

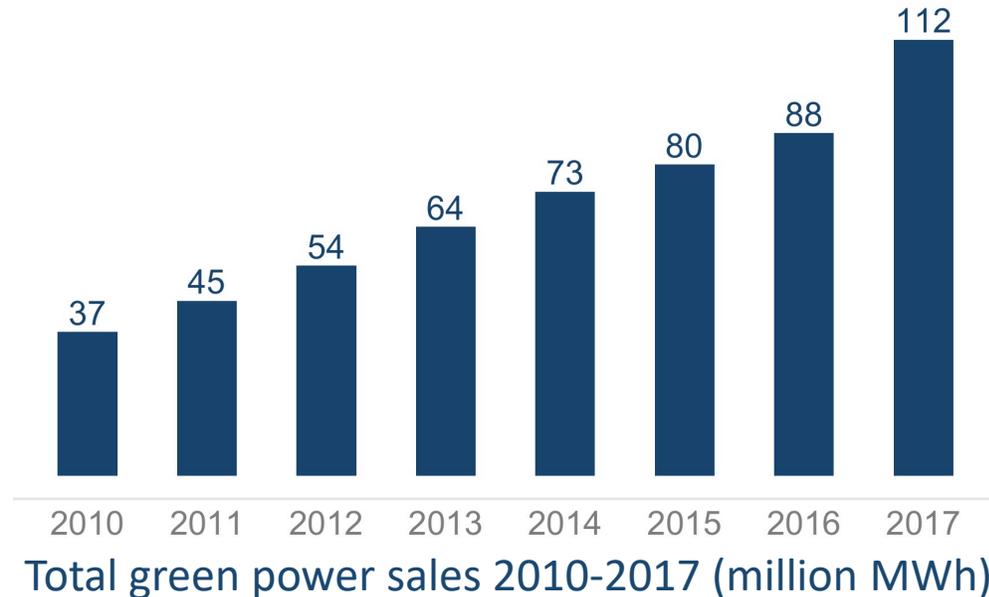


State of the Voluntary Green Power Market (2017 Data)

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EPA Green Power Partnership Webinar
3/13/2019

The Big Picture

In 2017, about **5.5 million customers** procured about **112 million MWh** of renewable energy through green power markets.



That represents about:

3%

of U.S. retail electricity sales

26%

of U.S. non-hydro renewable energy generation

Source: O'Shaughnessy et al. (2018)

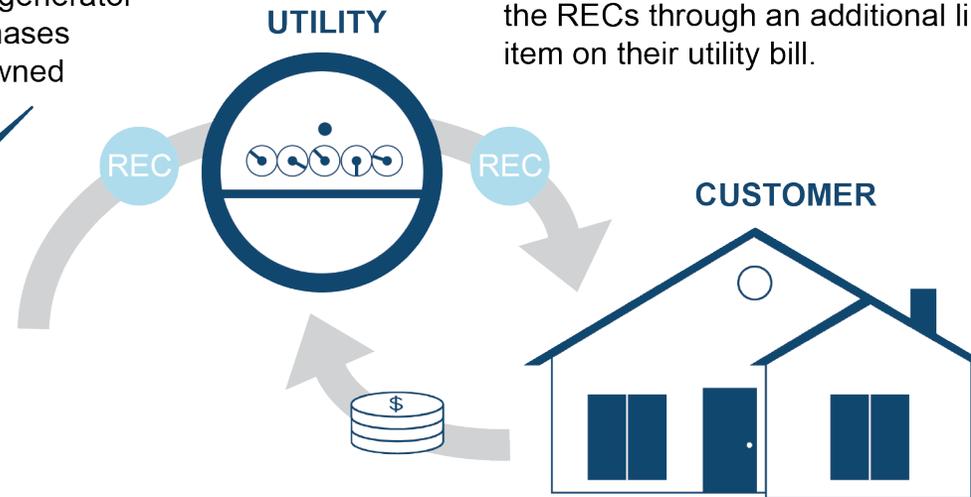
The Markets

Utility Green Pricing

Utility green pricing programs begin with a renewable energy generator. The utility either owns the generator and retains RECs or purchases RECs from a third-party owned generator.



The utility retires the RECs on behalf of green pricing customers, who pay for the RECs through an additional line item on their utility bill.

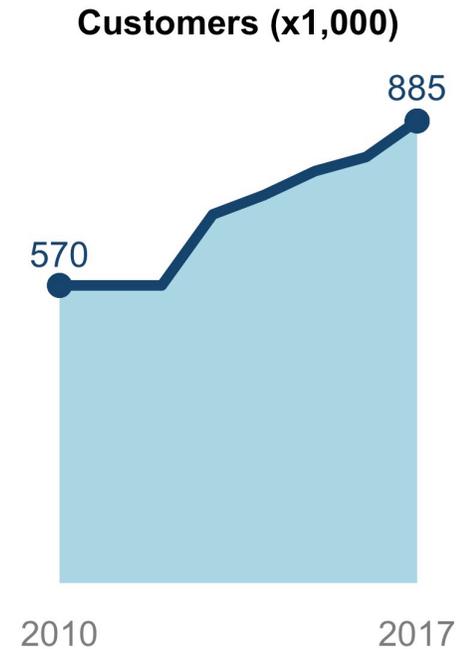
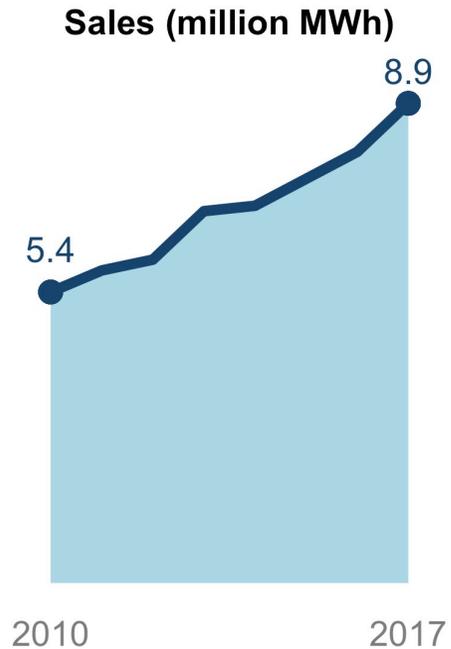


