15th October 2018

Keys to overcoming barriers to EV-grid integration already in hand

Transport and Environment workshop on Grids, renewables and e-mobility: how to get the maximum out of the three
Trigger for our analysis

- Often hear that grids will face blackouts with EVs connecting to them and that we will need massive investments in distribution grids
- But little you hear about the current use of existing distribution networks
- Making best use of existing networks → spread cost across higher usage and minimise future investments
Utilisation rate for networks

• Similar to load factor for power plants
• Maximum capacity unknown – maximum flow used as a proxy
  • Rates calculated an overestimation of real rates
• Conclusion: existing networks are significantly undertulised
• **No obligation** on network companies to monitor the use of the grids
Distribution networks significantly underutilised

[Bar chart showing utilisation rates for Westnetz, Edis, and France for annual, peak day, and typical summer day scenarios.]

Utilisation Rate [%]

- Westnetz
- Edis
- France

Region

Annual
Peak day
Typical summer day
Significant spare capacity even on the peakiest of days
How can we make best use of existing networks?

• While equitably distributing the costs to integrate e-mobility?

• Two key levers

  1. Smart pricing: time-differentiated, usage-based pricing both for energy and delivery is essential
  2. Smart technology (e.g. smart meters): to maximise benefits of smart tariffs and vice versa
EV Tariffs - Minnesota

Standard rate for residential consumers

<table>
<thead>
<tr>
<th>Anytime Winter</th>
<th>Anytime Summer</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.032¢/kwh</td>
<td>10.582¢/kwh</td>
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EV rate for residential consumers

<table>
<thead>
<tr>
<th>Off-Peak Year Round</th>
<th>On-Peak Winter</th>
<th>On-Peak Summer</th>
</tr>
</thead>
</table>

Source: Xcel Energy

For customers on the ToU rate, more than 92% of charging occurs during the off-peak window
RES, Grids and e-mobility: Time-of-use tariff in Hawaii

Hawaii Time of Use Rate Over 24-hour Period

- Midnight (0-6 AM): $5.00 per kWh
- Nighttime (7 AM-11 PM): $15.00 per kWh
- Peak (12 PM-6 PM): $35.00 per kWh

Hourly Price ($/kWh)
Policy recommendations

- Foster well-functioning, and competitive wholesale and retail markets
- Networks: establish dynamic tariffs for controllable loads (e.g. EVs, heat pumps)
- Enable and support the deployment of smart technology
- Consumer education essential
- Performance based regulation: align public policy objectives with monopoly targets
- Monitoring: establish metrics and targets (e.g. grid utilisation)
Resources from RAP

- Treasure Hiding in Plain Sight: Launching Electric Transport with the Grid We Already Have
- Cleaner, Smarter, Cheaper: Network tariff design for a smart future
- Beneficial Electrification: Ensuring Electrification in the Public Interest
- Smart Rate Design for a Smart Future
- Designing Distributed Generation Tariffs Well
- Next-Generation Performance-Based Regulation
- Getting From Here to There: Regulatory Considerations for Transportation Electrification
About RAP

The Regulatory Assistance Project (RAP)® is an independent, non-partisan, non-governmental organization dedicated to accelerating the transition to a clean, reliable, and efficient energy future.

Learn more about our work at raponline.org
Smart tariff design can deliver demand response, downwards and upwards.

The SMUD tariff

Figure 17. Example Residential Time-of-Use Rate

Summer
Residential Time-of-Day (5-8 p.m.) Rate
June 1-Sept. 30

Peak
Mon.-Fri. only 5-8 p.m.

Mid-Peak
Mon.-Fri. only 8 p.m.-midnight

Off-Peak
Mon.-Fri. Midnight-noon
All hours on weekends and holidays

Value of Flexibility for Integrating Renewable Energy

Avoid Home Charging during these hours

Source: California ISO