



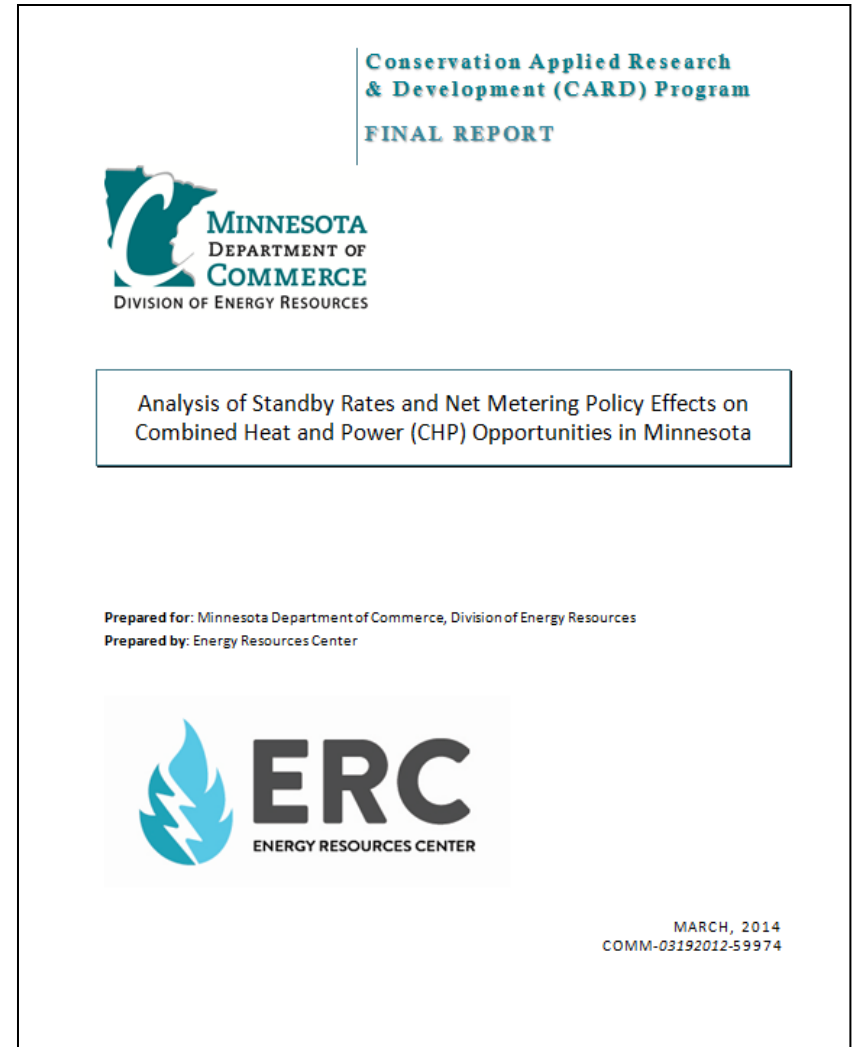
# Analysis of Standby Rates and Net Metering Policy Effects on Combined Heat and Power (CHP) Opportunities in Minnesota

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# Presentation Background

- Assesses the existing standby rates and net metering policies and how they affect the market acceptance of CHP projects today and presents recommendations that could help reduce the barriers that these factors impose on CHP development in Minnesota.
- Models the economic potential of CHP projects in Minnesota investor owned utility (IOU) service territories based on analyzing the impact of current versus hypothetically improved standby rates.



