Net Metering 2.0
Considering New Options to Integrate Distributed Resources

Kit Carson Meeting, Taos, NM

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Effects of Distributed Solar on Rates

Drivers of Effects

• *Penetration level* = total distributed solar generation as a percentage of total retail electricity sales.

• *Net avoided costs* = the value of solar (VoS) to the utility (i.e., benefits minus costs) relative to the utility’s average cost of service (CoS).

• *Solar compensation rate* = payment or bill savings per unit of solar generation, relative to the CoS.

Source: Barbose, G. January 2017: *Energy Analysis and Environmental Impacts Division, Lawrence Berkeley National Laboratory (LBNL): Putting the Potential Rate Impacts of Distributed Solar into Context*
Two Views of Cost Recovery

Traditional Utility View
DG customer “uses” the grid and should pay for it;

Solar Advocate View
Value of distributed resource is greater than the retail rate;
Value of Solar Studies

RMI Survey Of Multiple Studies: Range: $0.04 - $0.30/kWh

Source: Representative Sample from Rocky Mountain Institute 2015
Value of Solar Studies: Utility Economic Values Only

- **Maine Short-Run**: $0.090
- **Maine Long-Run**: $0.138
- **Minnesota**: $0.135
- **Austin**: $0.107
- **Average per-kWh Rate**: $0.115

**Regulatory Assistance Project (RAP)**
High-Cost vs. Low-Cost Utilities
How big is the impact if: 5% of customers install solar over 5 years?

• Assume:
  • Distribution is 40% of the bill
  • No Distribution Cost Savings
  • Average Power Supply Cost = Marginal Power Supply Cost

• Then:
  • Impact on other consumers is 2%
System Cost Impacts

Low levels of saturation: 0% - 5%

Moderate levels of saturation: 5% - 10%
• Voltage Regulation

High levels of saturation: Over 10% of Customers
• Generation and Transmission Impacts
# Alternatives to Net Metering

<table>
<thead>
<tr>
<th><strong>TABLE 1</strong></th>
<th><strong>OPTION NAME</strong></th>
<th><strong>SELF-SUPPLY</strong></th>
<th><strong>EXPORT PRICE</strong></th>
<th><strong>ADDER/ANCHOR</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NEM 2.0</td>
<td>Y</td>
<td>Retail Rate</td>
<td>Selected Non-bypassable charges; Time of Use Rate&lt;sup&gt;10&lt;/sup&gt;</td>
</tr>
<tr>
<td>2</td>
<td>Net Billing</td>
<td>Y</td>
<td>Locational Value</td>
<td>Transferrable Credit; Transition Credit; Opt-in Grid Services</td>
</tr>
<tr>
<td>3</td>
<td>Net Billing + Grid Services</td>
<td>Y</td>
<td>Market Price</td>
<td>Transferrable Credit; Managed Demand Charge</td>
</tr>
<tr>
<td>4</td>
<td>Buy All, Sell All</td>
<td>N</td>
<td>Locational Value</td>
<td>Transferrable Credit; Transition Credit</td>
</tr>
<tr>
<td>5</td>
<td>BASA + Grid Services</td>
<td>N</td>
<td>Market Price</td>
<td>Transferrable Credit</td>
</tr>
</tbody>
</table>

<sup>10</sup> To allow for comparison, the following assumptions are held constant throughout these options: current CPUC policy on minimum bill charges, non-bypassable charges, TOU rates, netting and true up intervals remain unchanged unless explicitly noted; no unidentified anchors or adders incremental to those identified here are applied.
# Evaluating Customer Generation Compensation Options

<table>
<thead>
<tr>
<th>OPTION</th>
<th>Locational Value</th>
<th>Grid Cost Recovery</th>
<th>Customer Choice</th>
<th>Decarbonize</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 NEM 2.0</td>
<td>![Circle]</td>
<td>![Circle]</td>
<td>![Circle]</td>
<td>![Circle]</td>
</tr>
<tr>
<td>2 Net Billing</td>
<td>![Dot]</td>
<td>![Circle]</td>
<td>![Dot]</td>
<td>![Circle]</td>
</tr>
<tr>
<td>3 NB + Grid Services</td>
<td>![Circle]</td>
<td>![Dot]</td>
<td>![Circle]</td>
<td>![Dot]</td>
</tr>
<tr>
<td>4 BASA</td>
<td>![Circle]</td>
<td>![Circle]</td>
<td>![Circle]</td>
<td>![Circle]</td>
</tr>
<tr>
<td>5 BASA Grid Services</td>
<td>![Dot]</td>
<td>![Circle]</td>
<td>![Dot]</td>
<td>![Circle]</td>
</tr>
</tbody>
</table>

**Scale**: Better ![Circle], ![Circle], ![Circle], ![Circle], ![Circle], Worse ![Circle], ![Circle], ![Circle], ![Circle]
Alternatives to Net Metering

Net Metering 2.0 - California

• Preserves the full retail credit for each kWh generated with surplus trued up annually
• One-time interconnection fee - range from $75-$145
• Customers with systems over 1 MW must pay a $800 interconnection fee and pay for all transmission/distribution upgrades
• Customers must pay non-bypassable charges on every kWh consumed
• All net-metered customers are automatically put on a time-of-use rate
• Disallowed utilities from imposing demand charges, grid-access charges, installed capacity fees, standby fees, or similar fixed charges on net-metered customers
Alternatives to Net Metering

Value of Solar Tariff (VOST) - Austin Energy

- 440,000 customers; generation capacity of 3,400 MW
- In designing its VOST, Austin Energy noted that traditional net metering likely did not adequately represent the full value of distributed generation
- Applies to all residential customers with solar interconnected to distribution grid
- VOST customers are billed for all energy used under regular residential tiered structure
- Bill is reduced by the VOS credit; when credit is larger, credit rolled over to next month’s bill
Alternatives to Net Metering

Value of Solar Tariff (VOST) (cont.)

