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Solar Energy and Net Metering

Solar energy is an increasingly important part of our nation's current energy mix and will play a vital role in our clean energy future. Today there are a number of ways that customers can obtain solar energy, including through large-scale utility projects, residential rooftop solar panels, and policies designed to utilize more green power. Large-scale utility solar projects amount to approximately 60 percent of the country's total installed solar capacity—and this capacity is expected to triple by the end of 2016. These projects offer the most cost-effective way to increase the use of solar that benefits all electricity customers.¹

Just as the number of utility solar projects grows, there is also growing interest in using rooftop solar panels and other small-scale, on-site power sources known as distributed generation (DG). To encourage the introduction of these systems when they first came to market years ago, many states approved a billing system called net metering. While net metering policies vary by state, customers with rooftop solar or other DG systems usually are credited at the full retail electric rate for any excess electricity they generate and sell to their local electric utility via the electric grid. Electric utilities are required to buy this power, even though it generally would cost them less to produce the electricity themselves or to buy the power on the wholesale market from other electricity providers.

As the use of solar energy continues to grow and the cost of solar technology continues to decline, policymakers across the country are debating whether and how to update current net metering programs. This document explains why net metering policies and rate structures in many states should be updated to ensure that everyone who uses the electric grid continues to help pay to maintain it and to keep it operating reliably at all times. This will ensure that all customers have safe and reliable electricity and that electric rates are fair and affordable for all customers.

What Are Distributed Generation Systems?

DG systems are small-scale, on-site power sources located at or near customers' homes or businesses. Some common examples include rooftop solar panels, energy storage devices, fuel cells, microturbines, small wind, and combined heat and power systems.

Customers with these types of generation systems connect to the local electric grid and use the grid both to buy power from their local electric utility during times when their DG systems are not producing enough to meet their needs and to sell power to their utility when their systems are producing more electricity than is needed. To be clear, the utility's grid infrastructure is the mechanism by which all buying and selling is actually accomplished.

¹A July 2015 study by The Brattle Group explored the cost of solar in Xcel Energy Colorado's service territory and found that utility solar cost \$66 to \$117 per megawatt hour compared to \$128 to \$192 per megawatt hour for residential rooftop solar power. These results are consistent with those of Massachusetts Institute of Technology's Future of Solar Energy Study and those of a Lawrence Berkeley National Lab Study released in August 2015.

What Is Net Metering?

Net metering is a billing system that allows electric customers to sell to their electric utility any excess electricity generated by their DG systems. Many different DG sources may be eligible for net metering credits, but rooftop solar installations are the most common type of DG promoted with net metering.

While net metering policies vary by state, customers with rooftop solar or other DG systems usually are credited at the full retail electricity rate for any electricity they sell to electric utilities via the grid. The full retail electricity rate includes not only the cost of the power but also all of the fixed costs of the poles, wires, meters, advanced technologies, and other infrastructure that make the electric grid safe, reliable, and able to accommodate solar panels or other DG systems. Through the credit or payment they receive, net-metered customers effectively avoid paying these costs for the grid.

Do Customers With DG Systems Still Use the Power Grid?

Yes. Unlike other energy sources, electricity has unique properties that do not allow it to be easily or economically stored—it must be generated and delivered at the precise moment it is needed.

Rooftop solar, like all solar, relies on the availability of the sun to generate electricity. The sun does not shine around the clock, and solar power can appear or disappear rapidly over the course of a day. Because the majority of residential DG customers do not have storage on their systems, they require a connection to the grid. The grid connection enables residential rooftop solar users to buy power when their system does not produce enough electricity to meet their needs and to sell electricity onto the grid if their system generates more than they need. Customers with DG systems also rely on the grid to ensure that their own power supply provides reliable, high-quality service at all times.

How Does Net Metering Impact Customer Bills?²

Customer electric bills are based on the electric utility's cost of providing electric service. This includes the cost of the fuels used to generate electricity and the cost to transport and deliver the electricity to the customer. Costs also include the maintenance of the grid, as well as utility programs for low-income assistance, energy efficiency, environmental improvements, and other public benefits.

In general, every electric customer has an electric meter that records the amount of power delivered by their electric utility. As electricity is used, the meter spins forward, much like a car's odometer records miles traveled. In the case of an electric meter, the meter records energy use in kilowatt-hours (kWh).

Net-metered customers generally are credited for the electricity they sell to the grid, with their electric meter essentially spinning backwards to provide a credit against the electricity that these customers must buy from their electric utility at night or during other periods when their electricity use exceeds their system's output. Customers are only billed for their "net" energy use.

That means that when rooftop solar or other DG customers generate electricity, they avoid paying for the utility's power, which is fair because they did not use it. But, they also avoid paying for all of the fixed costs of the grid that delivers power when they need it and/or takes the excess power they sell back to the utility.

²Customers who purchase or lease rooftop solar panels and other DG systems first have to pay for the cost of those systems. Customers either pay for the entire system up front or enter into a lease agreement, which results in a monthly bill that is in addition to the bill that the local electric utility sends. Leases are the most typical purchase arrangement.

As a result, these grid costs are shifted to those customers without rooftop solar or other DG systems through higher utility bills, which is not fair.

What Is the Difference Between Retail and Wholesale Electricity Rates?

Retail electricity rates are the final rates charged to customers by an electric utility, based on all of the costs involved in generating, transporting, and delivering power.

Wholesale electricity rates include the cost of the fuel used to generate electricity and the cost of buying the power in the competitive wholesale market from any number of electricity providers. They do not include the cost of transporting and delivering the electricity through the electric grid to reach a customer. Wholesale prices usually change on an hourly basis throughout the day.

