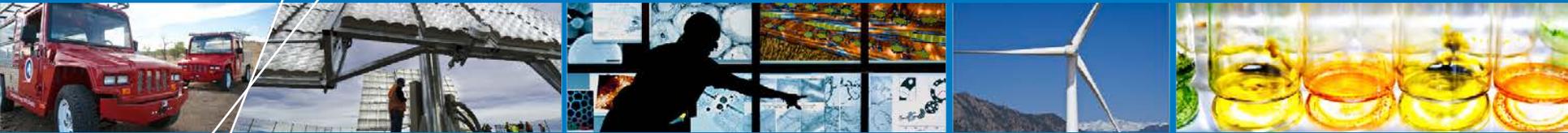


Charting the Emergence of Corporate Procurement of Utility-Scale PV



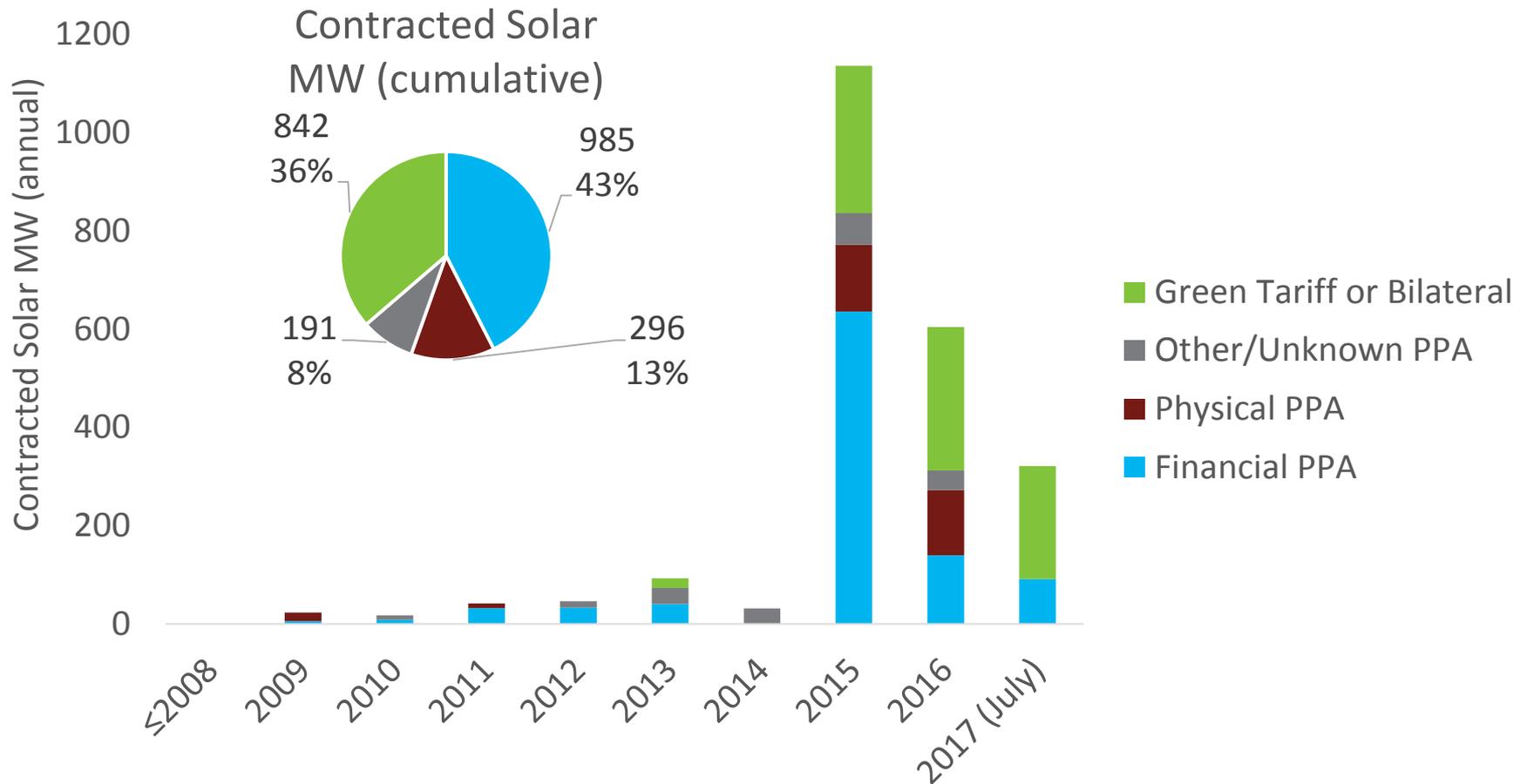
Jenny Heeter, Jeffrey J. Cook, Lori Bird
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Overview

