



Status and Trends in the Voluntary Market

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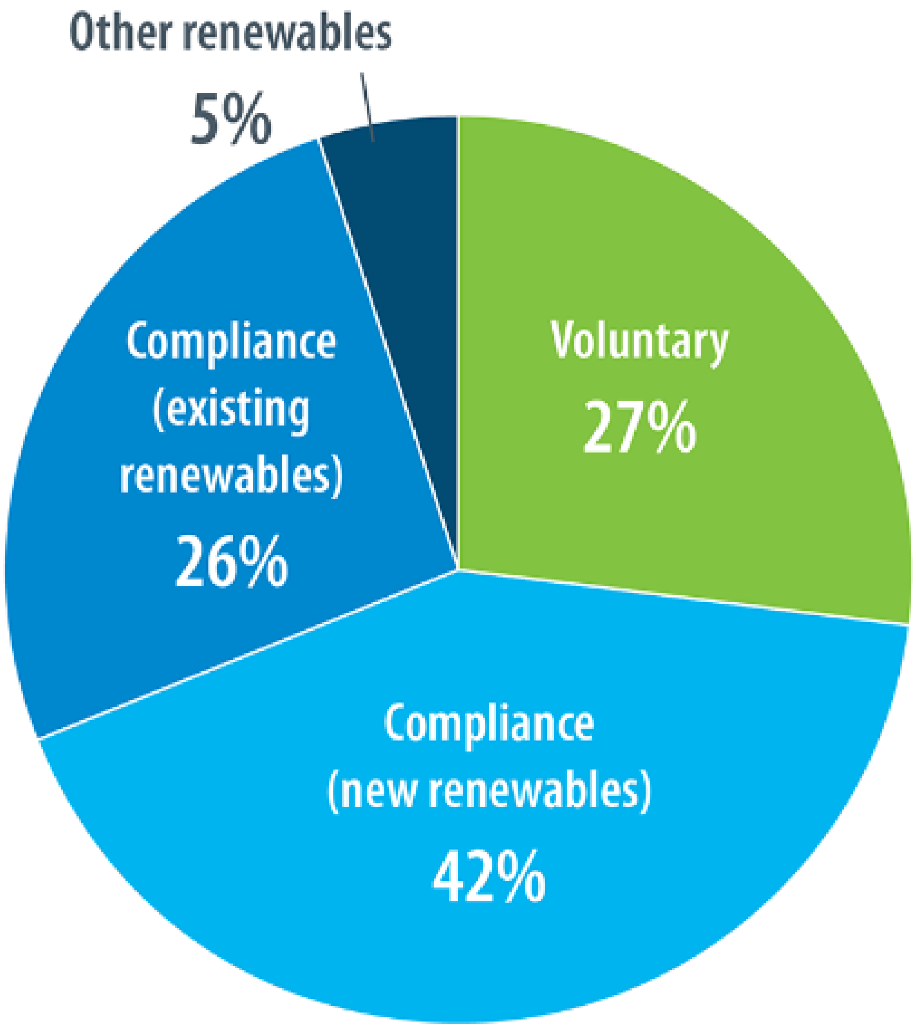
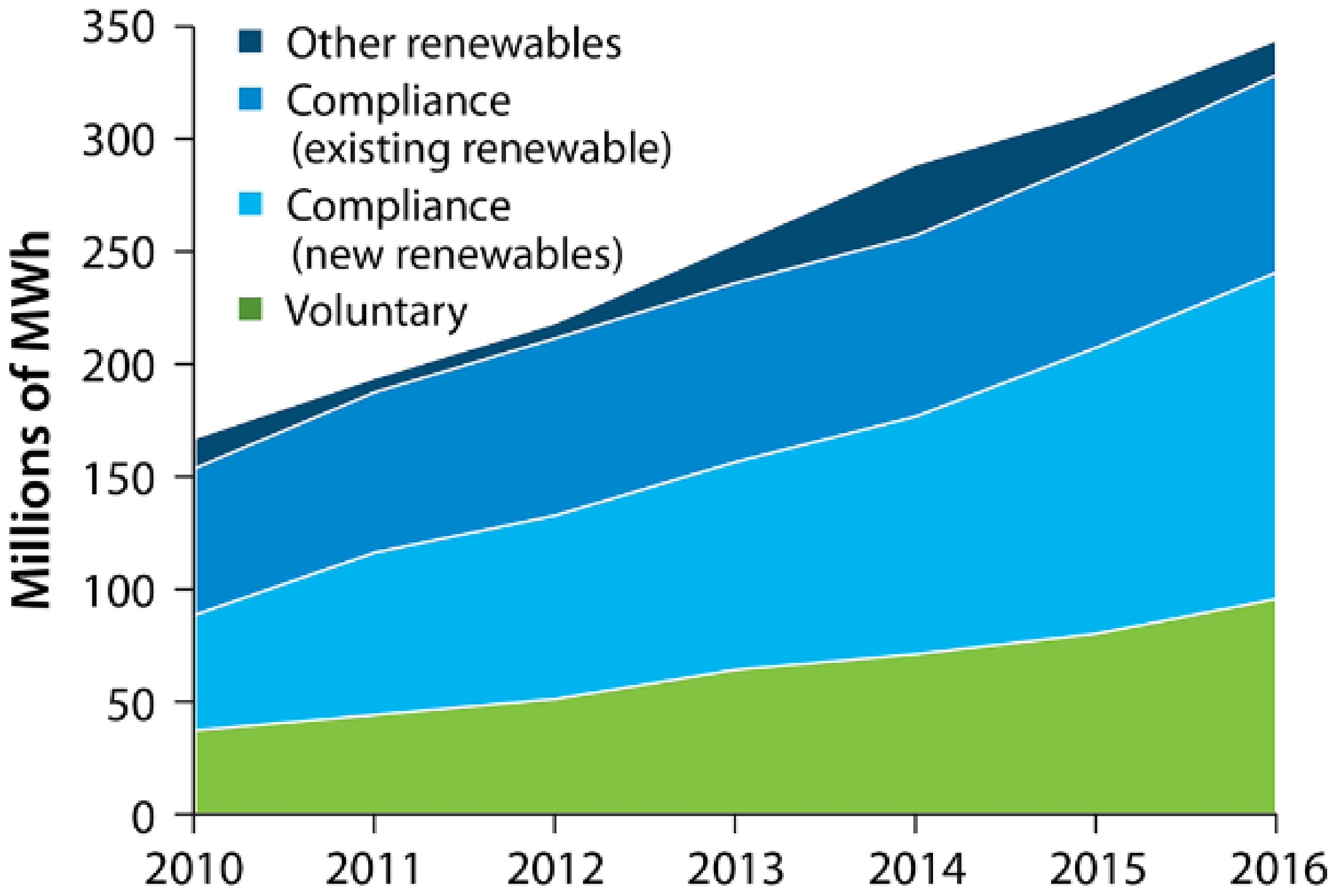
NREL is a national laboratory of the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, operated by the Alliance for Sustainable Energy, LLC.