Basic utility green pricing program structure

Specific program structures vary

Utility Green Pricing Trends

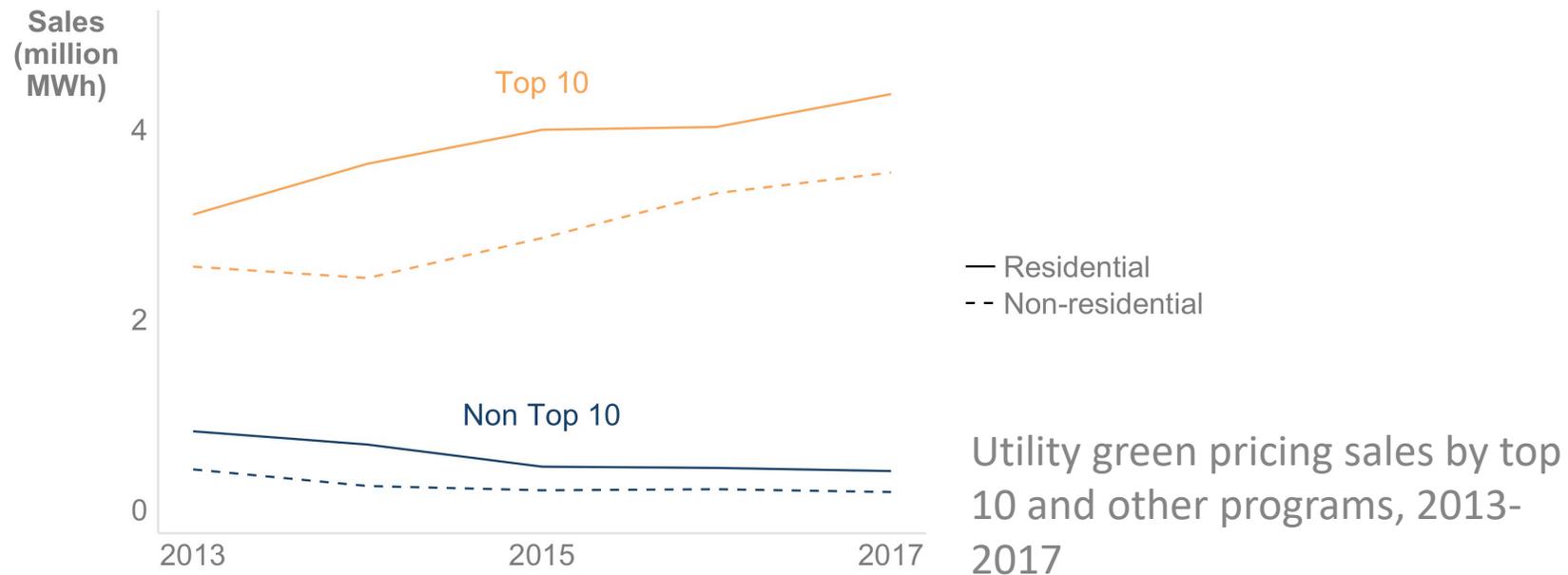
About **885,000 customers** procured about **8.9 million MWh** of renewable energy through utility green pricing programs in 2017. Utility green pricing sales grew by about 11% from 2016 to 2017.



Source: O'Shaughnessy et al. (2018)

Green Pricing Growth Led by the Top Programs

Recent growth in green pricing sales is driven by growth in the top 10 programs. Sales in other programs have generally declined over time, though that decline has slowed in recent years.

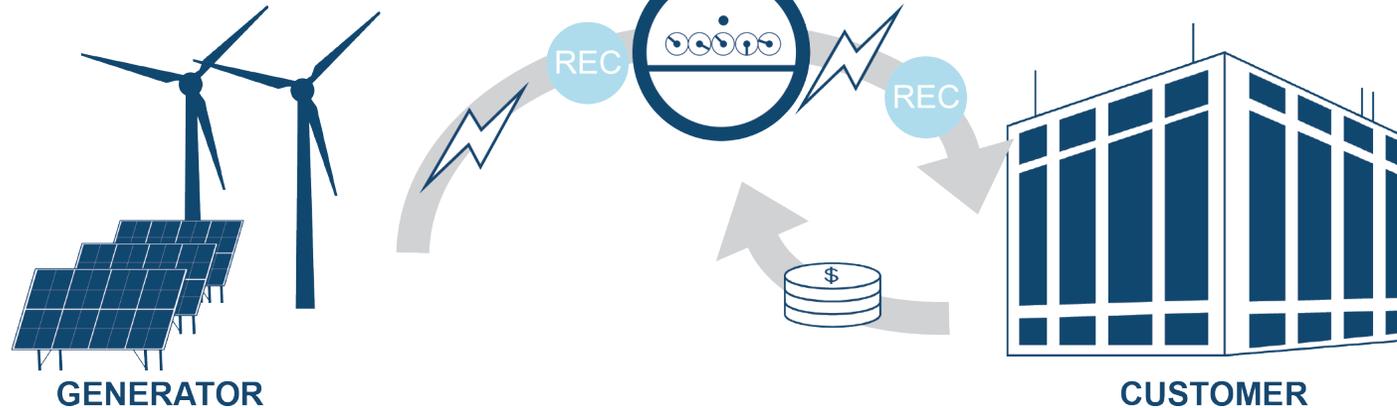


Source: O'Shaughnessy et al. (2018)

Utility Renewable Contracts

In a utility renewable contract, the customer enters into a contract with the utility to procure power and RECs from a renewable energy provider. Unlike green pricing programs, the customer may be able to specify the resource for the product.

The utility provides the power and RECs to the customer. The customer continues to pay the utility with a modified green tariff or bilateral contract rate.