# Presentation Focus

## **An Analysis of standby rate tariffs from:**

- ▶ Xcel Power
- ▶ Minnesota Power
- ▶ Otter Tail Power Company

## **An Analysis of MN Net Metering Laws**

For more detailed information visit the ERC report published April 2014:

<http://mn.gov/commerce/energy/images/SRNMPE-CHP-Opportunities.pdf>

# What is Standby Service?

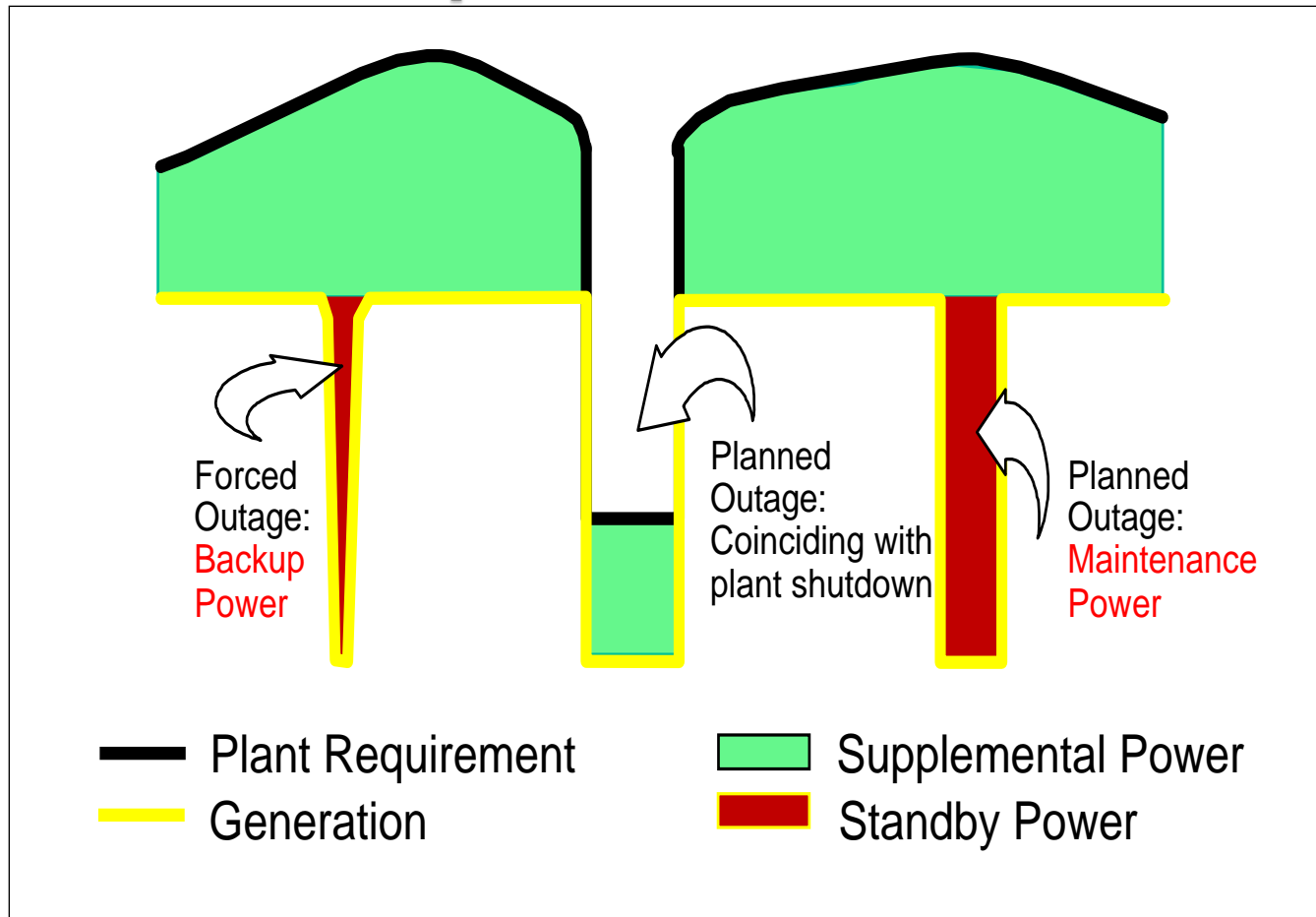
- ▶ Set of electric utility products for customers with on-site, non-emergency generation
- ▶ Provides for a utility backstop
- ▶ Standby Service terms are important
  - Determines relative economics of self-provision, utility full requirements service & purchasing competitively

