(Re)designing Cost-Reflective Tariffs

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CRP is very complicated

- Tariffs divided into: transmission, distribution, retail/wholesale
- Distribution:
  1. Augmentation costs – SRMC and LRMC? decreasing demand peak?
  2. Sunk/residual costs – how to allocate? historical responsibility?
  3. O&M costs – just a per kWh charge?
- How to:
  1. Calculate & allocate each of these
  2. Design tariffs that people want to take up, use and keep!
- Tariffs consist of structure and price components
- Here focus on
  - **Structure**, and how to design a tariff so that a household’s bill correlates to its contribution to the demand peak and augmentation costs
  - **Residual costs?**
Demand charge-based tariffs from all DNSPs in Qld, Vic, ACT, Tas, SA, but not yet NSW

**SAPN’s Low Voltage Residential Actual Demand Tariff – DUOS 2017/18 (incl. GST)**

<table>
<thead>
<tr>
<th>Capacity - peak</th>
<th>Peak demand from 4 – 9pm (based on max half-hour demand) in each summer month. Every day.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate</td>
<td>$15.8358/kW/month (Nov – March)</td>
</tr>
<tr>
<td>Capacity – off peak</td>
<td>Peak demand from 4 – 9pm (based on max half-hour demand) in each non-summer month. Every day.</td>
</tr>
<tr>
<td>Rate</td>
<td>$7.9162/kW/month (April – Oct)</td>
</tr>
<tr>
<td>Energy</td>
<td>7.909c/kWh any time</td>
</tr>
<tr>
<td>Fixed</td>
<td>A min 1kW off-peak capacity charge</td>
</tr>
</tbody>
</table>
# Comparing DNSPs demand charge tariffs

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>DNSP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand charge applied to 4 highest demand days in month</td>
<td>Ergon</td>
</tr>
<tr>
<td>Demand charge applied to single highest demand day in a month</td>
<td>Rest</td>
</tr>
<tr>
<td>Same demand charge all year</td>
<td>Energex, ActewAGL</td>
</tr>
<tr>
<td>Different rates in summer/non-summer months</td>
<td>Rest</td>
</tr>
<tr>
<td>Two peak periods in each day</td>
<td>ActewAGL, TasNetworks</td>
</tr>
<tr>
<td>Min demand charge as fixed daily charge</td>
<td>Ergon, SAPN, United Energy</td>
</tr>
</tbody>
</table>
Assessing demand charge tariffs

SAPN

Demands at the time of network peak (kW)

Utilised Demand Charge (kW)
Unitised demand charge

- Monthly demand rates converted to equivalent kW value
- Sum of monthly demand charges = 1kW
  - eg 1. If demand charge rate is same each month, unitised demand charge in each month = 1/12 kW
  - eg 2. If demand charge rate is twice as large in 6 months as in the other 6, then unitised demand charge
    - in higher months = 2/18 kW
    - in lower months = 1/18 kW
- Provides a visual correlation between what customer pays and the costs they impose on the network
- Also makes different tariffs easier to compare
Unitised demand charge

- Demand at time of network peak is high
- Customer's own demand peaks are high
Unitised demand charge

Demand at time of network peak is high

Customer’s own demand peaks are high
Unitised demand charge

Demand at time of network peak is high

Customer's own demand peaks are high
Other DNSP tariffs are very similar
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![Graph showing the relationship between unitised demand charge (kW) and demand at the time of network peak (kW).]
Unitised demand charge

Demand at the time of network peak (kW)

Unitised Demand Charge (kW)

SAPN
Of top 50 peaks, only 6 are in summer.
CC vs number of peaks

[Graph showing correlation coefficient (CC) vs number of peaks for SAPN Tariff 1, with lines indicating correlation based on network monthly peak and household monthly peak.]
Low CC

![Graph showing the relationship between unitised demand charge (kW) and demand at the time of network peak (kW). The graph is labeled SAPN and includes a trend line.](image)
High CC

Tariff 1 (Summer/Winter without min demand based on network peak)

Unifised Demand Charge (kW)

Average Demand at first 5 peaks

0   1   2   3   4   5   6   7   8   9   10
CC vs number of peaks

SAPN Tariff 1

- Red line – CC for SAPN’s tariff (non-coincident)
- Blue line – CC for coincident demand
UDC compared to first 5 network peaks
DC only during summer and winter

Tariff 1 (Summer/Winter w1kW for all months based on household peak)
DC applied to coincident demand (all year)
## Coincident demand pricing

<table>
<thead>
<tr>
<th>Problem</th>
<th>In fact ....</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer won’t know when peak is</td>
<td>Customer’s own peak can occur at any time of day and all through year. Network peak is much more predictable.</td>
</tr>
<tr>
<td>Tariff too complicated</td>
<td>Tariff identical to standard demand charge tariff ie. Charge applied between eg. 4.30 to 7.30 during summer/winter months.</td>
</tr>
<tr>
<td>Is ex post (after the fact)</td>
<td>All elec bills are ex post. From customer’s point of view is the same. Difference is that the DNSP has to go back and calculate.</td>
</tr>
</tbody>
</table>
Summer peaks are more aggregated

Both same time and same day
DC applied to coincident demand (all year)
DC applied to coincident dem summer & winter

Tariff 1 (Summer/Winter w1kW for all months based on network peak)
Then no 1kW min charge
Original SAPN demand charge tariff

Tariff 1 (based on household peak)
Coincident dem, summer/winter, no 1kW

Tariff 1 (Summer/Winter without min demand based on network peak)
As previous but compared to single peak

Tariff 1 (Summer/Winter w1kW for only for S/W months based on network peak)
Original SAPN demand charge tariff
Coincident dem, summer/winter, no 1kW

Tariff 1 (Summer/Winter w1kW for only for S/W months based on network peak)
With 1kW min removed

Tariff 1 (Summer/Winter without min demand based on network peak)
Then no 1kW min charge
Conclusions

- Demand charges more cost-reflective if applied to coincident demand in summer and winter (for this dataset, but for other datasets the same principle applies)
- Comparisons to the ‘5 peaks’ assumes some demand response
- Approach would work equally well for a rebate-based tariff
Good correlation but household peaks aren’t what causes network peak
Residual costs … coincident peaks

Poor correlation

Compare demand at network peak (2011 vs 2013) CC: 0.55
Again, good correlation but household peaks aren’t what causes network peak.
Residual costs ... kWh vs coincident peaks

Better correlation, but still not great. So best to apply residual costs to kWh charge?
Thank you
Questions?
Mismatch - kW

![Graph showing the relationship between Household Peak Reduction and Network Peak Reduction against Cap (kW).]
Possible demand charge tariff
Annual Peak – 20 houses
Summer peak?

- Aggregated (network) peak is in summer, but ....

![Blacktown, season of household peak load](image1)

- Summer: 49%
- Autumn: 28%
- Spring: 11%
- Winter: 11%

![Ausgrid 300, season of household peak load](image2)

- Summer: 54%
- Autumn: 29%
- Spring: 12%
- Winter: 6%