Because of the way that net metering policies originally were designed, net-metered customers are credited for the power they sell to electric utilities, usually at the full retail electricity rate, even though it would cost less for utilities to produce the electricity themselves or to buy the power on the wholesale market from other electricity providers.

Many energy experts agree that net-metered customers should be compensated at the wholesale price for the electricity they produce, similar to other electricity providers. This reflects the fact that electric utilities buying this power still must incur the costs of delivering the power to their customers, including the costs of maintaining the poles, wires, meters, and other infrastructure required to deliver a reliable supply of electricity.

How Does Distributed Generation Affect the Grid?

As the use of rooftop solar and other DG systems increases, so, too, does the two-way flow of power on the electric distribution system. To ensure the safe and reliable delivery of electricity, an electric utility's distribution system must be able to safely manage and control the flow of two-way power. At the same time, electric utilities face integration challenges associated with the fluctuating levels of power created by variable wind and solar DG systems.

Electric utilities must invest in their distribution systems to avoid overloading circuits, causing voltage regulation or power quality problems, or jeopardizing the safety of the public or utility employees. However, if net-metered customers do not contribute to the fixed costs of maintaining the grid and keeping it operating reliably, a utility's remaining customers will face higher rates to pay for these costs.

Should Current Net Metering Policies Be Updated?

Yes. For one thing, the costs of producing solar power have declined substantially since the net metering concept was first introduced, but the financial benefits of net metering have not been adjusted to reflect this. Net metering was deliberately limited to a small number of utility customers or electricity production levels, as a way to incentivize the market. With that accomplished, many states are now meeting or exceeding their caps on net metering customers, even with some states granting extensions to the caps.

Throughout the country, state legislatures and utility regulatory commissions are taking steps to update outdated net metering policies to enforce their caps and to eliminate the shift in costs from customers with rooftop solar systems to customers without the systems. Until this is addressed, non-DG customers will continue to carry ever-increasing costs.

How Are States Dealing With The Cost Shift Created By Net Metering?

Almost every state is looking at different solutions to reform net metering to address the high costs and cost shift caused by outdated net metering policies. These solutions range from legislative action to policy changes directed by or at state utility regulatory commissions.

In December 2015, the Nevada Public Utilities Commission found that net metering resulted in a \$623 cost shift per rooftop solar customer in southern Nevada. The commission took action and updated the state's net metering policy to change the rate paid for net-metered power to the same rate the utility paid for other sources of power. The commission also added a small energy charge and created a separate customer class for residential rooftop solar producers because their impact on the system is different from that of other residential customers. The Nevada PUC Chairman Paul Thomsen said, "The new rate is intended to ensure that the 98 percent of residential utility ratepayers who are non-solar customers do not subsidize those with solar systems." <http://www.foxreno.com/news/features/top-stories/stories/controversial-solar-rate-changes-stay-effect-9167.shtml#.VpsAbU3luok>

In Hawaii, the Hawaii Utilities Commission recently reformed the state's net metering policies to pay residential solar producers the same price as paid to larger, competitive solar producers. These policies now assure that all solar producers receive comparable prices, have incentives to promote efficiency, and avoid imposing additional excessive costs on utility customers who do not or cannot install rooftop solar systems.

What Are Others Saying About The Need To Update Current Net Metering Policies?

"When this rate structure is combined with net metering, which compensates residential [solar PV] generators at the retail rate for the electricity they generate, the result is a subsidy to residential and other distributed solar generators that is paid by other customers on the network."

The Massachusetts Institute of Technology, [The Future of Solar Energy](#), May 5, 2015

"In short, net metering is regressive political income redistribution in support of a putatively progressive cause. Several states including Hawaii, Arizona, and California have recently proposed changing their net-metering policies to reduce the cost shift. In October, the Hawaii Public Utilities Commission cut by roughly half the rate paid to new solar customers after finding that the subsidy was unnecessary to encourage solar adoption. Nevada's regulators went even further by slashing payments to *existing* solar customers from retail to the wholesale rate and raising their fixed charge for using the grid. Solar can strain the grid because the sun doesn't shine all the time."

[The Wall Street Journal Editorial](#), December 28, 2015

"The PUC rightly decided that allowing panel owners to collect retail rates for their surplus power unfairly burdened the rest of the state's power customers. Going forward, solar customers will have to pay more for their connection to the grid and get by with wholesale rates on their surplus electricity."

[The Las Vegas Review-Journal Editorial](#), January 2, 2016

The Council of State Governments passed a [resolution](#) in December 2015 that encourages state policymakers to recognize the value the electric grid delivers to all and to: (citation for resolution)

1. Evaluate the system-wide benefits and costs of DG (including costs and benefits relating to the investment in and operation of generation and the transmission and distribution grid) so that those costs and benefits relating to DG can be appropriately allocated and made transparent to regulators, legislators and consumers; and

2. Facilitate the continued provision of safe, reliable, resilient, secure, cost-effective, and environmentally sound energy services at fair and affordable electric rates as new and innovative technologies are added to the energy mix; and

3. Update policies and regulations to ensure that everyone who benefits from the electric power grid helps pay to maintain it and to keep it operating reliably at all times.

The bottom line:

The intent of the original net metering policy was to incentivize early adopters, not create huge subsidies from one group of customers to another. Now that the cost of solar systems has come down significantly, there is no need for continued large subsidies. And, states that have seen rapid growth in rooftop solar have had to develop new policies to reform net metering to subsidies and provide certainty for the marketplace.

Solar power is an important part of our energy future, and the electric grid is the essential infrastructure that helps to deliver solar energy to customers. It is important that policymakers and regulators consider all possible approaches when looking to reform outdated net metering policies to end the cost shift and to enact policies that ensure a bright and sustainable future for solar that benefits all electricity customers.

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