Rate Design and Net Metering
Sean Gallagher, Solar Energy Industries Association (SEIA)

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Where are States Going with Solar Rate Design, and Why?

Sean Gallagher, SEIA
Vice President State Affairs

Chicago PV Conference & Expo
November 9, 2016
• Founded in 1974
• U.S. National Trade Association for Solar Energy
  – 1,000 member companies from around the world
  – Members from across all 50 states
  – Largest companies in the world as well as small installers
• SEIA is the voice of the U.S. solar energy industry
  – We promote solar to State Policy Makers, the White House, and Congress
• Our Mission: Build a strong solar industry to power America
The Midwest is emerging as a vibrant new solar market thanks to innovation and investment at the local and regional levels. New companies continue to spring up throughout the region. A strong combination of falling costs, customer interest, and major policy development is supporting new investment and attracting the attention of major national solar companies.

Since 2010, Midwest solar capacity has grown over 4,284%, from just over 14 MW to over 632 MW of cumulative installed solar capacity. There are over 1,300 companies at work throughout the value chain in the Midwest. Solar jobs in the Midwest have increased over 75% since 2012, employing over 20,720 people. Below are summaries of some of the major market developments occurring in the region.

SEIA would like to thank all of its Midwest partners for their support. Special thanks go to our colleagues at the Environmental Law and Policy Center, Fresh Energy, the Iowa Solar Trade Association, and Renew Wisconsin, who provided information for this report.
Yearly U.S. Solar Photovoltaic (PV) Installations

- **Residential (PV)**
- **Non-residential (PV)**

Megawatts

- **2006**: 100
- **2007**: 100
- **2008**: 100
- **2009**: 100
- **2010**: 100
- **2011**: 100
- **2012**: 100
- **2013**: 100
- **2014**: 100
- **2015**: 100
- **2016E**: 3000

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State and Local Policy: Net Metering (NEM)

Net Metering for Small Generators

Source
Solar panels and wind turbines collect energy.

Inverter
The inverter converts the electricity from direct current (DC) to alternating current (AC).

House
The energy is used in your home, school, or business.

Utility Pole
Distribution of excess energy through utility distribution system.

Meter
The bidirectional meter indicates energy usage and excess energy produced.
In 2016, 20 states have reached grid parity

“Grid parity is a minimum threshold of economic attractiveness where the levelized cost of energy (LCOE) dips below a customer’s electricity bill savings in year 1 of system life.”
Q3 2016 Action on Net Metering, Rate Design, & Solar Ownership Policies

The NC Clean Energy Technology Center, 50 States of Solar, Q3 2016, Figure 1

Table 1. Summary of Policy Actions (Q2 2016)

<table>
<thead>
<tr>
<th>Policy Type</th>
<th># of Actions</th>
<th>% by Type</th>
<th># of States</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential fixed charge increase</td>
<td>42</td>
<td>35%</td>
<td>25 + DC</td>
</tr>
<tr>
<td>Net metering</td>
<td>37</td>
<td>31%</td>
<td>24</td>
</tr>
<tr>
<td>Solar valuation or net metering study</td>
<td>16</td>
<td>13%</td>
<td>15 + DC</td>
</tr>
<tr>
<td>Community solar</td>
<td>12</td>
<td>10%</td>
<td>11</td>
</tr>
<tr>
<td>Residential solar charge</td>
<td>8</td>
<td>7%</td>
<td>6</td>
</tr>
<tr>
<td>Third-party ownership of solar</td>
<td>3</td>
<td>2%</td>
<td>3</td>
</tr>
<tr>
<td>Utility-led rooftop PV programs</td>
<td>3</td>
<td>2%</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>121</td>
<td>100%</td>
<td>42 States + DC</td>
</tr>
</tbody>
</table>

Note: The "# of States/ Districts" total is not the sum of the rows, as some states have multiple actions.
How do NEM & rate design reforms affect “grid parity”?

![Bar chart showing Number of States at Grid Parity in 2016: Business-as-Usual NEM vs. NEM Reform Scenarios](chart.png)

Executive Summary: U.S. Residential Solar Economic Outlook 2016-2020
A Landmark Settlement in Colorado Over Solar Grid Fees: ‘This Could Be a Model’

Proof that the solar industry and utilities can find proactive alternatives to solar grid fees.

by Julia Pyper
August 16, 2016

New York commission’s value of rooftop solar report

By Danielle Ola   Oct 28, 2016 11:39 AM BST

The New York Department of Public Services commissioned a report on Thursday that will aim to find the value of rooftop solar and other distributed energy resources.

