how well they are explained, as well as whether they make sense. Choice can be good for customers, but too much choice can be confusing, unless clear examples can be provided to show when each option is most suitable.

Customer impacts

AER Question: (16): Do existing customers require a greater protection from the impact of tariff changes than customers who are new or making new significant investments?

APVI Response

This question is essentially identical to Question 6.

AER Question: (17): What are the advantages and disadvantages of new investment customers and customers consuming above a threshold being automatically assigned a new demand tariff?

APVI Response

We have answered this question in Question 7.

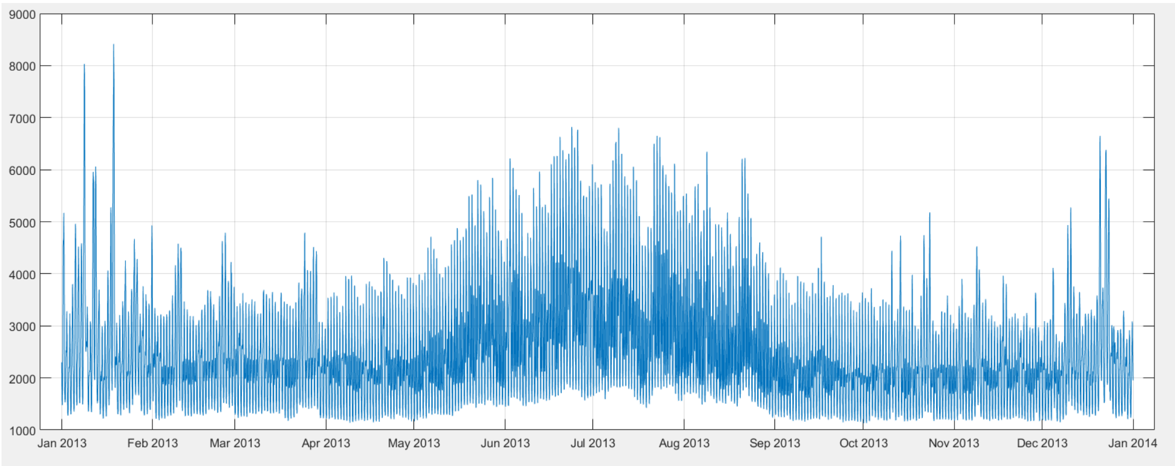
AER Question: (18): What are the advantages and disadvantages of the 'transitional' demand tariff (assigned to customers), having its level increasing over 6 years, and not reflecting a higher summer vs winter charge?

APVI Response

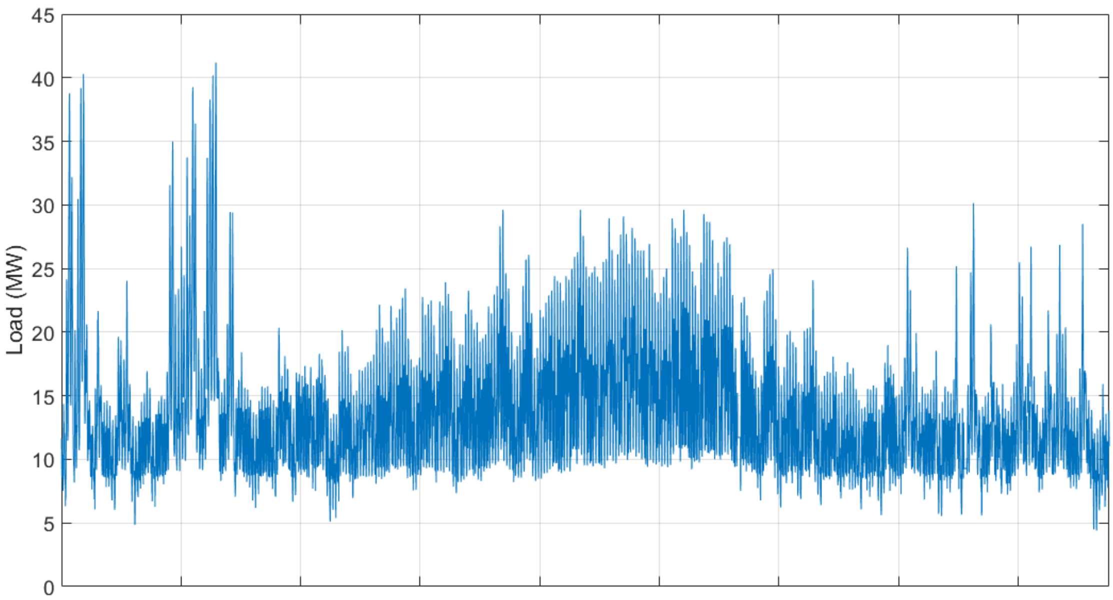
Assuming that the demand charge is designed properly (see above discussion), it may be appropriate to increase the tariff over a shorter period than six years. If the demand charge is effective in reducing the summer peaks, equal summer and winter demand charges may then be more appropriate than higher summer rates. This would require analysis based on SAPN's own load data.

