Assessment of Residential Net Metering Subsidies

PRESENTED BY
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What is NEM?

Net energy metering

- I install solar on my roof
- When my panels produce less than I’m consuming, I only pay for net consumption
- When my panels produce more than I’m consuming, I get to sell back to the grid at my retail rate
Why is NEM?

- Hard to measure, as long as I’m still drawing from the grid
- Perceived as socially beneficial support for solar
- Subsidies are popular
Why was NEM (possibly) helpful?

— Subsidies can be a good thing
  • Spillovers and learning-by-doing
  • Climate change!
— But these arguments only apply if you think rooftop solar is a good thing to have
  • It’s expensive
  • Capacity factors are low
  • “Cleaning the power sector is only one component of decarbonization, and studies have shown that using rooftop solar is one of the most expensive means possible to do so.” —Behlihomji and Pulgar (two hours ago)
Why is NEM a problem?

Retail rates are not social costs
Why is NEM a problem?

Retail rates are not social costs

- Utilities get almost all of their revenue through volumetric rates
  - $ per kWh
- My solar panels mean I’m reducing my contribution to the grid by more than I’m reducing the grid’s costs
- Utilities still get paid, just not by me
Literature (small, non-random sample)

- Alexander, Brown, and Faruqui (2016)
- Behlihomji and Pulgar (2019)
- Borenstein (2017)
How much does this matter?

- It depends!
Net Energy Metering and its unintended consequences

NEM policies create a cross-subsidy issue from non-solar customers to solar customers

*These subsidies grow rapidly with the increased penetration of rooftop solar*
Brattle undertook a study to quantify the magnitude of these NEM cross-subsidies using data from a diverse group of sixteen U.S. utilities. Our study presents three enhancements to the previous studies with similar objectives:

- We selected 16 utilities with varying geographic locations, size, distributed generation (DG) policy and rooftop PV penetration levels in order to achieve a broad representation of the utility landscape in the U.S.
- We developed a methodology to quantify the NEM subsidies and applied it consistently to all utilities included in the study, enabling side-by-side comparisons of NEM subsidies.
- Our methodology is based on a cost-of-service approach, rather than a cost-and-benefit approach, and explicitly identifies the costs avoided by NEM customers and is therefore more transparent.
Study Scope (cont’d)
16 utilities in 14 states

Legend
- Total residential customers
- Total DG residential customers
- Average DG installed capacity per customer

Total residential customers
- > 2,000,000
- > 1,000,000 and < 2,000,000
- > 500,000 and < 1,000,000
- < 500,000

- Idaho Power, ID
  - 426,966 cust
  - 0.2% of customers
  - $ 4.8 kW/cust

- Westar, KS
  - 327,214 cust
  - 0.1% of customers
  - $ 6.2 kW/cust

- KCPL, KS
  - 222,425 cust
  - <0.1% of customers
  - $ 7.0 kW/cust

- Xcel Energy, MN
  - 1,131,107 cust
  - 0.1% of customers
  - $ 5.8 kW/cust

- Indianapolis P&L, IN
  - 432,975 cust
  - <0.1% of customers
  - $ 5.5 kW/cust

- Rocky Mountain Power, UT
  - 780,158 cust
  - 2.0% of customers
  - $ 5.0 kW/cust

- NV Energy, NV
  - 796,196 cust
  - 2.6% of customers
  - $ X kW/cust

- PGE, CA
  - 4,402,442 cust
  - 6.1% of customers
  - $ 5.3 kW/cust

- SCE, CA
  - 4,401,781 cust
  - 4.7% of customers
  - $ 5.3 kW/cust

- APS, AZ
  - 1,061,814 cust
  - 5.2% of customers
  - $ 6.3 kW/cust

- PNM Resources, NM
  - 451,248 cust
  - 1.7% of customers
  - $ 4.4 kW/cust

- OGE, OK
  - 654,457 cust
  - <0.1% of customers
  - $ 3.7 kW/cust

- Ameren, MO
  - 1,047,640 cust
  - 0.1% of customers
  - $ 5.4 kW/cust

- Con Edison, NY
  - 2,187,429 cust
  - 0.5% of customers
  - $ 6.4 kW/cust

- Louisville G&E, KY
  - 356,424 cust
  - 0.1% of customers
  - $ 3.8 kW/cust

- Duke Energy, NC
  - 1,669,923 cust
  - 0.1% of customers
  - $ 5.4 kW/cust
Study Methodology

We relied on the cost-of-service approach, which is reliable but very data intensive. We collected the required data from publicly available data sources and by reaching out to our contacts at the utilities studied.