The report is part of governor Cuomo’s ‘Reforming the Energy Vision’ (REV) strategy, under which the state is procuring new investment into clean energy and driving innovation in the sector, intended to lead to regulatory changes.

The staff report will outline recommendations to the commission on how to best value and quantify the benefits distributed resources such as rooftop solar give to the state’s grid, the public, and the wider environment. This tricky valuation has been worked on for more than a year by DPS staff and other key energy stakeholders such as utilities, industry workers and consumer advocate groups.
Rate Design and Distributed Solar Generation

Douglas Jester, Principal
5 Lakes Energy
djester@5lakesenergy.com
My New Home
near Northport MI

PassivHaus Certified
Net Zero
Rooftop Solar
Integrated 3-season Greenhouse
My Local Grocer
Northport MI

Only grocer in town
My Proposal to Tom’s Food Market

My greenhouse will produce tomatoes December through June.

I asked Tom’s to exchange a tomato in July through November for every tomato I give them in December through June.

Tom’s doesn’t like that idea. They think I should pay for use of their store.
My Justification to Tom’s Food Market

Tomato prices are higher in December through June than in July through November, so my exchange proposal seems like a fair deal.

Tom’s still doesn’t like that idea. They think I should pay for use of their store.
My Second Proposal to Tom’s Food Market

My tomatoes will be organic, which have a market premium. I’ll give Tom’s organic tomatoes December through June in exchange for tomatoes July through November that are produced with pesticides.

Tom’s still doesn’t like that idea. They think I should pay for use of their store.
Tom’s First Counterproposal

Tom’s proposes that I sell all of my organic tomatoes to Tom’s at their wholesale price for non-organic tomatoes and buy all of the tomatoes I need from Tom’s at their retail price. Otherwise, Tom’s will push the Township Board to prohibit tomato gardens.

I don’t like that idea. I should be able to grow and use my own tomatoes without paying Tom’s anything.
Tom’s Second Counterproposal

Tom’s proposes that I can produce and consume my own tomatoes without paying Tom’s for them, if I pay Tom’s $80 per week membership fee for the privilege of buying my other groceries at Tom’s wholesale cost. Otherwise, Tom’s will push the Township Board to prohibit tomato gardens.

I don’t like that idea. This is a weekend house and I won’t need a lot of groceries most weeks.
Tom’s Third Counterproposal

Tom’s proposes that I can produce and consume my own tomatoes without paying Tom’s for them, if every week I pay Tom’s their gross markup on the largest grocery purchase I’ve made in the last year.

I don’t like that idea. We host a large party for summer solstice.
Tom’s Current Proposal
A Supply Chain Usage Fee

Tom’s proposes that I can produce and consume my own tomatoes and still buy my other groceries from Tom’s, if I pay Tom’s a fee on the tomatoes I don’t buy from them (my imputed tomato purchase). That fee will cover Tom’s store markup on tomatoes, the cost of transporting tomatoes from California to Tom’s and the portion of the California wholesale price of tomatoes that covers farm land rent. I can avoid paying for water, fertilizer, pesticides, etc., since the farm won’t need to use those to produce my tomatoes.
I Lied
This wasn’t about Tom’s and Tomatoes
This was about Solar and my Utility.
Michigan Distributed Solar Policy

Current law provides true net metering for systems under 20 kW, capped at 0.5% of energy sales. Actual uptake to date is about 0.15% of energy sales.

Michigan’s energy laws are currently under debate. All of those proposals I attribute to Tom’s have been made by Michigan utilities in the legislative process.
A Sensible Market-Analogous Policy

I do not pay Tom’s anything for the tomatoes I produce and consume. I should not pay my utility for solar power I produce and consume.

I buy any additional tomatoes I need from Tom’s at their retail price. I should buy supplemental power from my utility at their retail price.

Tom’s will buy my excess tomatoes at their wholesale price for organic tomatoes, FOB Tom’s. My utility should buy my excess solar power at their wholesale price* for renewable power, FOB my meter, which they will resell through their “green power” product.