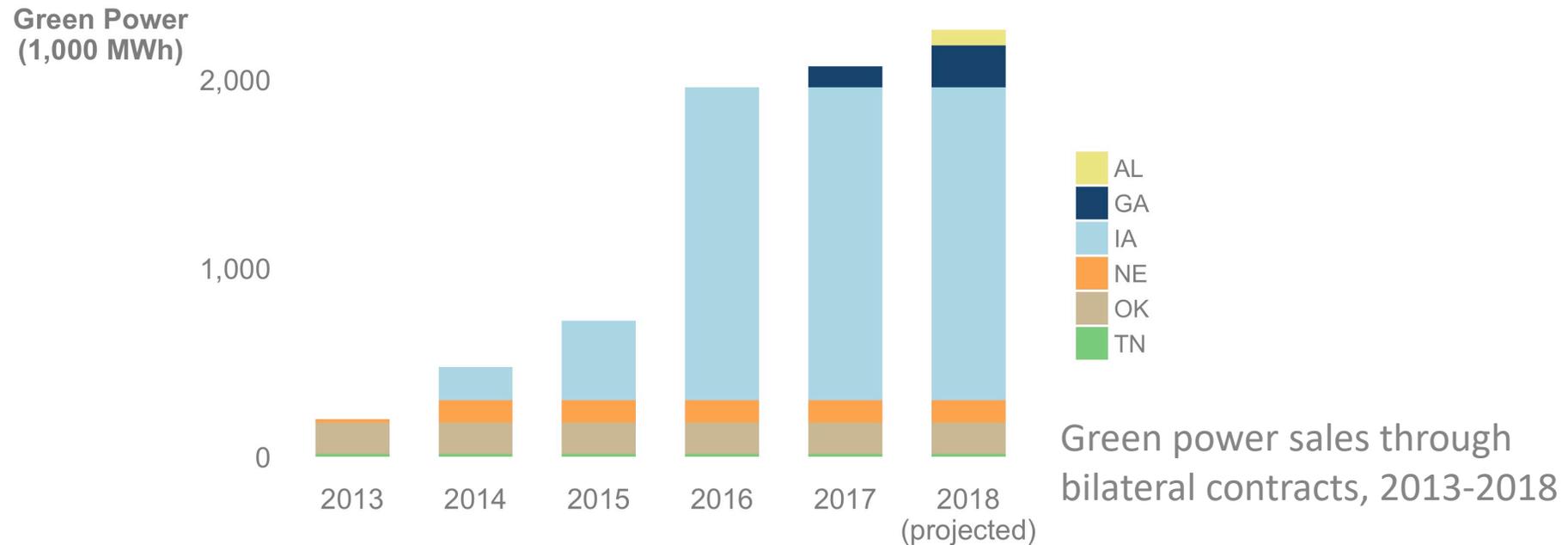


Basic utility renewable contract structure

Specific program structures vary

Bilateral Contracts

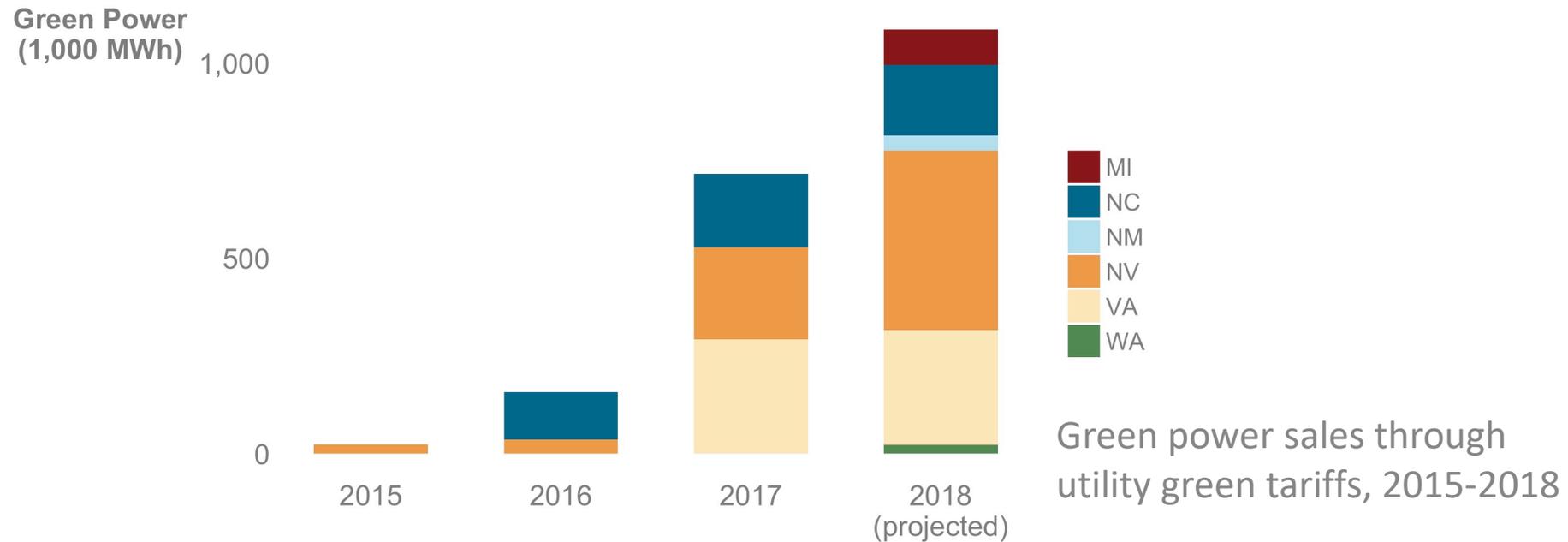
About 741 MW of green power capacity had been procured through bilateral contracts through the end of 2017, generating around 2.2 million MWh/year.



Source: O'Shaughnessy et al. (2018)

Utility Green Tariffs

About 770 MW of green power capacity had been procured through utility green tariffs by the end of 2017, generating around 716,000 MWh in 2017.



Source: O'Shaughnessy et al. (2018)

Competitive Suppliers

In restructured electricity markets, customers may choose a competitive electricity supplier that offers a green power product.

The competitive supplier provides the customer with power and RECs. The utility remains responsible for transmission and distribution. The competitive supplier may charge a premium for the green power product.



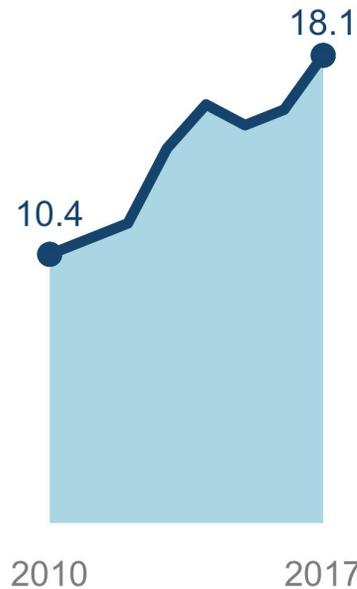
Basic competitive supplier sales structure

Specific program structures vary

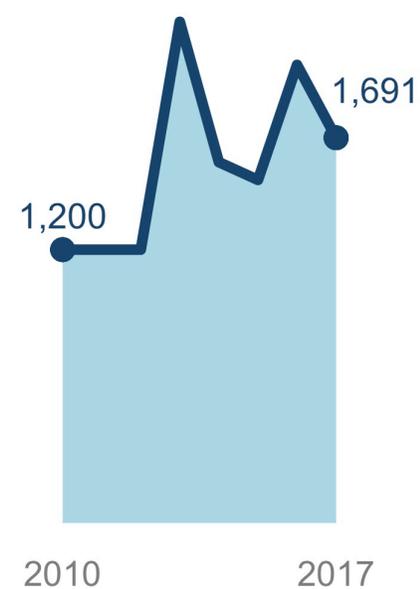
Competitive Supplier Trends

About **1.7 million customers** procured about **18 million MWh** of renewable energy through competitive suppliers in 2017. Competitive supplier green power sales grew by about 13% from 2016 to 2017.

Sales (million MWh)



Customers (x1,000)