- Calculated VOS based on:
  - avoidance of line losses,
  - energy saving,
  - saving of generation capacity,
  - securing the price of fuel,
  - Saving of transmission and distribution capacity and
  - environmental benefits.

- VOS tariff intended to have the same monetary effects for Austin Energy as electricity purchases from the wholesale market

- Following VOST, installations went up from NEM
# Austin Energy, Texas

**Standard Rates**

This is the default rate option under this schedule.

<table>
<thead>
<tr>
<th>Basic Charges ($/month)</th>
<th>Inside City Limits</th>
<th>Outside City Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer</td>
<td>$10.00</td>
<td>$10.00</td>
</tr>
<tr>
<td>Delivery</td>
<td>$0.00</td>
<td>$0.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Energy Charges ($/kWh)</th>
<th>Inside City Limits</th>
<th>Outside City Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 500 kWh</td>
<td>$0.02801</td>
<td>$0.03700</td>
</tr>
<tr>
<td>501 – 1,000 kWh</td>
<td>$0.05832</td>
<td>$0.05600</td>
</tr>
<tr>
<td>1,001 – 1,500 kWh</td>
<td>$0.07814</td>
<td>$0.07868</td>
</tr>
<tr>
<td>1,501 – 2,500 kWh</td>
<td>$0.09314</td>
<td>$0.07868</td>
</tr>
<tr>
<td>Over 2,500 kWh</td>
<td>$0.10814</td>
<td>$0.07868</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Value of Solar</th>
<th>Value-of-Solar Rate ($/kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential Customers</td>
<td>$0.09700</td>
</tr>
</tbody>
</table>
Half of System Peak in Maui

Table 3. HECO Companies’ Net Energy Metering Program Capacity and Enrollment

<table>
<thead>
<tr>
<th>Capacity (MW)</th>
<th>HECO</th>
<th>HELCO</th>
<th>MECO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installed or Approved</td>
<td>327.9</td>
<td>73.3</td>
<td>88.8</td>
</tr>
<tr>
<td>In the Queue</td>
<td>17.3</td>
<td>5.1</td>
<td>11.9</td>
</tr>
<tr>
<td>Total</td>
<td>345.2</td>
<td>78.4</td>
<td>100.7</td>
</tr>
</tbody>
</table>

| Total NEM Customers | 51,680 | 11,549 | 12,893 |
| System Peak Load (MW) | 1,165  | 188    | 191    |
| NEM % of All Customers | 17%    | 14%    | 18%    |
| NEM % of System Peak  | 30%    | 42%    | 53%    |
Alternatives to Net Metering

Incentivize Storage - Hawaii

• Ended Net Metering in 2015 because of high penetration rates (30-53 percent of peak load)

• Replaced with Smart Export program
  • Customers install solar + storage
  • Expected that customers will charge batteries during daylight hours and use power in the evenings
  • Customers receive a credit for energy exported during the evening, overnight, and early morning hours
  • Daytime export is not compensated
  • Credits can be used to offset energy from the grid.

• Another program allows export at set rate and utility control of DG system
End Net Metering - Nevada

- In 2015, Nevada PUC implemented a new net metering program
  - Increased fixed service charge - to triple over a set period
  - Decreased the energy charge for excess energy from DG – set to fall 2 cents per kWh
- Market for DG slowed dramatically, major solar firms left the state and over 2,600 jobs lost
- As a result, legislature passed bill to reinstate NEM: compensation set at 95% of retail rate, to decline with each 80 MW of solar installed to a floor of 75%
- Solar rebounded – first 80 MW tier subscribed by 2018
A few slides on storage and rate design opportunities
Water Heaters Are Probably the Cheapest Source of Storage

- High concentration in multi-family
- Unlikely to run out of hot water
- Can provide ancillary services to grid
- Water heater controls widely used in France, Australia, and in rural Minnesota
Multi-Family Daily Use is Within Capacity of a 52 Gallon Tank

- Daily Usage: 5.33 kWh
- 52 Gallon Tank Capacity: 7.92 kWh @ 140° Max & 75° inlet water temp.
Grid-Integrated Water Heating also Provides Ancillary Services
Ancillary Service Value May Exceed Water Heating Energy Cost
Green Mountain Power Tesla Battery Tariff

- Customer Ownership Option: Direct Purchase
- “Shared Access” Option: $1.25/day
  - Utility: Diurnal Storage, Ancillary Services
  - Customer: Emergency backup power
Rate design should make the choices the customer makes to minimize their own bill consistent with the choices they would make to minimize system costs.
TOU & Critical Peak Pricing Work
Price Can Influence When EVs Are Charged

Dallas/Ft Worth (standard rates)

San Diego (time-of-use rates)

Copied from: M.J. Bradley, 2017
Potential Grid Savings Are Huge

SOURCE: Berkheimer et al SAE Paper, 2014
TOU Rates and Low-Income Customers

• Low-income customers have smaller dwelling sizes, lower than average users
  • Less likely to have major peak-focused loads like central air conditioning
• More likely to have electric water heat, which can be controlled.
• Most (NOT ALL) low-income customers will benefit from TOU rates.
Capturing Locational Value

• Distribution System Planning, and Integrated Resource Planning are key to discover value

• Then:
  1) demand response programs where location factors into calls;
  2) standard offer to customers who install equipment in high cost parts of the grid
  3) procurement of qualifying resources from the sensitive part of the grid
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

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