Voluntary Market Increased 19% in 2016 to ~95 million MWh; ~27% of Market



2016

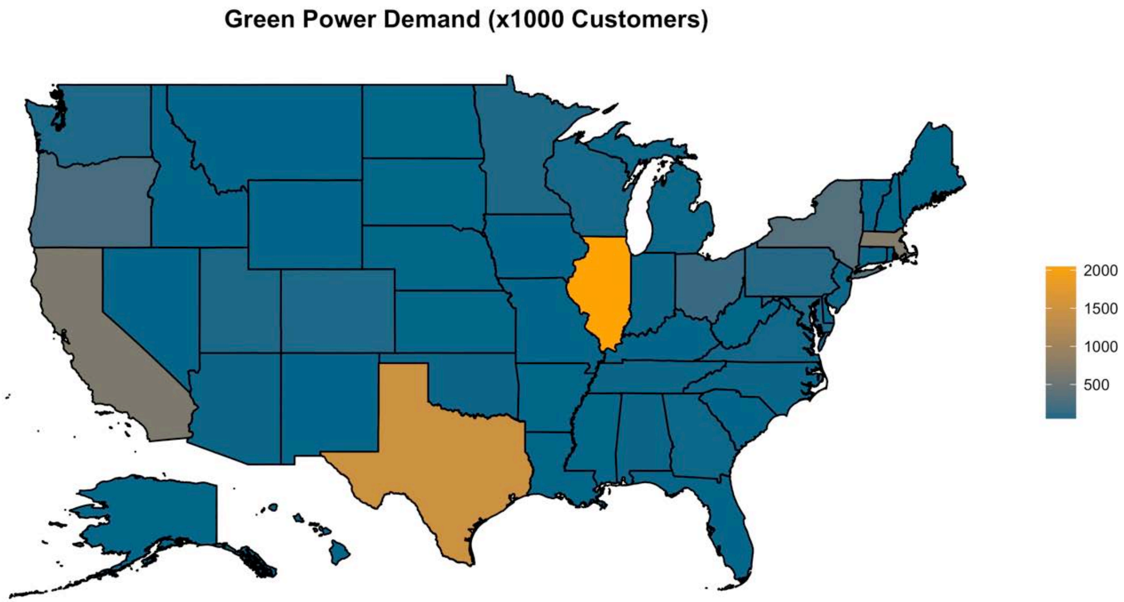


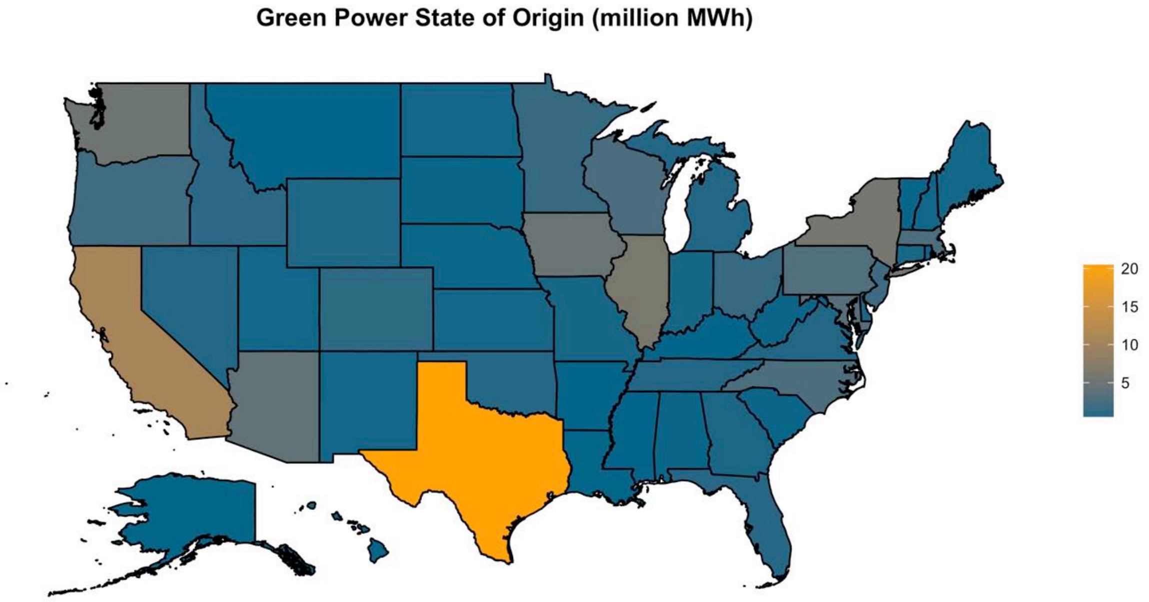