Our methodology involves four main steps:

**Step 1:** Calculation of DG customers’ electricity usage and peak demand

**Step 2:** Calculation of DG customer bills for pre- and post-DG

**Step 3:** Calculation of Cost of Serving DG customers for pre- and post-DG

**Step 4:** Calculation of NEM subsidy
NEM Subsidy Summary ($/cust./mo.)

The NEM subsidies range in $22-$105/cust./mo. across utilities

Note: For utilities who did not provide the DG customer profiles, the numbers are based on average NEM subsidies across the four scenarios. For SCE and APS, the numbers are without inter-class cross-subsidies for comparability to other utilities.
Aggregate NEM Subsidy ($million/year)

For some utilities such as PG&E and SCE, the subsidies reach $339M and $247M, respectively

Note: For utilities who did not provide the DG customer profiles, the numbers are based on average NEM subsidies across the four scenarios. For SCE and APS, the numbers are without inter-class subsidies for comparability to other utilities.
Cross-Subsidy Conclusions

Our study shows that NEM policy has led to substantial subsidy issue between DG customers and non-DG customers

- The subsidies can reach as high as $100/customer/month for some utilities such as PGE and SCE with a total amount of $340 and $250 million per year.
- Other utilities such as APS and NV have between $60-$70/customer/month with a total amount of $20-$40 million per year.
- NEM subsidies for the rest of utilities mostly are around $20-$50/customer/month

This means that non-DG customers are currently covering tens of millions to hundreds of million dollars of the cost of serving DG customers
Cross-Subsidy Conclusions

Some states, such as New York, California, Arizona, Utah, have adopted modifications to lower the incentives for DG generation and/or to better quantify the value DG creates for the system.

However, these policies typically apply to new DG customers and customers who have invested in their DG systems prior to the introduction of the new policies are grandfathered.

This implies that the cross subsidy problem will persist until these systems complete their useful lives highlighting that the positive and negative implications of these polices are long-lived.

This is a good reminder for the states that have not experienced large penetrations of DG resources to revisit their net metering policies and adopt cost-based compensation methods before the problem gets worse.
California NEM 2.0

In 2016, California implemented NEM 2.0 as a successor tariff to its former NEM NEM 2.0 continues the existing NEM structure while making adjustments to align the costs of NEM customers more closely with those of non-NEM customers.

<table>
<thead>
<tr>
<th></th>
<th>Former NEM</th>
<th>NEM 2.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interconnection Fee</td>
<td>None</td>
<td>$75-$175</td>
</tr>
<tr>
<td>Non-bypassable charges</td>
<td>Based on net energy consumption over a year</td>
<td>Based on net energy consumption in each metered interval</td>
</tr>
<tr>
<td>Time-of-use rate</td>
<td>Optional</td>
<td>Required</td>
</tr>
<tr>
<td>Installation size limit</td>
<td>1 MW</td>
<td>No limit; interconnection fee gets larger</td>
</tr>
<tr>
<td>IOU program cap</td>
<td>5% of IOU’s aggregated peak demand</td>
<td>No cap</td>
</tr>
</tbody>
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So what should we do? (CRI 2018)

1:20 - 2:50    Concurrent Sessions

DER – RATES I
Chair: Cynthia Fang
Discussants: Neil Lessem, Dennis Keane
Ahmad Faruqui and Walter Graf: Do Load Shapes of PV Customers Differ from other Customers?
Louis Linden, Paul Nelson, and Gigio Sakota: Effective Load Carrying Capacity for Demand Response Resources
Brian Lubeck: Residential Customer Segmentation

2:50 - 3:00    Break

3:00 - 4:30    Concurrent Sessions

DER – RATES II
Chair: Dennis Keane
Discussants: Dhaval Dagli, Tim Mount
Neil Lesseem: New Network Tariff Design in Deregulated Markets
Amparo Nieto: Examining Design Elements of New York’s “Reforming Energy Vision”
Brian Dickman: Regulatory Implication of Grid Evolution – Reforming Rates
Colin Kerrigan: Zero Net Energy Codes on Cost Recovery
So what should we do? (CRRI 2019)

Rates for Distributed Energy Resources

Chair: Cyndee Fang
Discussants: Darryl Biggar

**Amparo Nieto:** Efficient Compensatory Framework for Microgrids and Energy Storage for their Value as Grid and Capacity Resources

**Naim Darghouth:** Implications of Rate Design for the Customer-Economics of Behind-the-Meter Storage

**Joseph Long:** TOU rates effect on Behind the Meter Storage Battery Investment

**Reuben Behlihomji, Erin Pulgar:** Evolution of NEM Cost-Shift
Thanks!
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Installed DG per customer