Assessment of Residential Net Metering Subsidies

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THE Brattle GROUP

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

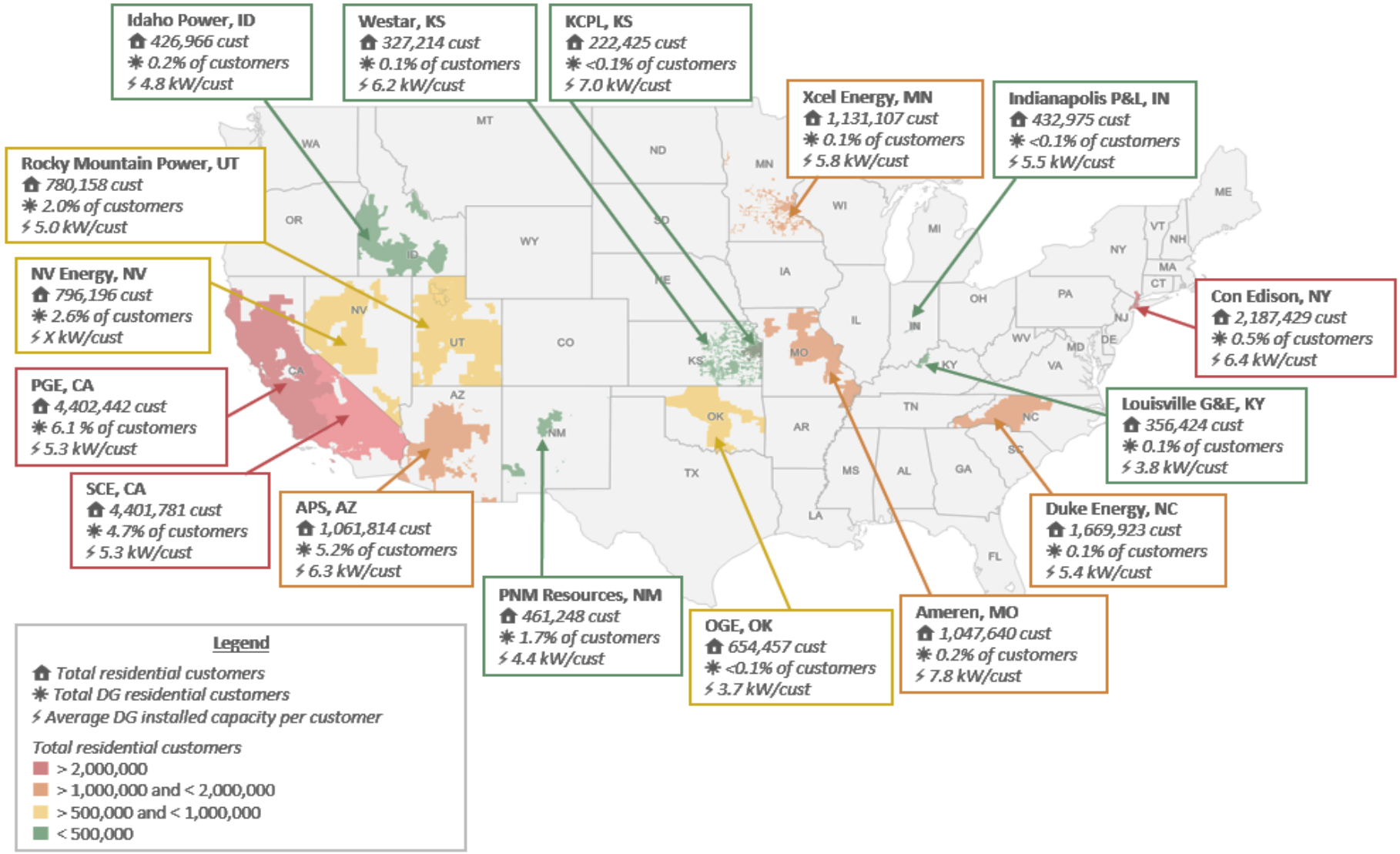
These subsidies grow rapidly with the increased penetration of rooftop solar