*full cost, not energy only

Tomato prices will vary seasonally, reflecting the varying supply and demand of tomatoes. Electricity prices should vary with time, reflecting the varying balance of supply and demand.
What the Numbers Look Like

![Graph showing Residential Solar PV capacity and on-site usage.]

- **12 PV Panels - 3.6 kW (DC)**
- **60%**
- **Smaller Arrays Use A Greater Share of Generation Onsite**
- **Residential PV Capacity Cap**

www.5lakesenergy.com
next generation
ENERGY PLAN

Solar Power PV Conference

November 2016
Background

1. Exelon Generation and ComEd filed the Next Generation Energy Plan (NGEP) on May 5
2. The NGEP grew out of discussions between Exelon Generation, ComEd and the Clean Jobs Coalition in the year since all three had separate energy legislation in Springfield in early 2015
3. NGEP contains significant parts of all three original bills as well as new elements and addresses concerns and desires of environmental stakeholders and consumer advocates
Illinois is a restructured market with Municipal Aggregation which has resulted in 41% of ComEd’s residential customers taking supply from alternative suppliers which represents 46% of residential usage.
Current State of Solar Net Metering as of 9/30/2016
(ComEd Service Territory)

- **Customers**
  - Residential: 657
  - Commercial: 107

- **Installed Capacity**
  - Residential: 3.8 MW
  - Commercial: 5.1 MW
  - Total: 8.9 MW
RPS Solutions

1. Carbon emissions and their impact on climate are increasingly important to our customers.

2. Current RPS law did not account for municipal aggregation moving majority of residential customers to alternative suppliers causing the Illinois Power Authority to lessen procurement.

3. NGEP requires all customers to pay a fee to the utility who will procure renewables for those customers:
   a) Prevents sweeping by having the utility hold the funds.
   b) Provides more than $200 million per year of stable, predictable principal funding for renewables and certainty around the process leading to more development in IL.

4. Allows contracts for solar of 15 years in length:
   a) Provides price stability and certainty for solar developers reducing the cost per rec as well as insuring solar is developed in IL.
   b) Residential rooftop SREC contracts paid upfront for 15 years of production.
   c) C&I rooftop (>10kW) and Community Solar SREC contracts paid out over first 5 years for 15 years of production.
   d) Funding certainty should lead to more than 1500MW of solar.

5. Provides funding for wind development in IL.
Net Metering and Rate Design Solutions

1. Rate design aligns charges paid by customers with the demand they place on the electric grid
2. Commercial and Industrial (C&I) customers have been on demand based rates for decades to better manage their energy costs
3. Demand based (or infrastructure footprint) rates eliminates the delivery service credit currently paid to residential and small C&I net metering customers that are being charged to all customers
4. Customer rates are fairly set by kilowatt (kW) instead of (kWh):
   a) Demand calculation based on the average daily maximum half-hour usage between the hours of 6am and 10pm for qualifying days (non-holiday weekdays, free nights and weekends) in the billing period
   b) 50% reduction in the customer charge (does not change the meter charge)
   c) Eliminate the 50 basis point collar ensuring ComEd earns no more than its ICC approved revenue
   d) Unbundle Generation and Transmission Capacity from Supply charges
   e) Optional Energy/Capacity/Transmission TOU established
5. Establishes a solar rebate in exchange for eliminating delivery service net metering credits
Distribution Feeders Peak at Different Times

2015 Feeder Peaks by Month

5,441 Feeders

Jan: 518
Feb: 425
Mar: 210
Apr: 150
May: 258
Jun: 419
Jul: 1,239
Aug: 786
Sep: 1,413
Oct: 16
Nov: 1
Dec: 6

2015 Feeder Peaks by Day of Week

5,441 Feeders

Sun: 509
Mon: 703
Tue: 925
Wed: 752
Thu: 1,467
Fri: 835
Sat: 250

2015 Feeder Peaks by Hour

5,441 Feeders

5am: 65
6am: 19
7am: 43
8am: 103
9am: 147
10am: 148
11am: 195
12am: 256
1pm: 244
2pm: 465
3pm: 582
4pm: 803
5pm: 372
6pm: 266
7pm: 320
8pm: 182
9pm: 10pm
Distributed Energy Rebate