# Possible Components of Standby

*(also called Partial Requirements Service)*

- A set of retail electric products for customers with on-site, non-emergency generation
  - *Backup power* during an unplanned generator outage
  - *Maintenance power* during scheduled generator service
  - *Economic replacement power* when it costs less than on-site generation
  - *Supplemental power* – additional electricity supply for customers whose on-site generation does not meet all of their needs
  - *Delivery* associated with these energy services

# Example of a Self-Generator's Purchase Requirements



# Minnesota Standby Rate Overview

Minnesota Standby Tariffs follow a similar construction:

- ▶ Monthly Customer Charge (\$/Month)
- ▶ Reservation Charge (\$/kW)
- ▶ Usage Charges (\$/kW & \$/kWh)

# Standby Principles

## **Criterion 1 – Transparency:**

- The separation of capacity costs to best reflect the drivers of cost for each component, i.e. dedicated distribution, shared distribution, transmission, and generation capacity;

## **Criterion 2 – Flexibility:**

- Rates that allow customers to minimize charges by operating in a manner beneficial for the utility; and

## **Criterion 3 – Economically Efficient Consumption:**

- Sending clear price signals that charge a premium for unscheduled outage demand that coincides with utility peak, and minimizing charges for scheduled outage demand during periods of excess utility capacity;



# Avoided Rate Modelling

Evaluates how Standby Rates affect the blended rate savings (total kWh price for electricity)

- Compares a customer's utility bills before and after CHP installation
  - Full Requirements Rate
  - Standby Rate
- Analyzes facility usage using multiple variables
  - Facility Size and Generator Size (kW)
  - Outage Probability (Forced Outage Rate) – ORNL
  - Load Profiles (not in report)

Methodology comes from “Standby Rates for Customer Sited Resources” published by the Environmental Protection Agency

# Avoided Rate Modelling

## Before CHP:

Customer Charge			\$25
Energy Charge (kWh)	\$0.058	400,000 kWh	\$23,200.00
Demand Charge (kW)	\$9.00	800 kW	\$7,200.00
			\$30,425.00
Tax		5%	\$1,521.25
Total			\$31,946.25
<b>Blended Rate (kWh)</b>			<b>\$0.0799</b>

400,000 kWh - 150,000 kWh

= 250,000 kWh

\$31,946.25 - \$12,941.25

= \$19,005.00

## After CHP:

Customer Charge			\$25
Energy Charge (kWh)	\$0.058	150,000 kWh	\$8,700.00
Standby Reservation (kW)	\$5.00	500 kW	\$2,500.00
Demand Charge (kW)	\$9.00	400 kW	\$3,600.00
			\$12,325.00
Tax		5%	\$616.25
Total			\$12,941.25
<b>Blended Rate (kWh)</b>			<b>\$0.0863</b>

kW <i>NOT PURCHASED</i>	250,000 kWh
Money <i>NOT SPENT</i>	\$19,005.00
Avoided Rate	\$0.076

Avoided Rate as a Percentage of Retail Rate	95%
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# Avoided Rate Modelling

## Why Use this Metric?

- Compares two prices
- Easily Understood
- Customer Driven Metric
- Reduces complex rate mechanics

## Drawbacks?

- Simple
- Not a cost of service study
- Doesn't address "fairness" or "appropriateness" of rates

# Standby Modelling Results

	Generating Capacity (kW)			
Standby Avoided Rates	500 kW	3,000 kW	10,000 kW	10,000 kW
Xcel Energy *	87%	90%	93%	96%
Alliant Energy	77%	77%	78%	78%
Minnesota Power	90%	95%	92%	97%
Otter Tail Power	97%	96%	96%	97%

\* Model did not analyze the financial effects of exceeding the grace period

# General Recommendations

(Not Utility Specific)

Principle:	Analysis and Recommendation:
Transparency	Standby rates should be transparent, concise and easily understandable.
	Standby usage fees for both demand and energy should reflect time-of-use cost drivers.
Flexibility	The Forced Outage Rate should be used in the calculation of a customer's reservation charge.
	The standby demand usage fees should only apply during on-peak hours and be charged on a daily basis.
Economically Efficient Consumption	Grace periods exempting demand usage fees should be removed where they exist and standby rates should be priced to reflect usage.