Attachment A: SGSC and SAPN load profiles

Smart Grid Smart City annual load profile used for the analysis in the submission



Annual load profile for one of SAPN's residential substations



Attachment B: Background on the APVI

The APVI is an independent Institute comprising companies, government agencies, individuals, universities and research institutions with an interest in solar photovoltaic electricity. In addition to Australian activities, we provide the structure through which Australia participates in the International Energy Agency (IEA) PVPS (Photovoltaic Power Systems) and SHC (Solar Heating and Cooling) programmes, which in turn are made up of a number of activities concerning PV and solar system performance and implementation. Further information is available from www.apvi.org.au.

APVI Objective

The objective of the APVI is to support the increased development and use of PV via research, analysis and information.

APVI subscription provides:

Information

- Australian PV data and information
- Standards impacting on PV applications
- Up to date information on new PV developments around the world (research, product development, policy, marketing strategies) as well as issues arising
- Access to PV sites and PV data from around the world
- International experiences with strategies, standards, technologies and policies

Networking

- Opportunity to participate in Australian and international projects, with associated shared knowledge and understanding
- Access to Australian and international PV networks (PV industry, government, researchers) which can be invaluable in business, research or policy development or information exchange generally
- Opportunity to meet regularly and discuss specific issues which are of local, as well as international interest. This provides opportunities for joint work, reduces duplication of effort and keeps everyone up to date on current issues.

Marketing Australian Products and Expertise

- Opportunities for Australian input (and hence influence on) PV guidelines and standards development. This ensures both that Australian products are not excluded from international markets and that Australian product developers are aware of likely international guidelines.
- Using the information and networks detailed above to promote Australian products and expertise.
- Working with international network partners to further develop products and services.
- Using the network to enter into new markets and open new business opportunities in Australia.

The International Energy Agency Programmes

PV Power Systems (IEA PVPS)

- **Mission:** *To enhance the international collaborative efforts which facilitate the role of photovoltaic solar energy as a cornerstone in the transition to sustainable energy systems*
- **Focus** (26 countries, 5 associates)
    - PV technology development
    - Competitive PV markets
    - Environmentally & economically sustainable PV industry
    - Policy recommendations and strategies
    - Neutral and unbiased information

Australia currently participates in:

PVPS Task 1: Information Dissemination

PVPS Task 9: PV Services for Regional Development

PVPS Task 13: PV System Performance

PVPS Task 14: High Penetration PV in Electricity Grids.

Solar Heating & Cooling (IEA SHC)

- **Mission:** *International collaboration to fulfil the vision of solar thermal energy meeting 50% of low temperature heating and cooling demand by 2050*
- **Focus** (21 countries, 2 associates)
    - Components
    - Systems
    - Integration into energy system
    - Design and planning tools
    - Training and capacity building

Current Australian participation:

- SHC Task 51 – PV in Urban Environments
- SHC Task 48 – Quality Assurance Support Measures for Solar Cooling Systems
- SHC Task 47 – Solar renovation of non-residential buildings
- SHC Task 46 - Solar Resource Assessment and Forecasting
- SHC Task 43 - Solar Rating & Certification Procedures
- SHC Task 42 - Compact Thermal Energy Storage
- SHC Task 40 - Net Zero Energy Solar Buildings

For further information on the Australian PV Association visit: **www.apvi.org.au**

For further information on the IEA PVPS Programmes visit **www.iea-pvps.org and www.iea-shc.org**