1. A rebate and wholesale net metering has been proposed as a fairer mechanism than full retail net metering for providing compensation to solar owners for the value their panels provide to grid
   a) Utility would be able to control and monitor output of the panels
   b) Utility would treat the rebate as a regulatory asset and earn a return
   c) Regulatory asset would be paid for by all customers not just residential
   d) Value of Rebate would be set equal to $1,000/kW for residential and $500/kW for C&I until 150MW of DER exists on the system, $750/kW and $325 thereafter until an ICC determined value is set in 2022
   e) Rebate would be available for all solar installations where smart inverters are deployed
## Value of Solar Compensation Methods

<table>
<thead>
<tr>
<th>Avoided Costs– Solar City Engineering “A Pathway to a Distributed Grid”</th>
<th>ComEd Proposal</th>
<th>How Compensated</th>
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<tbody>
<tr>
<td>Energy &amp; Line Losses</td>
<td>Included</td>
<td>Retail Energy Rate</td>
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<tr>
<td>Ancillary Services</td>
<td>Included</td>
<td>Retail Energy Rate</td>
</tr>
<tr>
<td>Generation Capacity</td>
<td>Included</td>
<td>PLC - $/kW/Day</td>
</tr>
<tr>
<td>Transmission Capacity</td>
<td>Included</td>
<td>NSPL - $/kW/Day</td>
</tr>
<tr>
<td>Distribution Capacity</td>
<td>Included</td>
<td>Solar Rebate</td>
</tr>
<tr>
<td>Renewable Energy Compliance</td>
<td>Included</td>
<td>Avoided RPS</td>
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<tr>
<td>Societal Benefits</td>
<td>Included</td>
<td>Federal ITCs State RPS</td>
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### Distributed Energy Rebate

<table>
<thead>
<tr>
<th>Timing</th>
<th>Compensation Options</th>
<th>Requires Smart Inverter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current NEM Customers</td>
<td>Residential: NEM as is or $1,000/kW rebate</td>
<td>Commercial: NEM as is or $500/kW rebate</td>
</tr>
<tr>
<td>After Effective Date and before 150MW of DER</td>
<td>Residential: NEM* as is or $1,000/kW rebate</td>
<td>Commercial: NEM* as is or $500/kW rebate</td>
</tr>
<tr>
<td>After 150MW of DER and before 1/1/22</td>
<td>Residential: NEM* as is or $750/kW rebate</td>
<td>Commercial: NEM* as is or $325/kW rebate</td>
</tr>
<tr>
<td>After 1/1/22</td>
<td>Residential: ICC Set Locational Rebate</td>
<td>Commercial: ICC Set Locational Rebate</td>
</tr>
</tbody>
</table>

*Note: New Solar Customers (after the effective date) who chose NEM during the transition period will receive the ICC rebate value in January 2022 less any delivery service credits received during the transition period*
Comparison of NEM to NGEP Solar Rebate

Residential Rooftop Solar

### Present Value of Avoided Costs (per Installed kW)

**NEM As IS**
- Avoided Energy: $1,084
- Avoided Capacity: $201
- Avoided Transmission: $288
- Avoided Distribution: $509
- Avoided Energy Efficiency: $439

**NGEP**
- Avoided Energy: $1,111
- Avoided Capacity: $201
- Avoided Transmission: $262
- Avoided Distribution: $499
- Avoided Energy Efficiency: $439

### Customer Payback Period

**Undiscounted**
- NEM As IS: 8.5 years
- NGEP: 4.5 years

**Discounted**
- NEM As IS: 12.5 years
- NGEP: 5.5 years

### IRR

- As Is Case: 11%
- NGEP: 30%

### Assumptions

- **West Facing System**
- **$3,429/kW Install Cost**

- **25 Year Life**
- **15% Capacity Factor**

- **2018 Install Year**
- **0.5% Degradation Factor**

- **3% Utility Cost Escalation**
- **15 Year Upfront SREC Contract @ $62 vs. As Is of 5 year @ $180 paid annually**

- **5% Discount Rate**
- **28% Tax Rate on SRECs, 30% ITC**
Comparison of NEM to NGEP Solar Rebate