# Xcel Power – Overview

## Standby Service Rider (SSR) - Charge Components:

- ▶ Customer Charge
  - Monthly “access” fee – three types: Forced Outage, Planned Outage and Non-Firm
  
- ▶ Standby Contract Capacity Fee
  - Applies against, “the amount of load served by the customer’s alternative generation.” Customer sets capacity requirements.
  
- ▶ Usage Rate Demand Charge when standby is taken
  - 964 hour grace period – Equals an 11% Forced Outage Rate
  - After grace period the Demand Charge of the base tariff replaces the Reservation Rate.
  
- ▶ Usage Rate Energy Charge when standby is taken
  - Charged at the applicable rate of the base tariff to which the SSR is attached

# Xcel Power – Rate (cont.)

	500 kW	3000 kW	10,000 kW	10,000 kW
<b>Voltage</b>	Secondary	Primary	Transmission Transformed	Transmission
<b>Rate</b>	General Service	GS – Time of Day	GS – Time of Day	GS – Time of Day
<b>Total</b>	\$294,723.59	\$1,657,975.80	\$5,298,892.92	\$5,219,008.92
<b>per kWh</b>	\$0.07	\$0.06	\$0.06	\$0.06
<b>Standby Rates</b>				
<b>Purchased Energy</b>	219,000 kWh	1,314,000 kWh	4,380,000 kWh	4,380,000 kWh
<b>Availability</b>	95%	95%	95%	95%
<b>Total</b>	\$50,570.97	\$233,915.78	\$614,122.04	\$469,727.84
<b>per kWh</b>	\$0.23	\$0.18	\$0.14	\$0.11
<b>Avoided Cost</b>	\$244,152.62	\$1,424,060.02	\$4,684,770.88	\$4,749,281.08
<b>Avoided kWh</b>	4,161,000 kWh	24,966,000 kWh	83,220,000 kWh	83,220,000 kWh
<b>Avoided Rate</b>	\$0.0587	\$0.0570	\$0.0563	\$0.0571
<b>% Avoided Rate of Full Requirements Rate</b>	<b>87.20%</b>	<b>90.41%</b>	<b>93.06%</b>	<b>95.79%</b>