https://www.nrel.gov/analysis/green-power.html

Sources: O'Shaughnessy et al. (2017); Barbose (2017); EIA (2017)

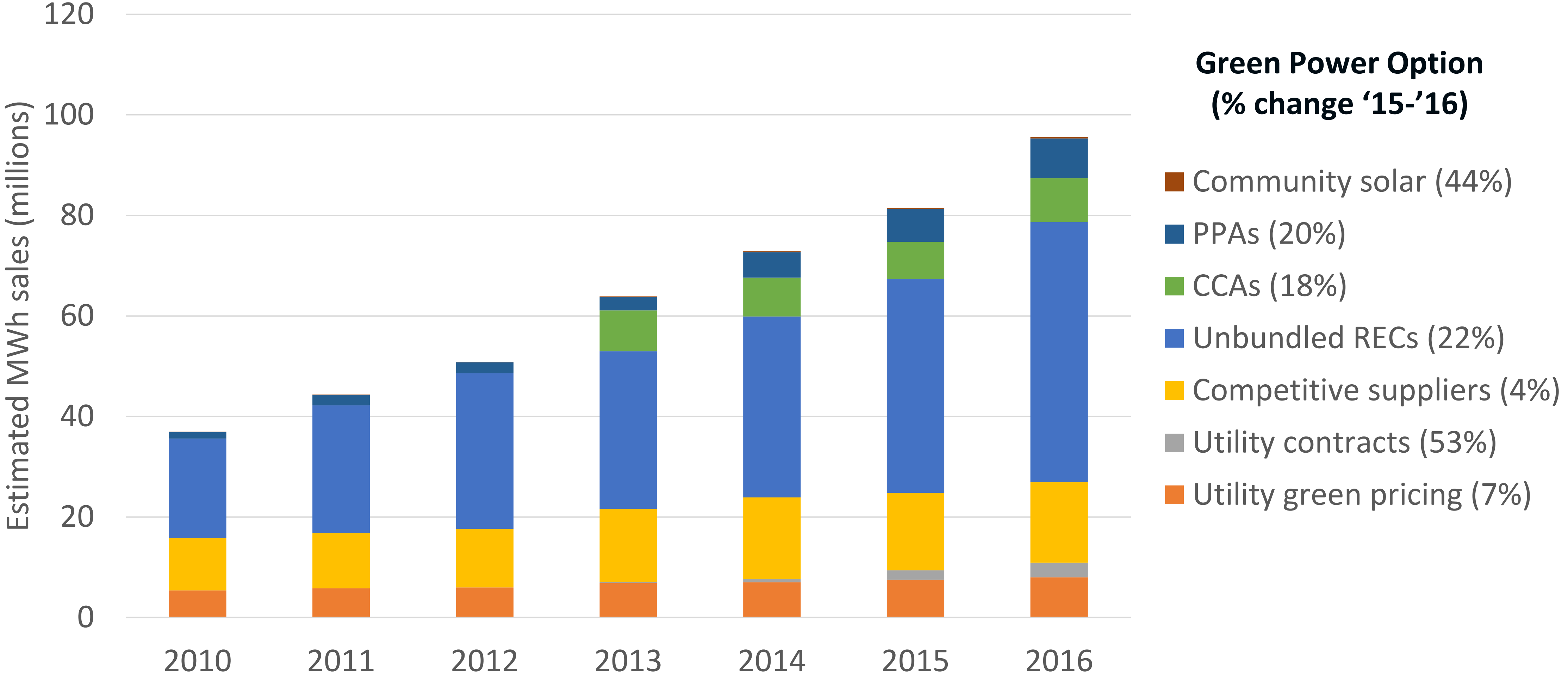
New State-by-State Data on Green Power Customers and Sales