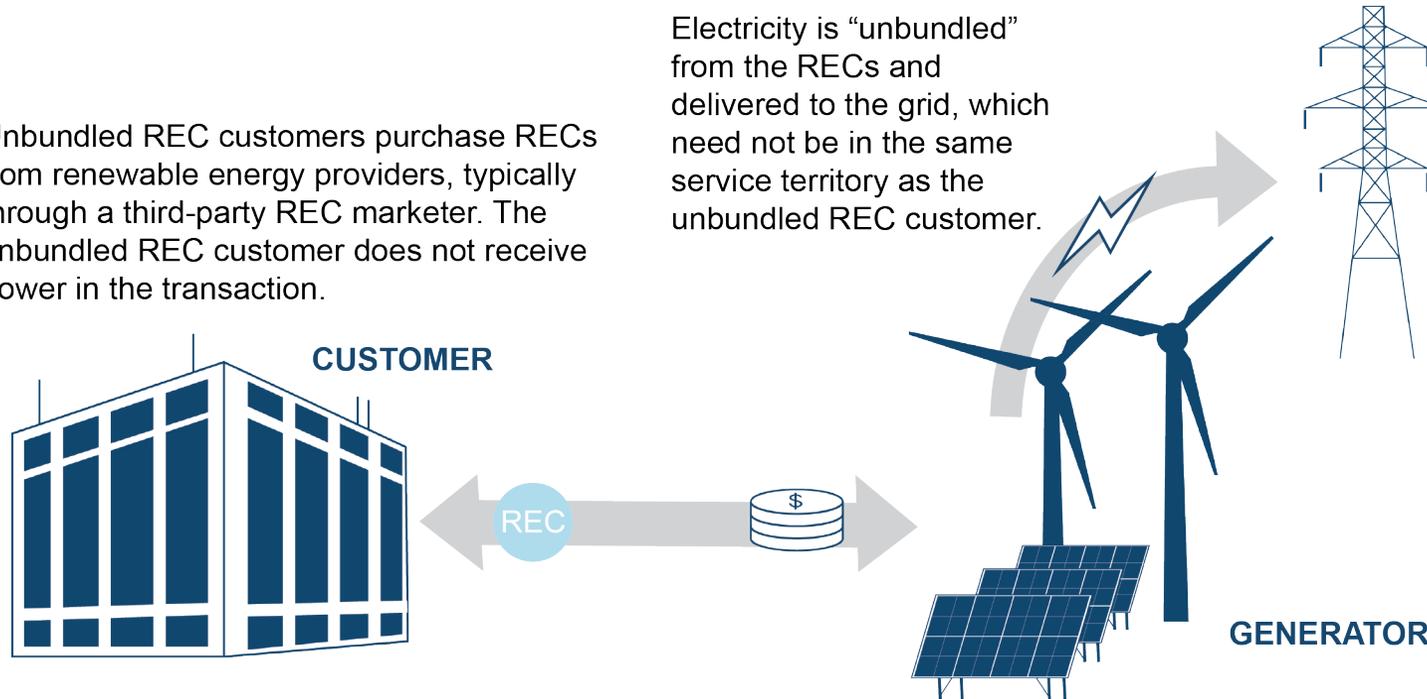


Source: O'Shaughnessy et al. (2018)

Unbundled RECs

Unbundled REC customers purchase RECs from renewable energy providers, typically through a third-party REC marketer. The unbundled REC customer does not receive power in the transaction.

Electricity is “unbundled” from the RECs and delivered to the grid, which need not be in the same service territory as the unbundled REC customer.



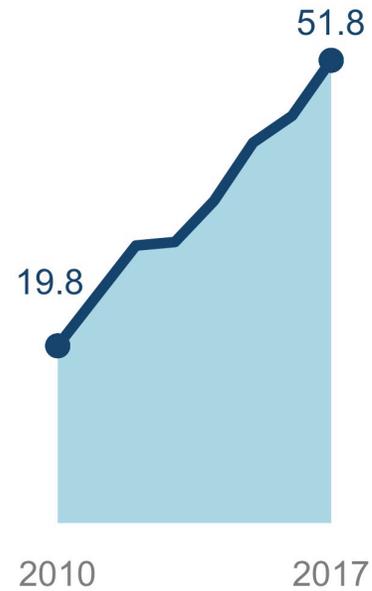
Basic unbundled RECs sales structure

Specific program structures vary

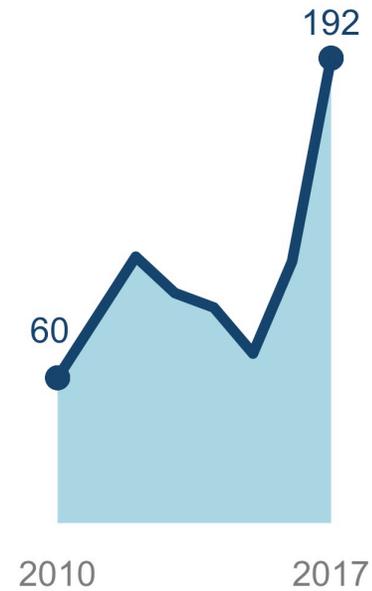
Unbundled RECs Trends

About **192,000 customers** procured about **52 million MWh** of renewable energy through unbundled RECs in 2017. Unbundled REC sales grew by about 14% from 2016 to 2017.

Sales (million MWh)



Customers (x1,000)

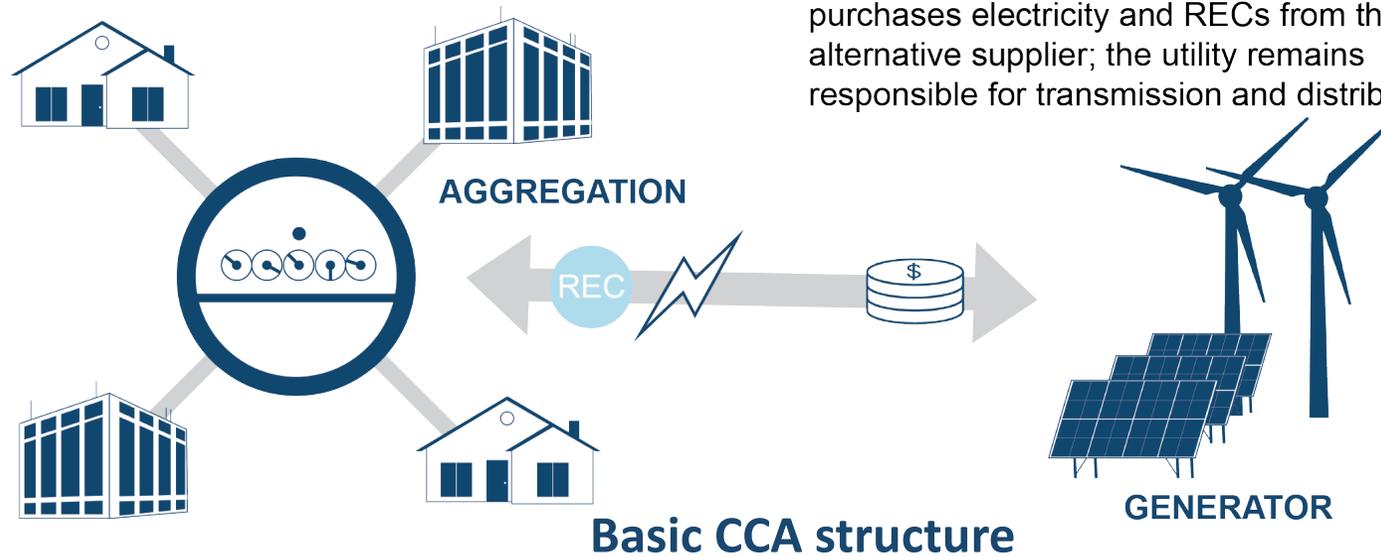


Source: O'Shaughnessy et al. (2018)

Community Choice Aggregation

A CCA effectively “aggregates” the electricity demand of many customers (residential and non-residential) in order to procure electricity from an alternative supplier.