# Xcel Power – Rate (cont.)

Facility Type	Max Demand (kW)			CHP Size (kW)	Voltage Class	CHP Capacity	Avoided Rate
	Summer	Shoulder	Winter				
Hospital	4,100 kW	3,700 kW	3,400 kW	4,100 kW Primary		Full Electric Demand	91%
Hospital	4,100 kW	3,700 kW	3,400 kW	4,100 kW Transmission Transformed		Full Electric Demand	94%
Hospital	4,100 kW	3,700 kW	3,400 kW	3,665 kW Primary		Avg. Baseloading	89%
Hospital	4,100 kW	3,700 kW	3,400 kW	3,665 kW Transmission Transformed		Avg. Baseloading	92%
Hospital	4,100 kW	3,700 kW	3,400 kW	4,027 kW Primary		Avg. Peak Baseloading	90%
Hospital	4,100 kW	3,700 kW	3,400 kW	3,083 kW Primary		Min. Baseloading	88%
Hospital	4,100 kW	3,700 kW	3,400 kW	3,932 kW Primary		Min. Peak Baseloading	90%
Hotel	1,900 kW	1,700 kW	1,450 kW	1,672 kW Primary		Avg. Baseloading	89%
Hotel	1,900 kW	1,700 kW	1,450 kW	1,243 kW Primary		Min. Baseloading	87%
Hotel	1,900 kW	1,700 kW	1,450 kW	1,931 kW Primary		Avg. Peak Baseloading	90%
Hotel	1,900 kW	1,700 kW	1,450 kW	1,759 kW Primary		Min. Peak Baseloading	90%
Hotel	1,900 kW	1,700 kW	1,450 kW	1,900 kW Primary		Full Electric Demand	91%
Hotel	1,900 kW	1,700 kW	1,450 kW	1,900 kW Transmission Transformed		Full Electric Demand	94%
Hotel	1,900 kW	1,700 kW	1,450 kW	1,672 kW Transmission Transformed		Avg. Baseloading	92%
Laundromat	375 kW	375 kW	375 kW	173 kW Primary		Avg. Baseloading	80%
Laundromat	375 kW	375 kW	375 kW	375 kW Primary		Full Electric Demand	85%
Paper Mill	2,300 kW	1,400 kW	2,300 kW	2,300 kW Primary		Full Electric Demand	92%
Paper Mill	2,300 kW	1,400 kW	2,300 kW	2,206 kW Primary		Avg. Baseloading	92%
Paper Mill	2,300 kW	1,400 kW	2,300 kW	2,154 kW Primary		Avg. Peak Baseloading	92%
Paper Mill	2,300 kW	1,400 kW	2,300 kW	2,300 kW Transmission Transformed		Full Electric Demand	95%
Paper Mill	2,300 kW	1,400 kW	2,300 kW	2,206 kW Transmission Transformed		Avg. Baseloading	95%
Paper Mill	2,300 kW	1,400 kW	2,300 kW	2,154 kW Transmission Transformed		Avg. Peak Baseloading	95%



# Xcel Power – Recommendations

Principle:	Analysis and Recommendation:
Transparency	Combine backup service and maintenance service under one reservation fee.
	Unbundle the components within the reservation rate.
	Firm standby demand usage fees during times of system constraint should be designed as they would for full-requirements customers of similar size.
Flexibility	Remove the grace period for firm backup power and instead tie the reservation charge to the customer's FOR .
	Create a buy-through option that allows self-generating customers to purchase all standby service from the market at market prices.
Economically Efficient Consumption	A daily on-peak, as-used demand charge should replace the grace period and additional demand charges found in the full-requirements tariff.

# Minnesota Power – Overview

## **Rider for Standby Service (RSS) Charge Components:**

- ▶ Standby Reservation Fee
  - Reserves Standby Service – (N/A for non-firm customers)
- ▶ Standby Demand Usage Fee
  - Summer Peak
  - Winter Peak
  - Off-Peak
- ▶ Usage Rate Energy Charge when standby is taken
  - Charged at the applicable rate of the base tariff to which the RSS is attached

# Minnesota Power – Overview

Customer shall pay a Standby Reservation Fee equal to the rate defined below times the Contracted Standby Demand.

Rate Schedule Voltage Level	Residential	General Service	Large Light & Power	Municipal Pumping	Large Power
Transmission	N/A	N/A	\$3.08	N/A	\$4.54
Primary Distribution	N/A	\$4.70	\$6.14	\$5.04	N/A
Secondary Distribution	\$4.27	\$6.93	\$9.74	\$7.25	N/A

## There shall be no Standby Demand Usage Fee applied if:

- ▶ (i) Contracted Standby Demand equals the nameplate capacity rating of the distributed generation system;
- ▶ the actual demand supplied by the DG system is greater than the difference between the nameplate capacity of the DG system and the Contracted Standby Demand during each 15-minute period of the billing month.