- NREL complied estimates of state-by-state customers and sales of green power for the first time using 2016 data; Full data set available
- Customers are concentrated in Illinois and Texas
- Texas, California, and Illinois account for more than 1/3 of green power supply; 18 states generated more than 1 million MWh





All Market Segments Grew, Though not at the Same Pace



Utility Green Pricing Growth Driven by Large Programs

- Utility green pricing programs sold about 8 million MWh (+7%) of renewable energy to about 800,000 customers (+3%)
- Large programs (>100,000 MWh/year) increased sales by about 7% from 2015 to 2016, driving an increase in sales overall; Sales among all remaining programs dropped by about 5% from 2015 to 2016.
- 57% of utility green pricing program supply was from unbundled RECs, primarily from contracts <5 years

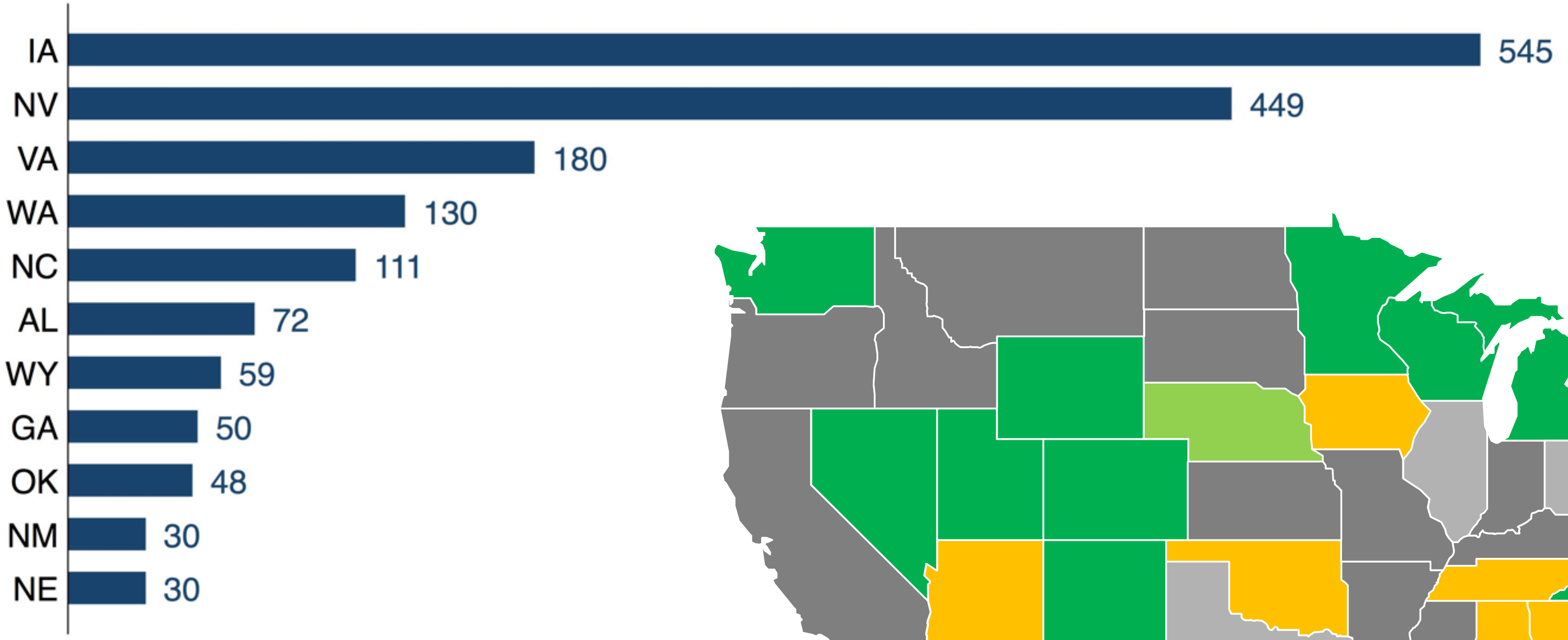
Top Green Power Sales
(as of December 2016)