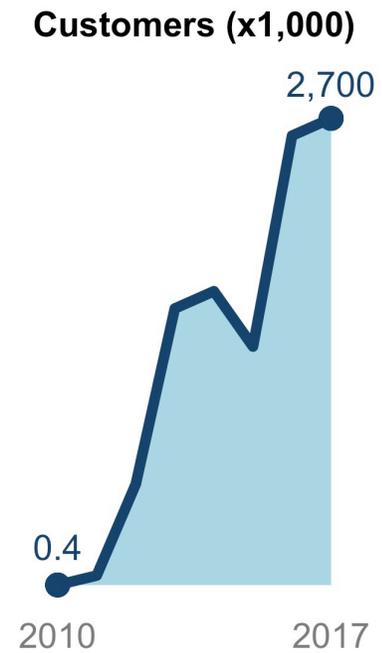
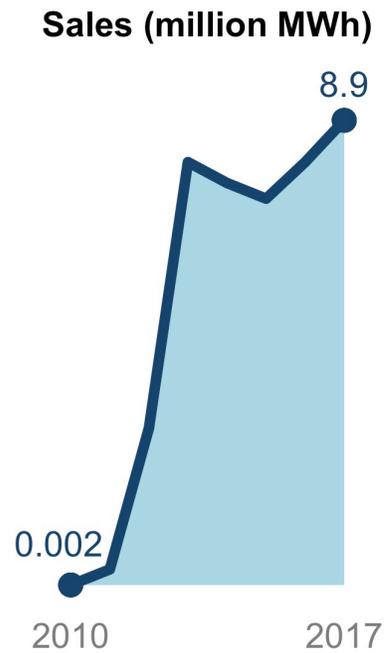
The CCA “switches” from an incumbent electricity supplier to an alternative supplier with a renewable energy product (though the switch may include a non-renewable product). The CCA purchases electricity and RECs from the alternative supplier; the utility remains responsible for transmission and distribution



Specific program structures vary

CCA Trends

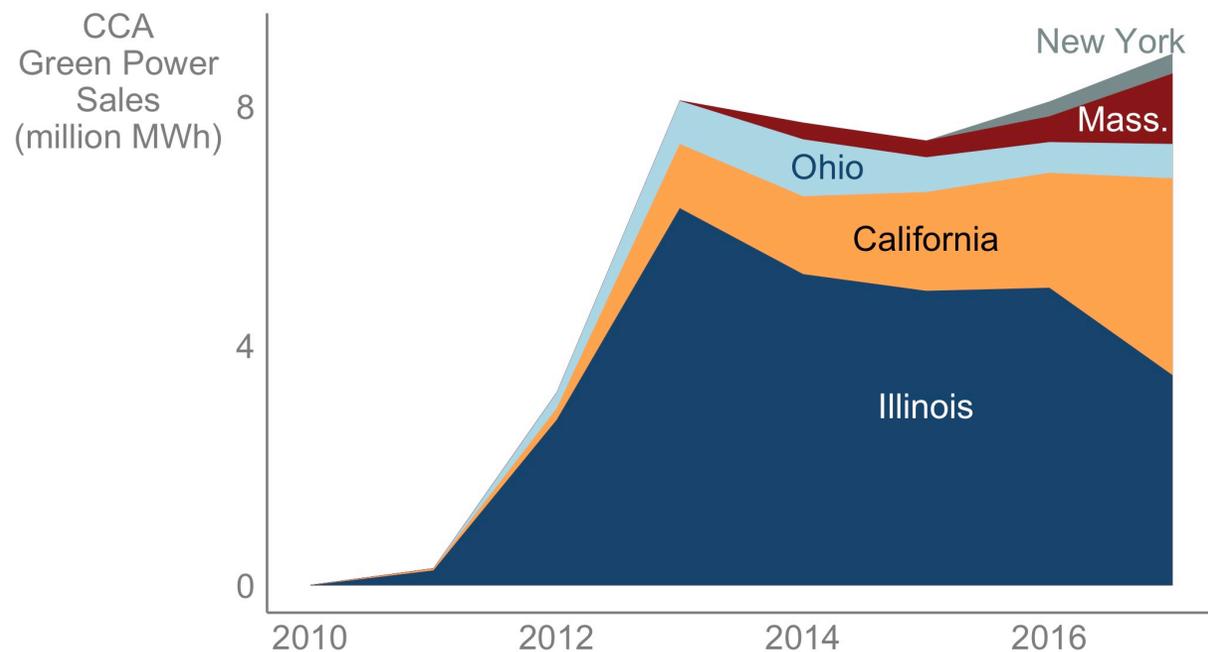
About **2.7 million customers** procured about **8.9 million MWh** of renewable energy through CCAs in 2017. CCA green power sales grew by about 10% from 2016 to 2017.



Source: O'Shaughnessy et al. (2018)

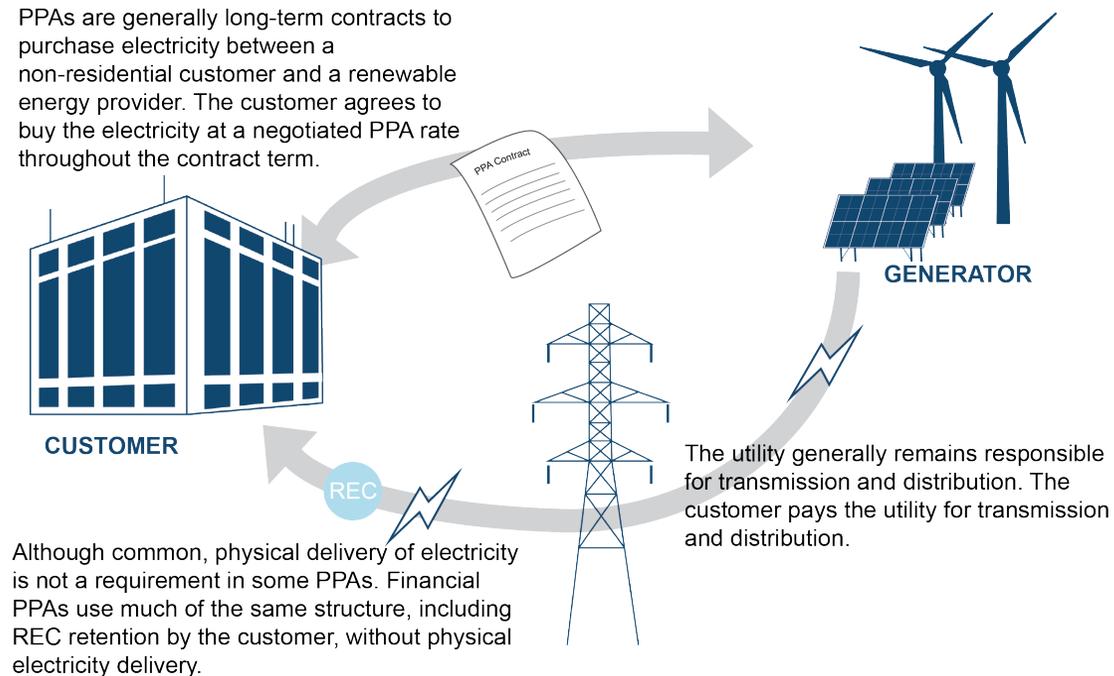
The Rise of the California CCAs

The continued increase in CCA green power sales is mostly driven by growth in California, Massachusetts, and New York. CCA green power sales continue to decline in Illinois.



Source: O'Shaughnessy et al. (2018)

Power Purchase Agreements



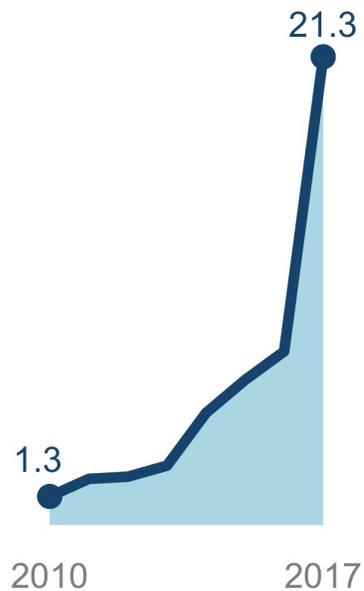
Basic PPA structure

Specific program structures vary. See full report for a more complete description of the differences between physical and financial PPAs

PPA Trends

About **270 offtakers** procured about **21.3 million MWh** of green power through PPAs in 2017. PPA green power sales grew by about 170% from 2016 to 2017.