# Minnesota Power – Results\*

	500 kW	3000 kW	10,000 kW	10,000 kW
Voltage	Secondary	Primary	Primary	Transmission
Rate	General Service	General Service	Large Light and Power	Large Light and Power
Purchased Energy	4,380,000 kWh	26,280,000 kWh	87,600,000 kWh	87,600,000 kWh
Total	\$343,117.38	\$1,995,074.28	\$6,899,408.75	\$6,650,624.75
per kWh	\$0.08	\$0.08	\$0.08	\$0.08
<b>Standby Rates</b>				
Purchased Energy	219,000 kWh	1,314,000 kWh	4,380,000 kWh	4,380,000 kWh
Availability	95%	95%	95%	95%
Avoided Cost	\$294,223.55	\$1,818,560.45	\$6,041,145.52	\$6,159,561.52
Avoided kWh	4,161,000 kWh	24,966,000 kWh	83,220,000 kWh	83,220,000 kWh
Avoided Rate	\$0.071	\$0.073	\$0.073	\$0.074
% Avoided Rate of Full Requirements Rate	90.26%	95.95%	92.17%	97.49%

\*Rate Mechanics have never been tested.

# Minnesota Power – Recommendations

Principle:	Analysis and Recommendation:
<b>Transparency</b>	The reservation and usage rates should be unbundled into corresponding generation, transmission and distribution cost components while the overarching mechanics should be made more transparent.
	Minnesota Power should specify how maintenance is treated and billed.
	Standby reservation charges and demand usage charges should reflect load diversity.
<b>Flexibility</b>	The standby reservation charge should incorporate a customer's FOR to allow self-generating customers to avoid a greater amount of the fixed monthly charges.
<b>Economically Efficient Consumption</b>	The standby demand usage fees should only apply during on-peak hours and be charged on a daily basis.
	Standby energy usage fee should reflect time-of-use cost drivers.

# Otter Tail- Rate

## **Standby Service (SS) - Charge Components:**

- ▶ **Customer Charge**
  - Monthly “access” fee – Firm/Non-Firm by Voltage Class
  
- ▶ **Reservation Capacity Fee**
  - Applies against Contracted Standby Demand
  - Standby Reservation plus Summer/Winter Adder
  
- ▶ **Usage Rate Demand Charge**
  - Metered Demand, per day On-Peak, per kW
  - Divided between Summer/Winter Seasons
  
- ▶ **Usage Rate Energy Charge –**
  - Time of Use divided between Summer/Winter Seasons

# Otter Tail Power – Results

	500 kW	1,000 kW	3,000 kW	10,000 kW
<b>Voltage</b>	Secondary	Primary	Primary	Transmission
<b>Rate</b>	General Service	Large General	Large General TOU	Large General TOU
<b>Purchased Energy</b>	4,380,000 kWh	8,760,000 kWh	26,280,000 kWh	87,600,000 kWh
<b>Total</b>	\$329,723.00	\$492,686.80	\$1,438,652.49	\$4,379,974.00
<b>per kWh</b>	\$0.08	\$0.06	\$0.05	\$0.05
<b>Standby Rates</b>				
<b>Purchased Energy</b>	219,000 kWh	438,000 kWh	1,314,000 kWh	4,380,000 kWh
<b>Availability</b>	95%	95%	95%	95%
<b>Total</b>	\$24,422.99	\$42,742.31	\$123,450.92	\$320,608.25
<b>per kWh</b>	\$0.11	\$0.10	\$0.09	\$0.07
<b>Avoided Cost</b>	\$305,300.01	\$449,944.49	\$1,315,201.57	\$4,059,365.75
<b>Avoided kWh</b>	4,161,000 kWh	8,322,000 kWh	24,966,000 kWh	83,220,000 kWh
<b>Avoided Rate</b>	\$0.073	\$0.054	\$0.053	\$0.049
<b>% Avoided Rate of Full Requirements Rate</b>	<b>97.47%</b>	<b>96.13%</b>	<b>96.23%</b>	<b>97.56%</b>