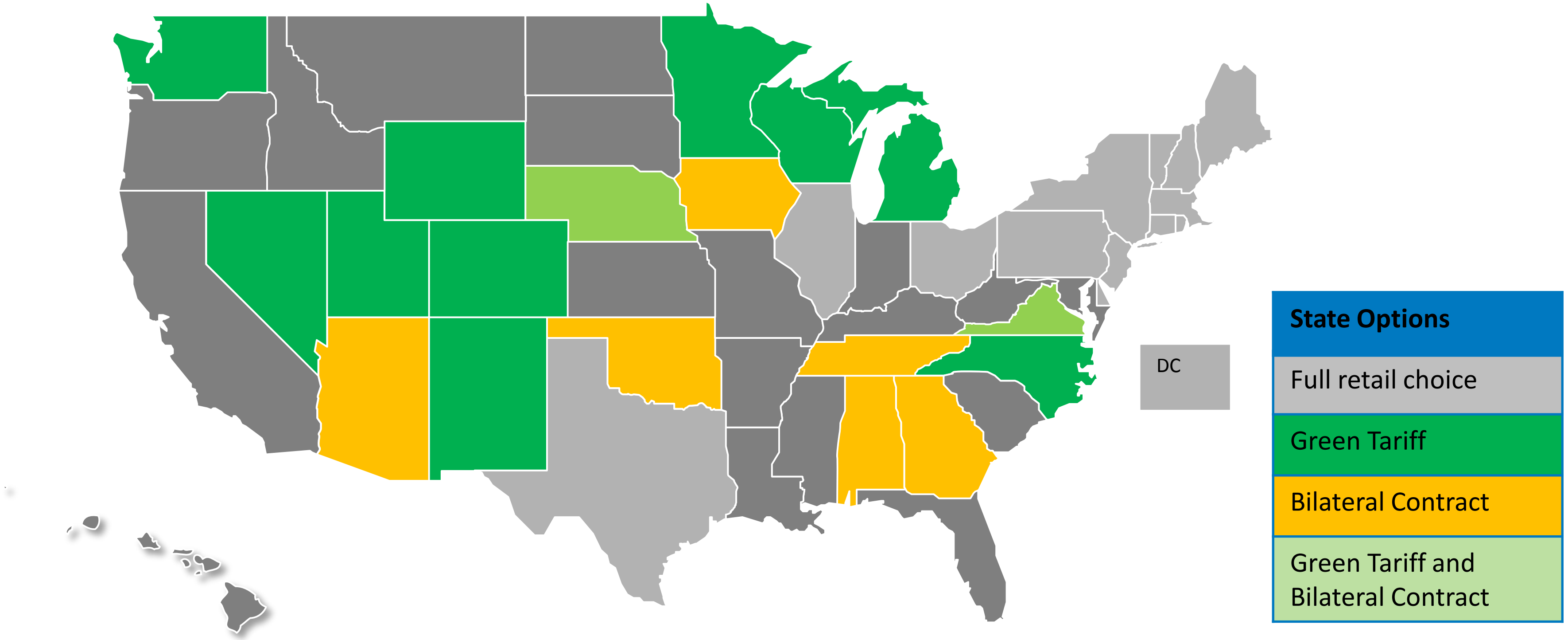
Rank	Utility	Sales (MWh/year)
1	Portland General Electric	1,524,616
2	Sacramento Municipal Utility District	741,337
3	PacifiCorp	733,363
4	Austin Energy	733,070
5	Puget Sound Energy	471,025
6	Xcel Energy	352,921
7	Dominion Virginia Power	336,917
8	Tennessee Valley Authority	232,127
9	Silicon Valley Power	206,692
10	Indianapolis Power & Light Co.	200,604

https://www.nrel.gov/analysis/assets/pdfs/utility-green-power-rankings.pdf

Utility Renewable Contracts: 9 Participants and 2.9 million MWh of Sales; Significant Number of MW not online as of 2016