Sales (million MWh)



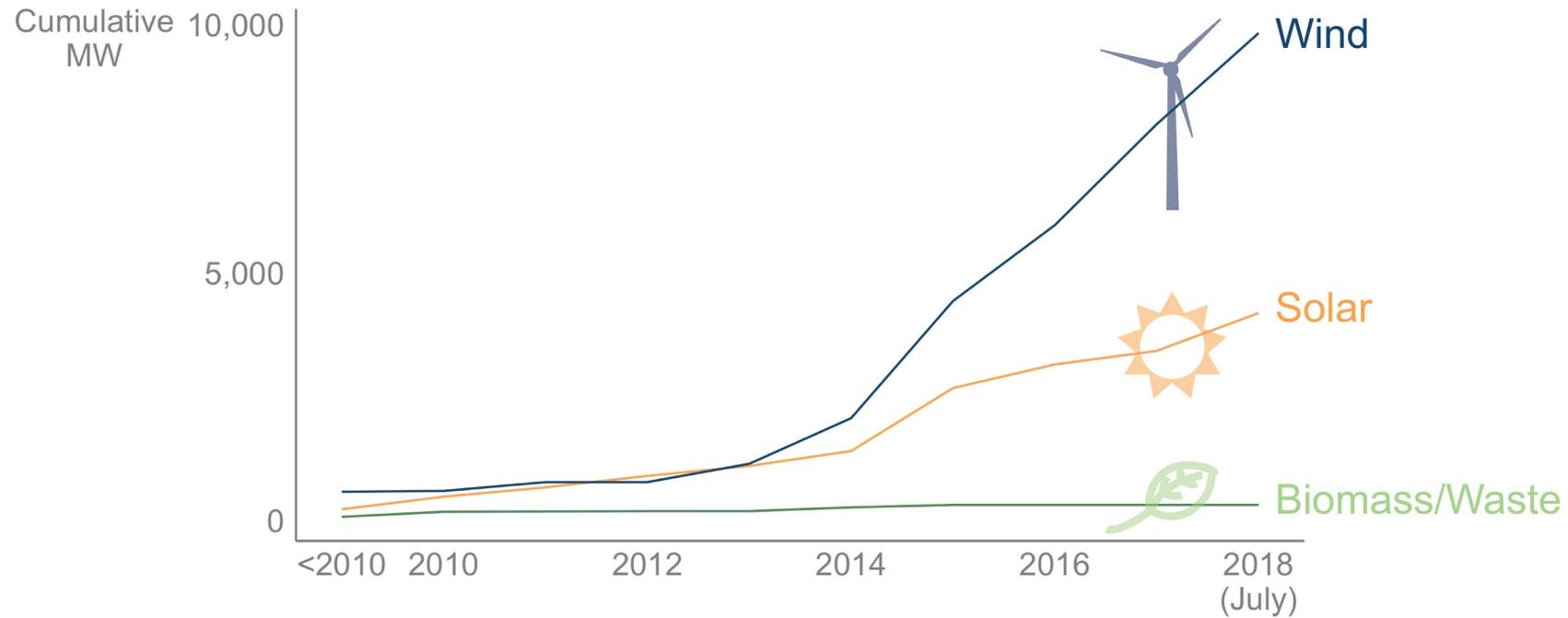
Customers (x1,000)



Source: O'Shaughnessy et al. (2018)

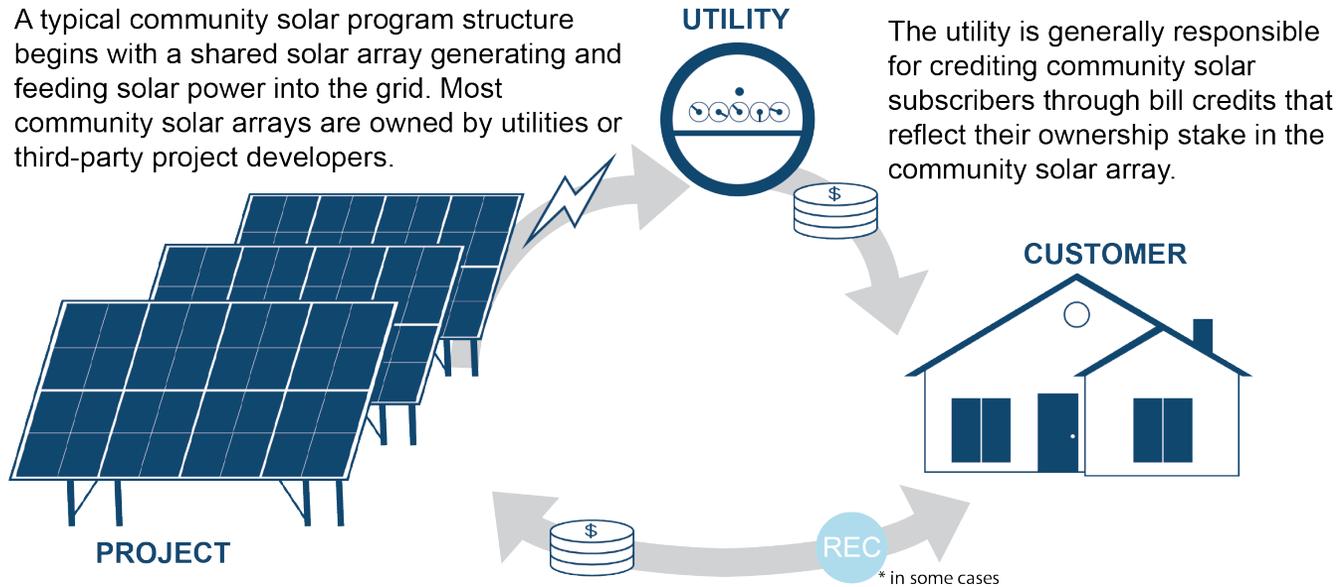
Wind Still Dominates, But Solar is on the Rise

Wind power remains the workhorse of green power PPAs accounting for about 70% of PPA capacity installed in recent years. Solar PPAs have become increasingly popular in recent years.