Quantifying NEM cross-subsidies

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

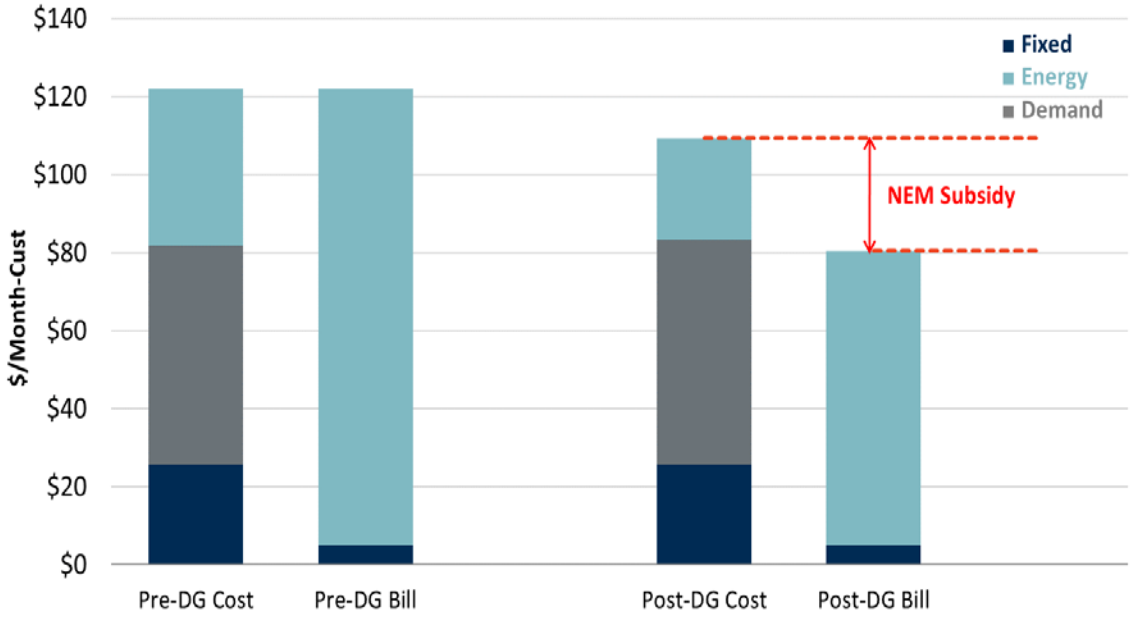


Study Methodology

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 reachin out to our contacts at the utilities studied

Illustration of the NEM subsidy calculation



Our methodology involves four main steps:

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

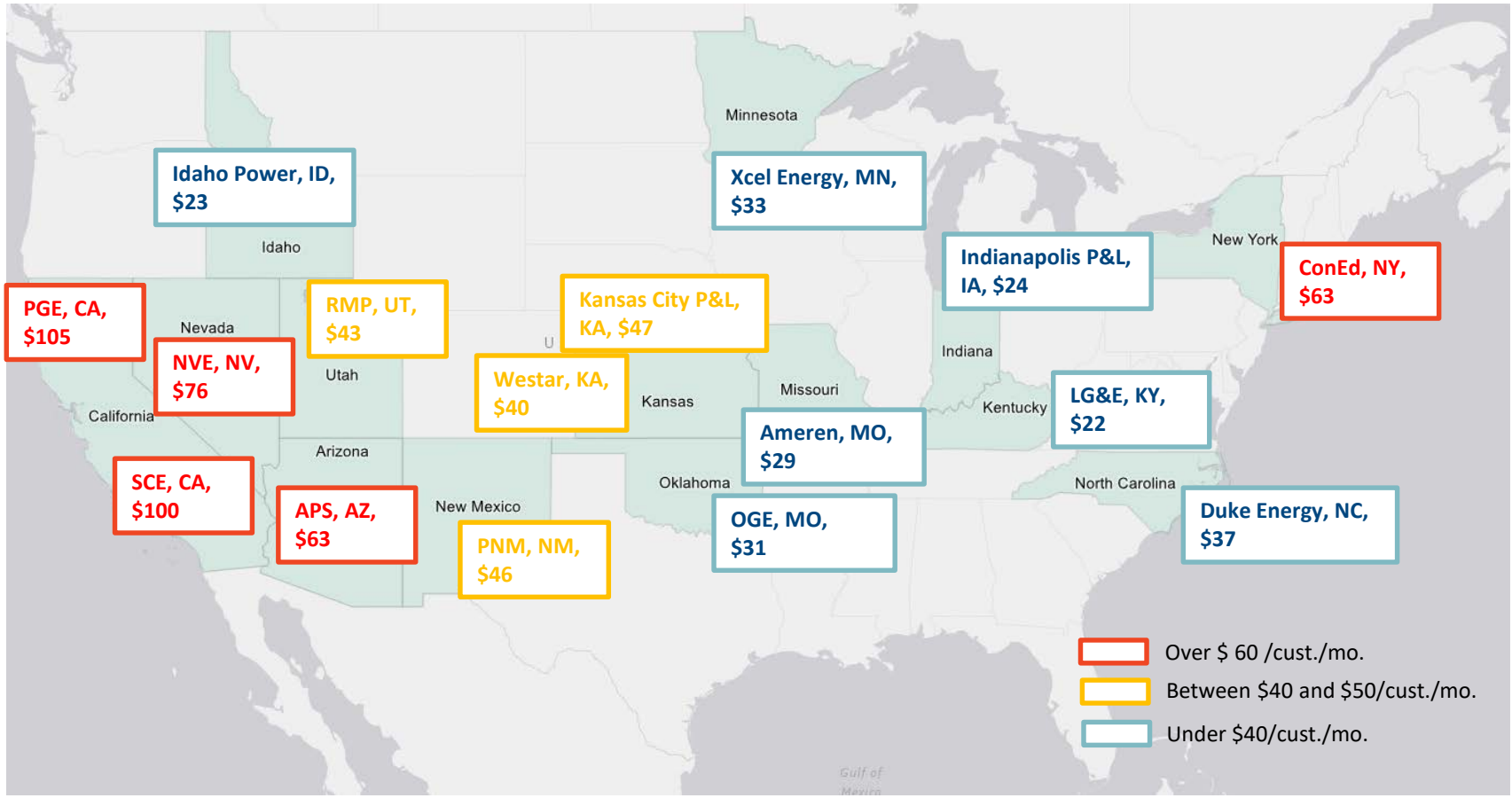
Step 2: Calculation of DG customer bills for pre- and post- DG