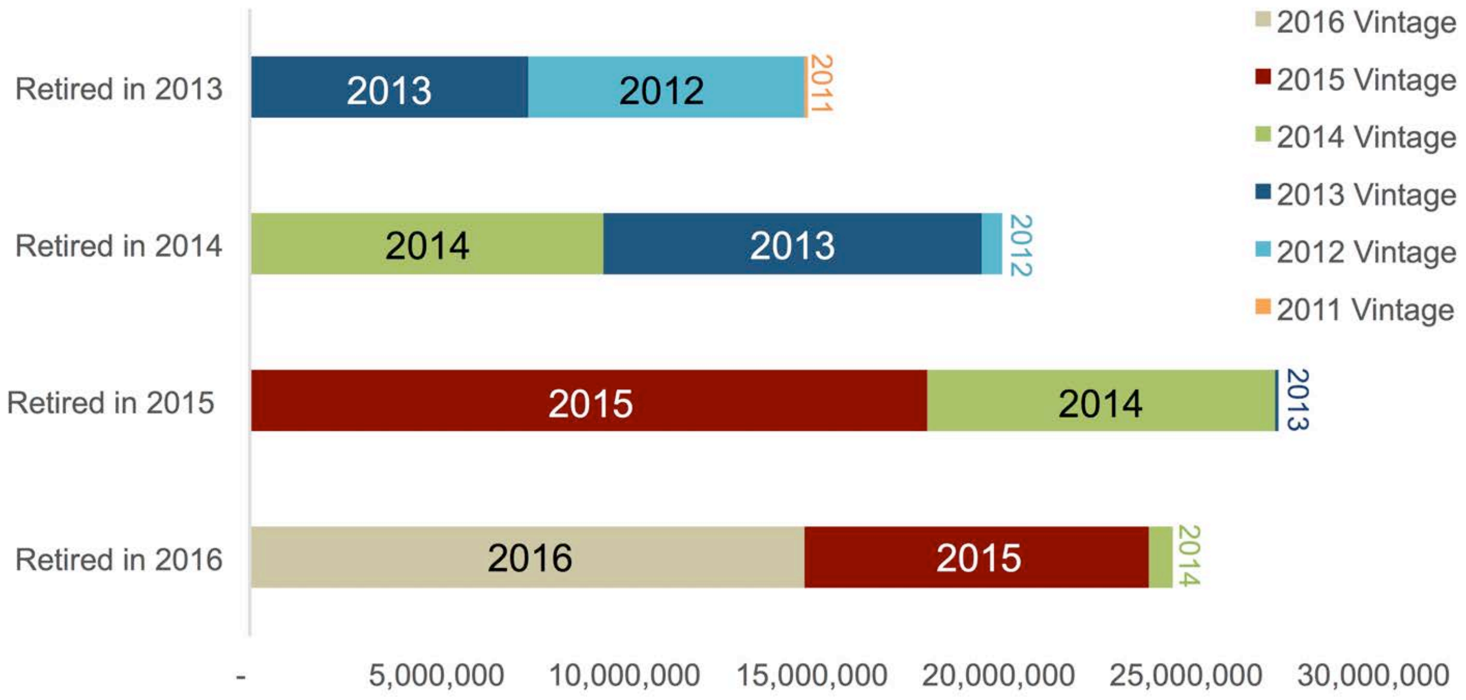
Cumulative utility renewable contract capacity by state (MW)





Competitive Supplier Market is Difficult to Track

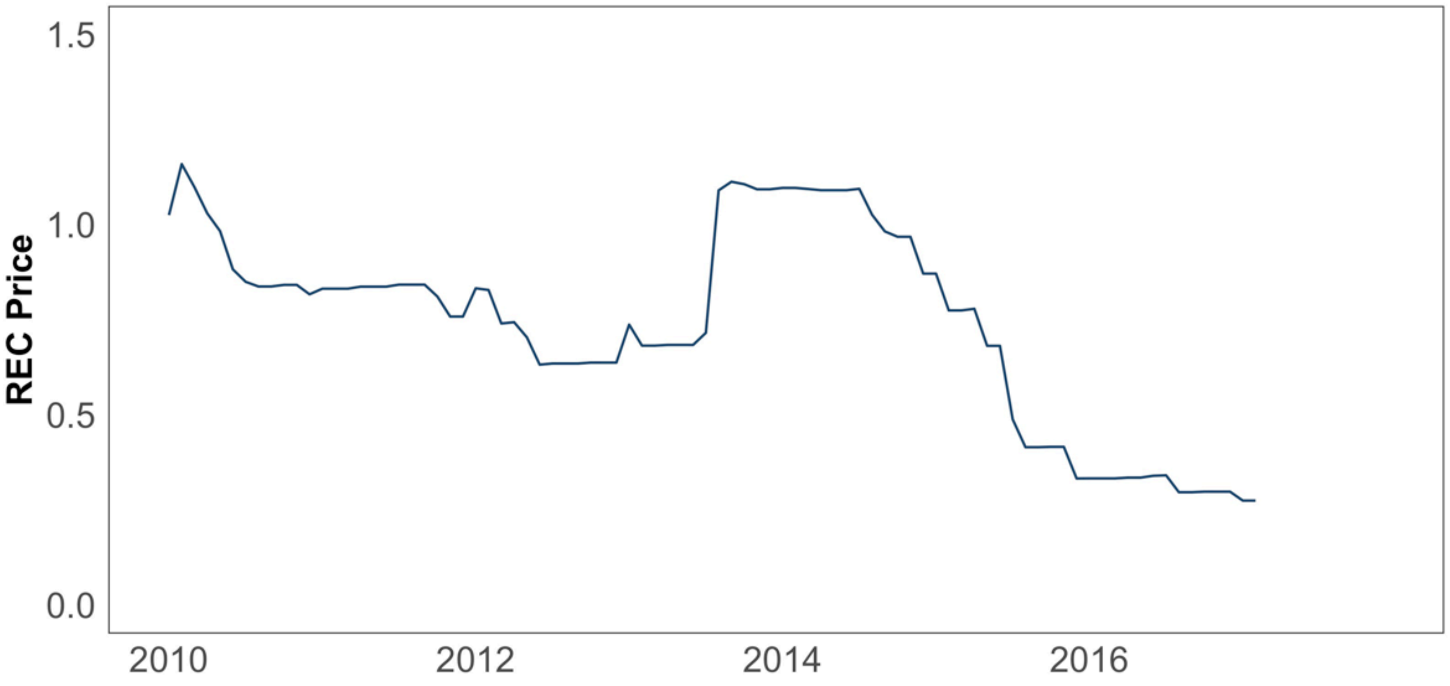
- Competitive suppliers sold about 16 million MWh (+4%) of renewable energy to about 2 million customers (+34%)
- Wind resources in ERCOT are a large source of both competitive supply and unbundled RECs; declined slightly in 2016 from a high of 27 million MWh in 2015.