### Assumptions

<table>
<thead>
<tr>
<th>Assumption</th>
<th>Value/Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>West Facing System</td>
<td>$2,250/kW Install Cost</td>
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<tr>
<td>25 Year Life</td>
<td>15% Capacity Factor</td>
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<tr>
<td>2018 Install Year</td>
<td>0.5% Degradation Factor</td>
</tr>
<tr>
<td>3% Utility Cost Escalation</td>
<td>15 Year SREC Contract @ $47 paid out over 5 years vs. As Is of 5 year @ $90 paid annually</td>
</tr>
<tr>
<td>10% Discount Rate</td>
<td>40% Tax Rate on SRECs and rebate, 30% ITC, and bonus Depreciation</td>
</tr>
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</table>

### Present Value of Avoided Costs (per Installed kW)

<table>
<thead>
<tr>
<th>Category</th>
<th>NEM As Is</th>
<th>NGEP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avoided Energy</td>
<td>$1,285</td>
<td></td>
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<tr>
<td>Avoided Capacity</td>
<td>$164</td>
<td></td>
</tr>
<tr>
<td>Avoided Transmission</td>
<td>$292</td>
<td></td>
</tr>
<tr>
<td>Avoided Distribution</td>
<td>$164</td>
<td></td>
</tr>
<tr>
<td>Avoided Energy Efficiency</td>
<td>$292</td>
<td></td>
</tr>
<tr>
<td>Solar Rebate (after tax)</td>
<td>$678</td>
<td></td>
</tr>
<tr>
<td>Total Present Value</td>
<td>$1,585</td>
<td></td>
</tr>
</tbody>
</table>

### Customer Payback Period

- **Undiscounted**
  - As Is Case: 3.5 years
  - NGEP: 5.5 years
- **Discounted**
  - As Is Case: 2.5 years
  - NGEP: 2.5 years

### IRR

- **As Is Case**
  - 29%
- **NGEP**
  - 59%
Potential Rooftop Solar Expansion (cumulative MWs)
Rate Design and Distributed Resources

November 9, 2016

Rebecca Stanfield, VP, Policy and Energy Markets
Why is Rate Design So Important to our Industry?

- Customer must be able to calculate whether a given investment in EE, DG, DR will be cost-effective over the life of the investment.
- If a customer cannot accomplish this with basic math, then only those who can afford not to care will invest in DERs.
Key Objectives To Guide Changes in Rate Design

- Customer understands bill.
- Customer is incentivized via price signals to take action that will lower the long-run costs for the system.
- Utilities is assured of recovering prudently incurred costs.
- Costs recovered equitably between and within customer classes.
- Relative stability (gradual changes, avoiding spikes).
Problem with Fixed Charges and Demand Charges

Fixed charges -
• The all-you-can-eat buffet results in a lot of waste and over-building of the system.
• Eliminate incentives to act in ways that would most effectively lower the overall cost of service.
Problem with Fixed and Demand charges, continued

Demand charges -

• Far from clear that customers have the tools to react to the price signal if they perceive it. If they don’t, it’s just a fixed charge in disguise.

• Not clear that the price signal actually incentivizes USEFUL reactions because an individual home peak has little to do with the incremental cost of utility service.
Recent decisions of note (nationally) -

• AZ – Administrative Law Judge rejects proposed UNS demand charges as unnecessary to difficult for customers to understand;
• Oklahoma – commission rejects demand charges proposed by Oklahoma Gas and Electric Company;
• Texas – El Paso Electric withdraws demand charge proposal
• Colorado – proposal withdrawn, settlement on TOU alternative
• Massachusetts – Commission says no to demand charges, finds utility has not demonstrated the existence of a cost-shift.
• Glasgow, KY tried it for 10 months, reversed it this month after customers revolted.
Midwest

• MN Commission generically looking at rate design as part of grid mod.
• Iowa decided penetration of DERs wasn’t significant enough to warrant a process now.
• ComEd proposal – far and away the most radical –
  • Mandatory for all residential customers.
  • No opportunity for the Commission to review the modeling, consider alternatives.
  • No pilots.
  • Premised on the notion that a cost-shift will occur, with no data supporting that conclusion.
ComEd continued – Proposal creates a tangled mess of confusing price signals -

• Bill divided four ways –
  • Meter & Customer charges are fixed
  • Transmission and Capacity are essentially fixed (demand charge based on use during the PJM 5–hour peak, retroactive)
  • Distribution charge – demand based on
  • Energy charge – $/kwh, opt-in TOU
• Far better ways exist to align the utility business model with the customer’s interest in efficiency and DERs.