# Otter Tail – Recommendations

Principle:	Analysis and Recommendation:
Transparency	<p>The reservation charges should be unbundled into generation, distribution and transmission cost components.</p> <p>Clearly state whether non-firm standby customers may take scheduled maintenance service.</p>
Flexibility	<p>The FOR should be used in the calculation of a customer's reservation charge.</p>



# Net Metering

## Minnesota Net Metering

- Eligible for customers up to 1 MW
- Customers above 100 kW must be on a standby rate\*
- CHP must have 40% Efficiency
- CHP Sized no larger than 120% of their on-site annual electric consumption
- NEG Credits priced at
  - Systems < 40 kW – “Average Retail Utility Energy Rate”
  - Systems > 40 kW – Utility Avoided Costs

# Net Metering – NEG Examples

State	Net Excess Generation (NEG) Policy for Net Metering Customers
California	<p>Customer may choose one of the following:</p> <ul style="list-style-type: none"><li>• NEG carried forward to customer's next bill indefinitely.</li><li>• Customer is financially compensated for NEG each billing period.</li></ul>
Pennsylvania	<ul style="list-style-type: none"><li>• NEG is carried forward as a kWh credit.</li><li>• Customer is financially compensated at the "price –to–compare" (includes the generation and transmission components, but not the distribution component, of utility's retail rate).</li></ul>
New York	<ul style="list-style-type: none"><li>• NEG for solar PV and wind carried forward as a kWh credit; at the end of a year all NEG is monetized at the utility's avoided rate. NEG for micro CHP is credited at the utility's avoided rate and carried over indefinitely.</li></ul>

# Net Metering – Standby Exemptions

Net-Metering and Standby Rates for States with CHP Inclusion in Net-Metering Policy:		
State	Standby	Capacity Limit
Florida	Customer's discretion	<ul style="list-style-type: none"> <li>• 2 MW</li> </ul>
Maine	Exempt	<ul style="list-style-type: none"> <li>• 660 kW for IOU customers</li> </ul>
Maryland	Exempt	<ul style="list-style-type: none"> <li>• 2 MW</li> <li>• 30 kW for Micro-CHP</li> <li>• Systems cannot exceed 200% of customer's baseline electricity consumption</li> </ul>
New York	Exempt	<ul style="list-style-type: none"> <li>• Solar: 2 MW for non-residential</li> <li>• Wind: 2 MW for non-residential</li> <li>• Micro-CHP: 10 kW (residential only)</li> <li>• Micro-hydroelectric: 2 MW for non-residential</li> </ul>
Oklahoma	Exempt	<ul style="list-style-type: none"> <li>• The lesser of 100 kW or 25,000 kWh/year</li> </ul>
Pennsylvania	Exempt	<ul style="list-style-type: none"> <li>• 5 MW for micro-grid and emergency systems</li> <li>• 3 MW for non-residential</li> <li>• 50 kW for residential</li> </ul>
Utah	Exempt	<ul style="list-style-type: none"> <li>• 2 MW for non-residential</li> <li>• 25 kW for residential</li> </ul>
Vermont	Exempt	<ul style="list-style-type: none"> <li>• 2.2 MW for military systems</li> <li>• 20 kW for micro-CHP</li> <li>• 500 kW for all other systems</li> </ul>
Washington	Exempt	<ul style="list-style-type: none"> <li>• 100 kW</li> </ul>

# Net Metering – General Recommendations

- 1. Standby rates should not be issued when utilities can recover capacity costs through a customer's supplemental demand charges.*
- 2. The Net Excess Generation Credit should be the average retail electric rate for all net metering customers.*

# Energy Resources Center

- ▶ 30+ years experience
- ▶ Located at the University of Illinois at Chicago
- ▶ Provides comprehensive and cutting edge solutions for energy and environmental challenges in the institutional, industrial, and commercial sectors
- ▶ Areas of expertise include:
  - energy efficiency
  - distributed generation
  - utilities billing data management
  - biofuels and bioenergy





# Thank You!

Questions?

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