Source: O'Shaughnessy et al. (2018)

Community Solar



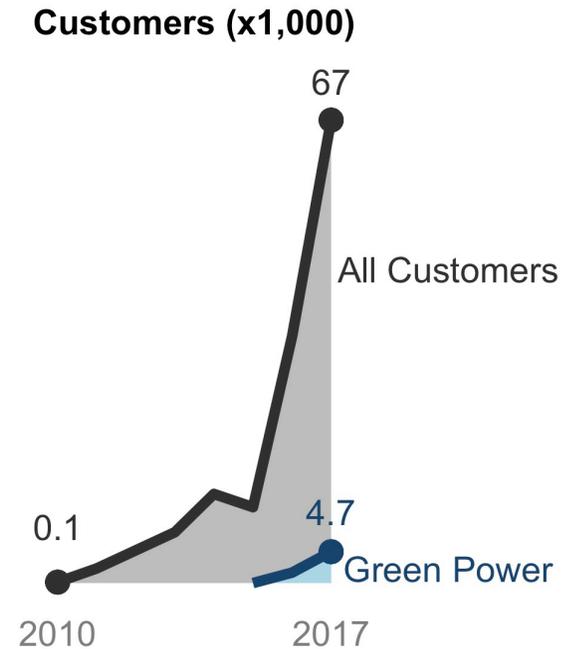
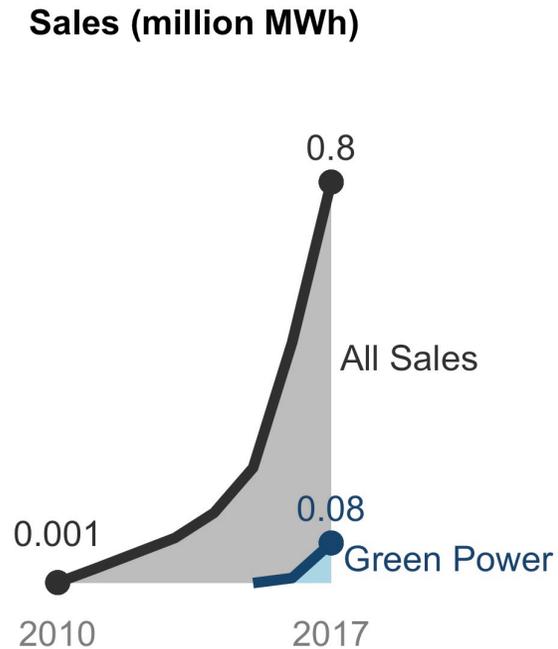
Community solar subscribers generally pay for their subscription through up-front purchases of capacity (kW) or output (kWh). In return, the subscribers receive bill credits and, in some cases, RECs. *However subscribers do not commonly receive the RECs, in which case their subscription is not a green power purchase.

Basic community solar program structure

Specific program structures vary

Community Solar Trends

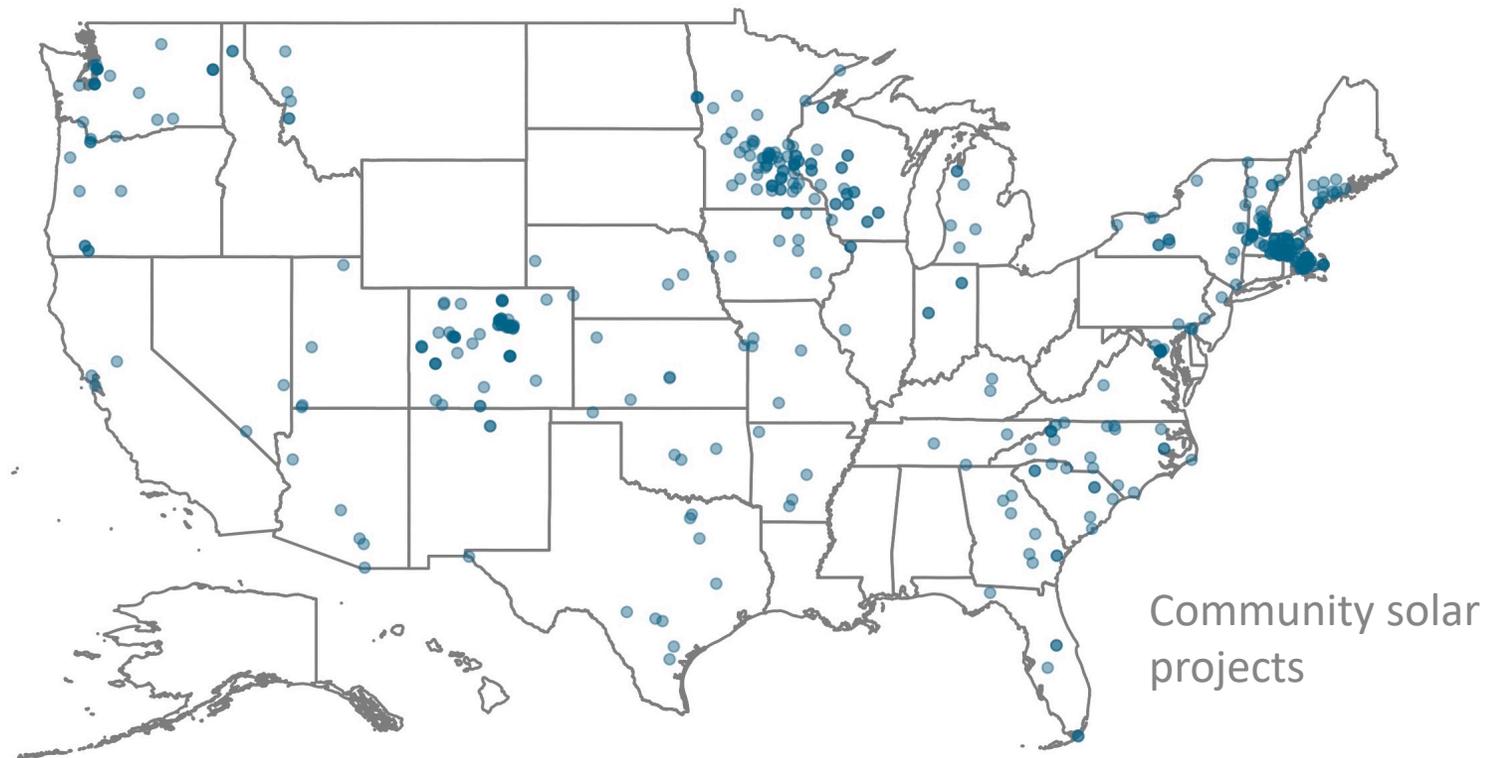
About **4,700 customers** procured about **80,000 MWh** of community solar green power in 2017. Community solar green power sales grew by about a factor of 8 from 2016 to 2017.



Source: O'Shaughnessy et al. (2018)