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.)

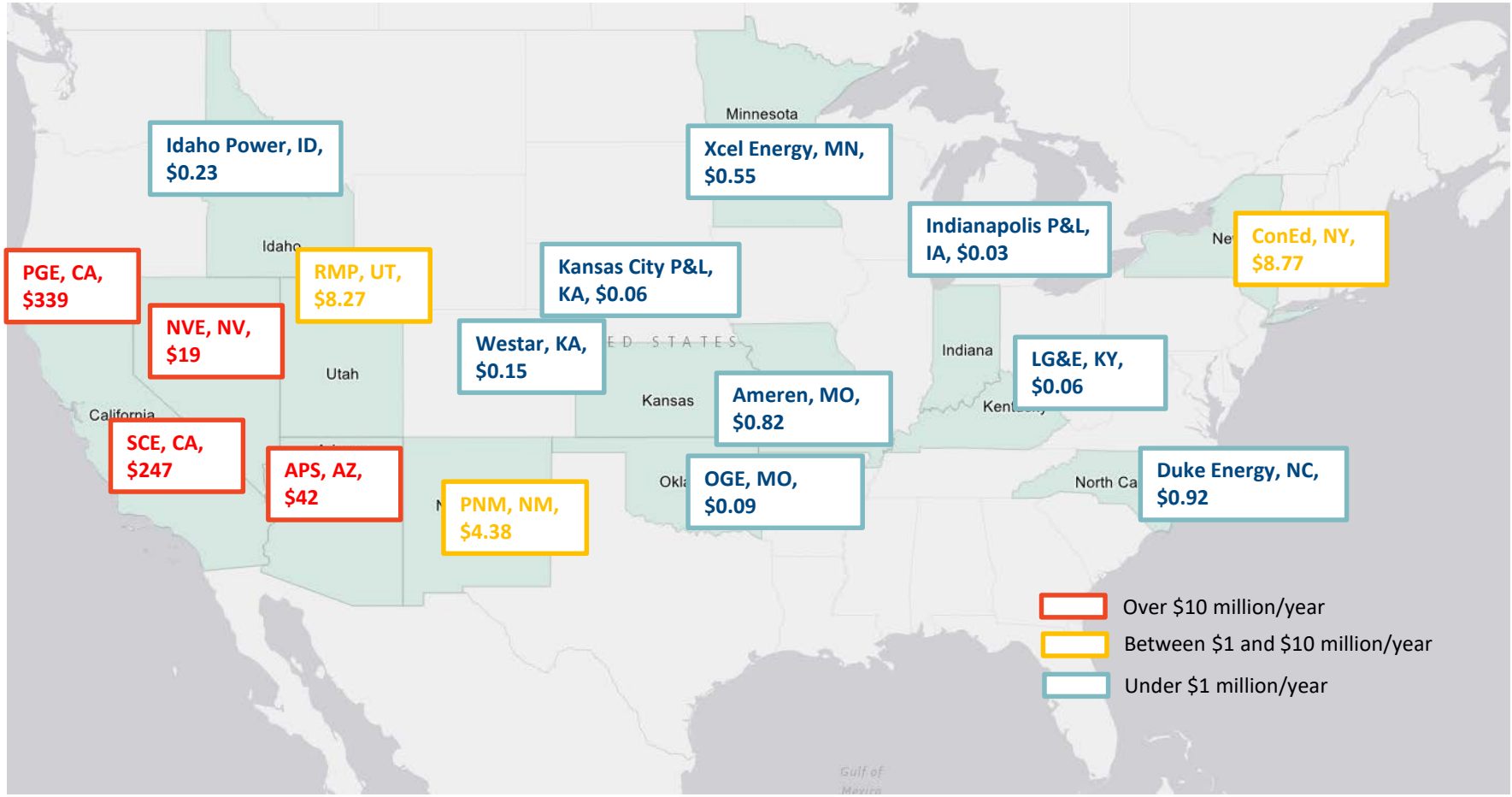
The NEM subsidies range in $22-$105/cust./mo. across utilities



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.