Voluntary REC retirements in ERCOT

Unbundled RECs Still Account for More than Half of Voluntary Market

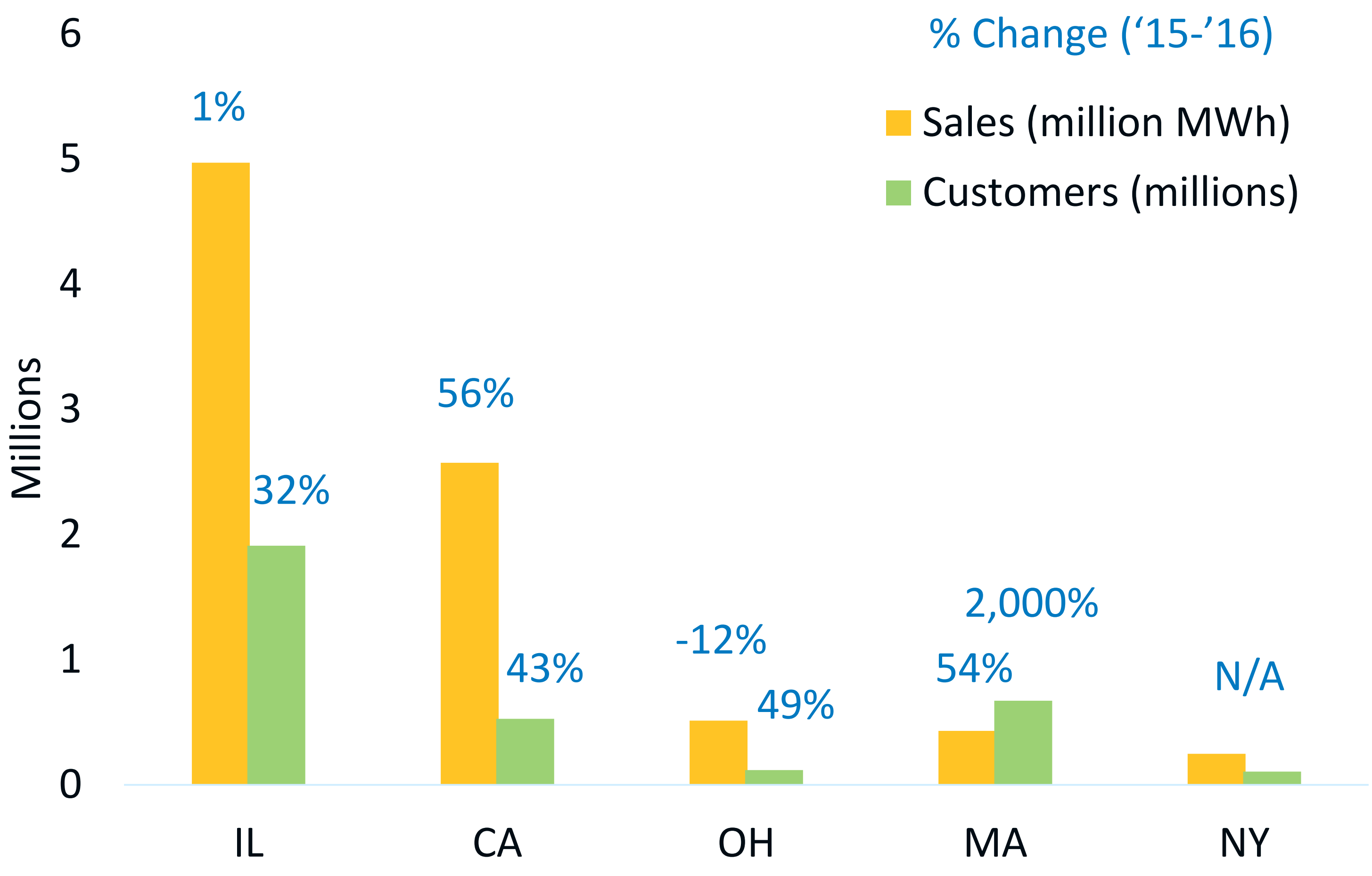
- About 108,000 customers (+54%) bought about 51.8 million MWh of green power (+22%) through unbundled RECs in 2016
- REC prices continued to remain low throughout 2016, after peaking at around $1.13/MWh in January 2014; 2016 REC prices averaged around $0.35/MWh