Community Solar Trends

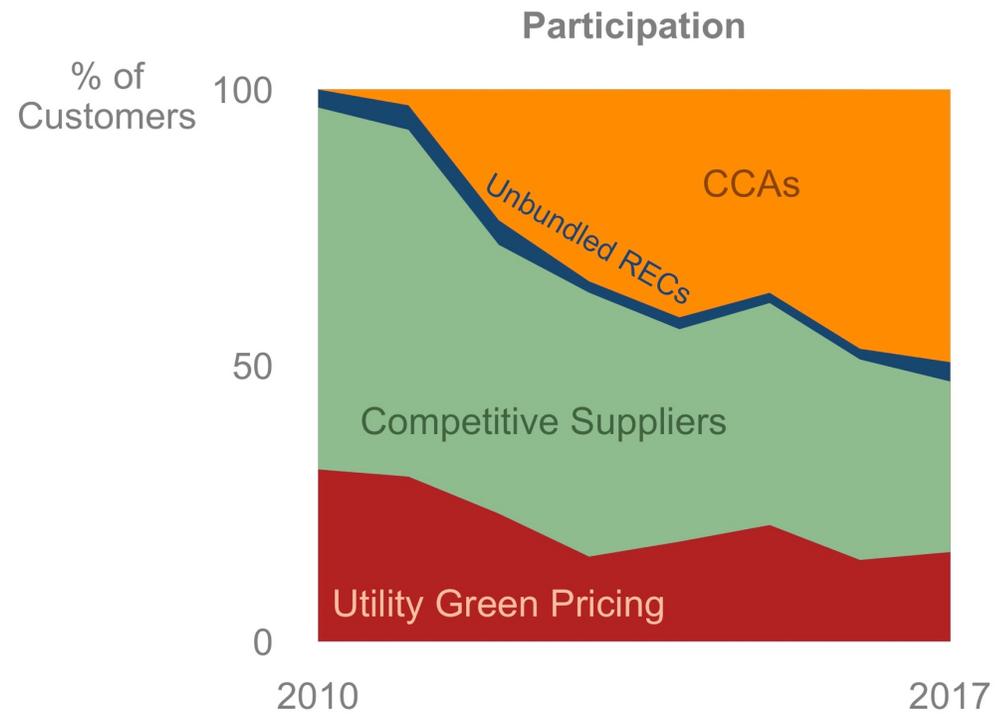
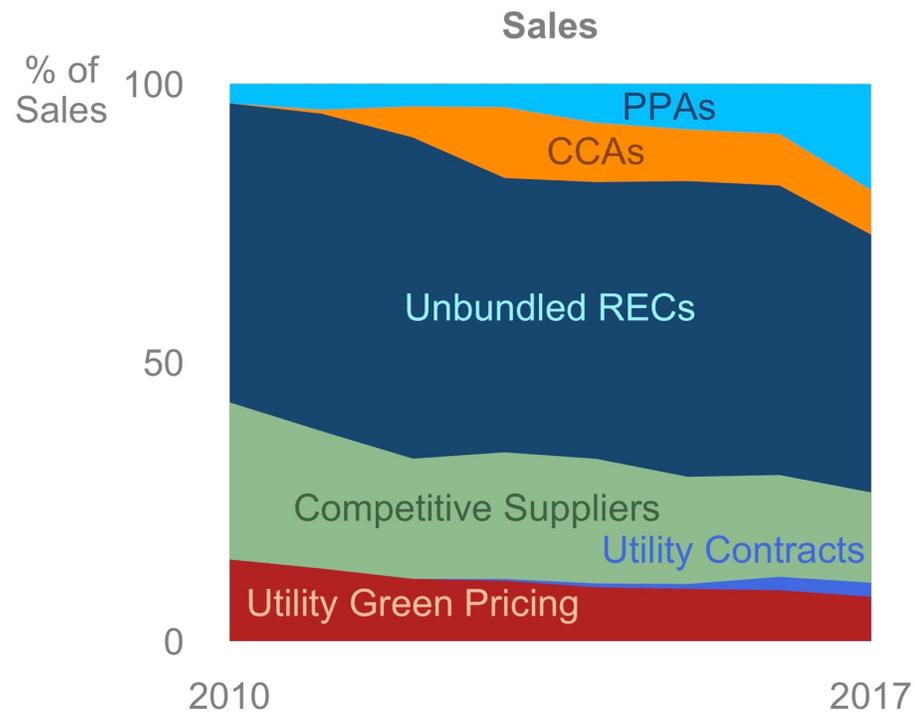
Community solar is now available in 39 states and Washington, DC.



Source: O'Shaughnessy et al. (2018)

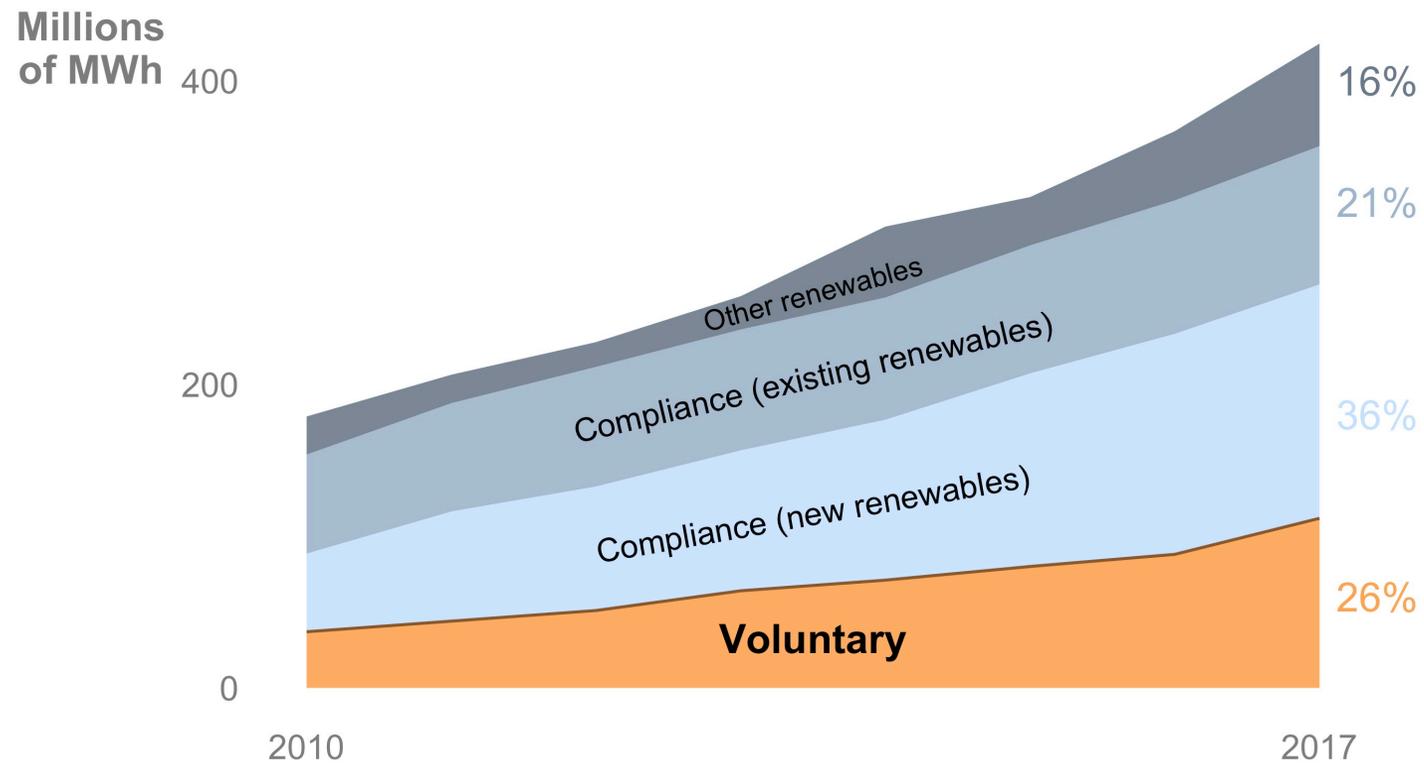
Market Trends

Green Power Sales and Customers by Mechanism



Source: O'Shaughnessy et al. (2018)

The Voluntary Green Power Market in Context



Source: O'Shaughnessy et al. (2018)

Reference

O'Shaughnessy, E., J. Heeter, and J. Sauer. 2018. *Status and Trends in the U.S. Voluntary Green Power Market (2017 Data)*. NREL/TP-6A20-72204.

Report: <https://www.nrel.gov/docs/fy19osti/72204.pdf>.

Data: <https://data.nrel.gov/submissions/98>.

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