	Former NEM	NEM 2.0
Interconnection Fee	None	$75-$175
Non-bypassable charges	Based on net energy consumption over a year	Based on net energy consumption in each metered interval
Time-of-use rate	Optional	Required
Installation size limit	1 MW	No limit; interconnection fee gets larger
IOU program cap	5% of IOU's aggregated peak demand	No cap

Source: California Public Utility Commission, Net Energy Metering.

So what should we do? (CRRI 2018)

1:20 - 2:50 ***Concurrent Sessions***

DER – RATES I ***Grove***

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 ***Grove***

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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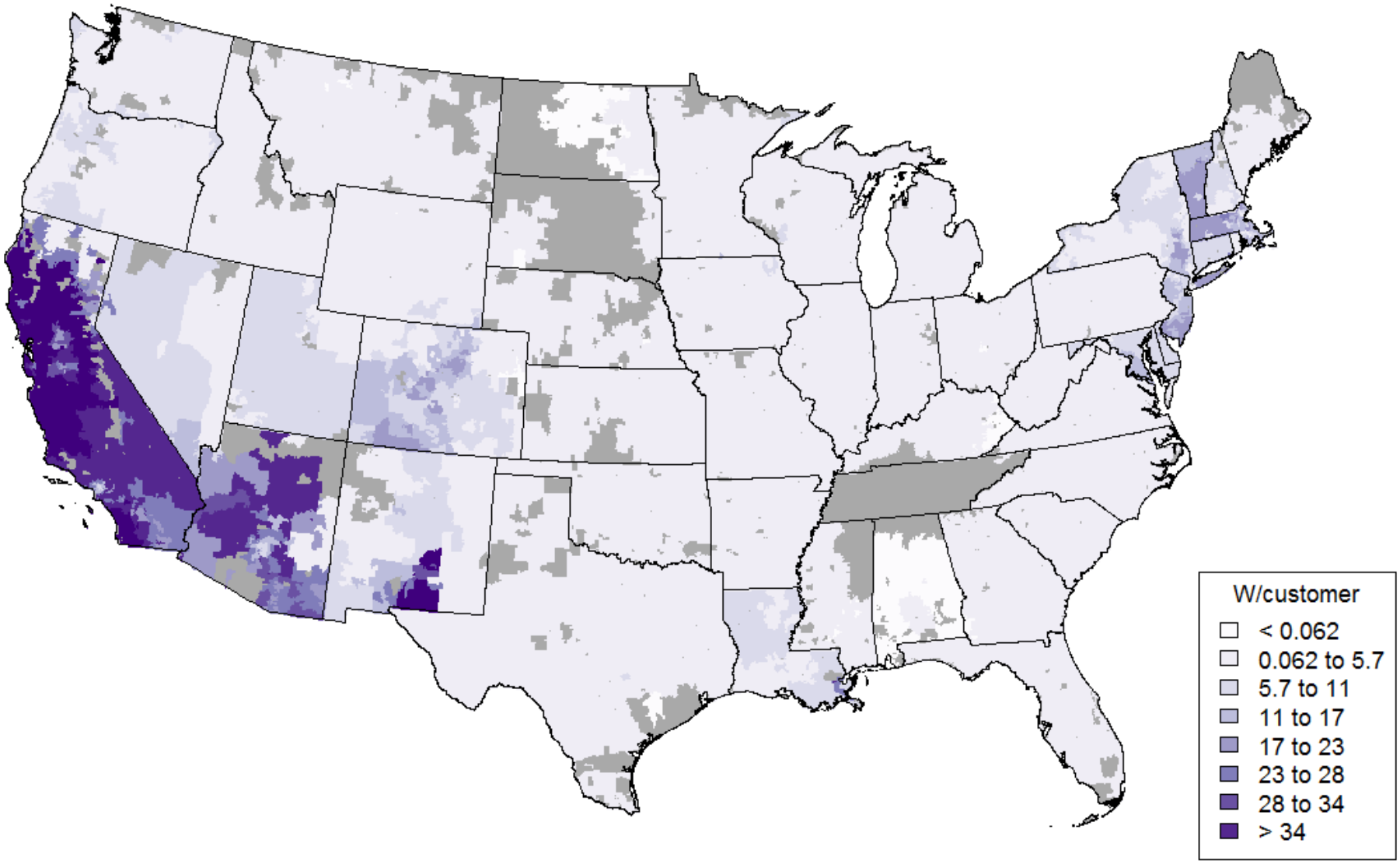
Installed DG per customer



Social Marginal Costs