Voluntary national REC prices

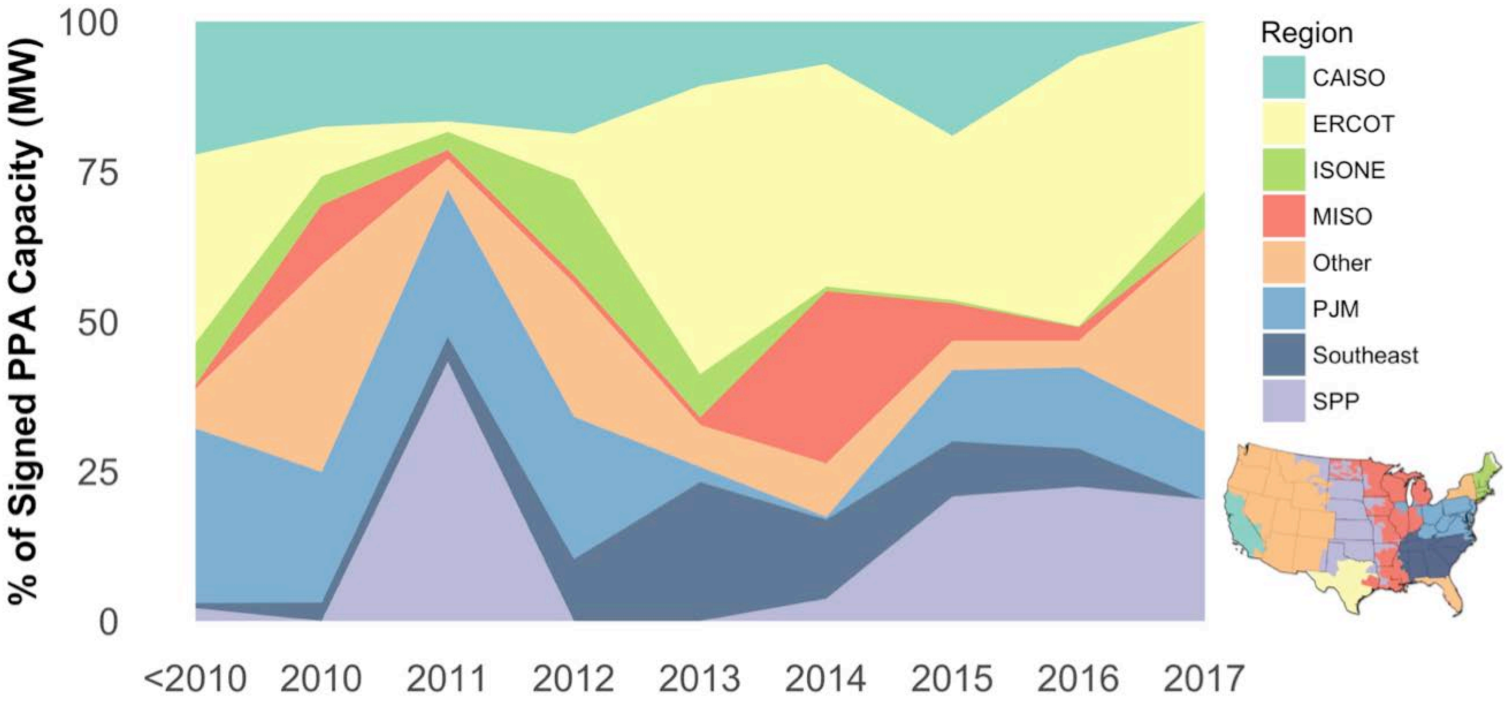
Community Choice Aggregation (CCA) Driven by Illinois and California

- CCAs sold about 8.7 million MWh of green power (+18%) to about 3.3 million customers (+72%)
- The CPUC estimates that as much as 85% of California's load could be served by CCAs, direct access, or DG by mid-2020s.



New Customers Continue to Sign PPAs; Not all Purchasers Keep RECs

- 7.9 million MWh of green power were consumed through 210 PPAs; these results reflect projects commissioned by the end of 2016 where we estimate that the customer purchases the RECs from the PPA project
- In 2016, 65% of the companies that had signed PPAs were first-time PPA signers.
- ERCOT and SPP dominate capacity



Share of signed PPAs (REC and non-REC projects) by region (based on location of generator)

NREL’s Voluntary Market Research

https://www.nrel.gov/analysis/green-power.html

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Status and Trends in the U.S. Voluntary Green Power Market (2016 Data)
The latest version of NREL's annual tracking of the voluntary market found that the U.S. voluntary green power market grew to 95 million megawatt-hours sold to 6.3 million customers in 2016.

Charting the Emergence of Corporate Procurement of Utility-Scale PV
This report examines the benefits, challenges, and outlooks for large-scale off-site solar purchasing in the United States. It features case studies of an aggregate power purchase agreement, a corporation exiting their incumbent utility, a utility offering large scale renewables to corporate customers, and a company with approval to sell energy into wholesale markets. [presentation and summary]

Policies for Enabling Corporate Sourcing of Renewable Energy Internationally: A 21st Century Power Partnership Report
This report explores the policy and regulatory enabling environment for corporate sourcing of renewables. The authors find that policy certainty is essential to creating vibrant markets for renewable energy, that policymakers may need to adjust policy mechanisms over time as markets go through different stages of maturity, and that policymakers must also consider the economic decisions that end users make in evaluating projects. [summary]