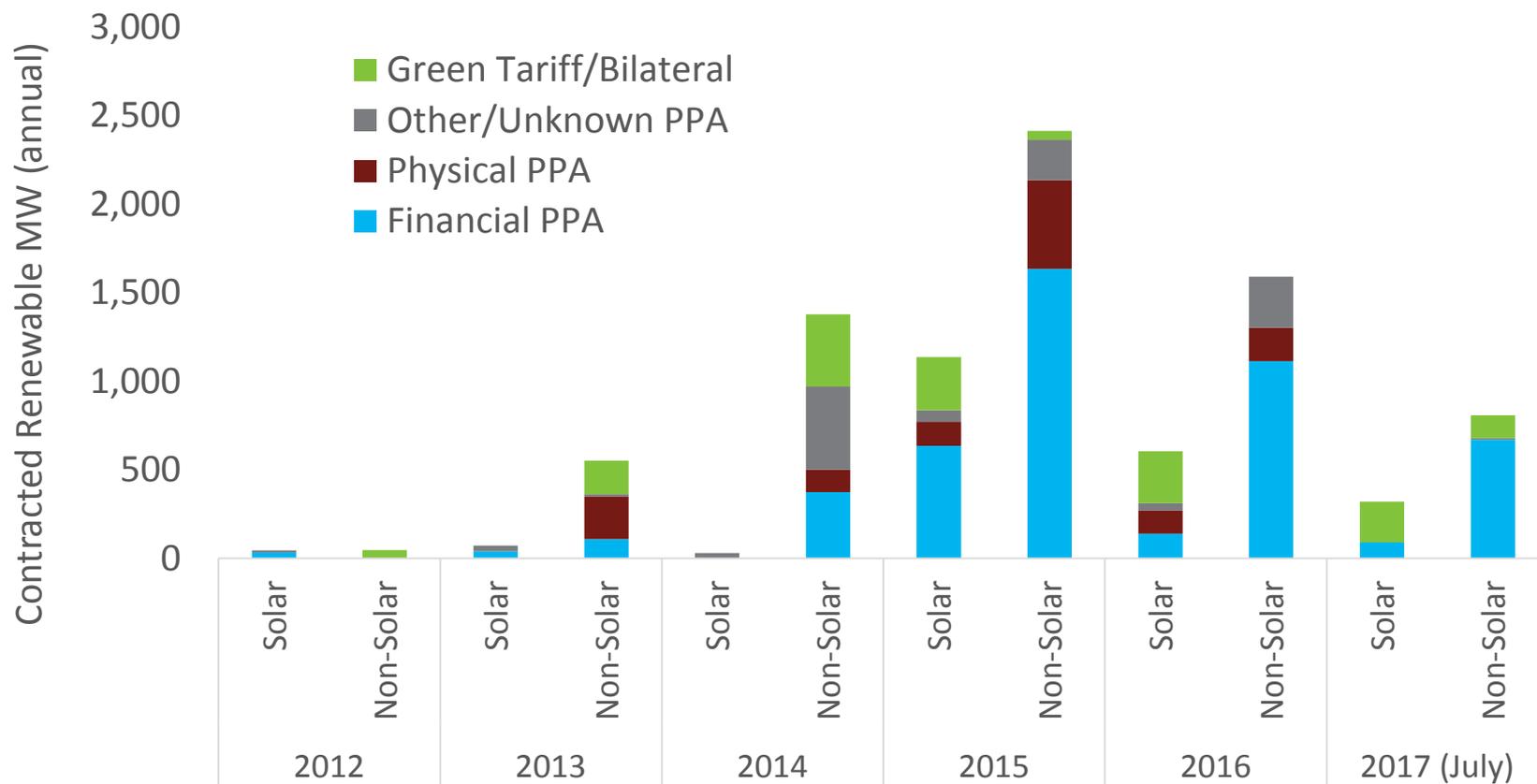
1. Corporate Off-site Solar Contracts
2. Purchasing Models:
 - Off-site Solar PPAs
 - Retail Choice
 - Utility Partnerships: Green Tariffs and Bilateral Contracts
 - FERC Authorized Wholesale Seller of Electricity
3. Pathway Comparison and Outlook

Corporate Off-site Solar Contracts



Corporate off-site PV contracts totaled more than 2,300 MW by July 2017. Most capacity is from either financial PPAs (43%) or green tariff/bilateral deals (36%).

Solar Contracts Represent about 25% of all Renewable Energy Contracts, 2008-July 2017



In recent years, solar has represented about 30% of the total market for off-site corporate procurement. Solar dominates the green tariff and bilateral contract segment, at 86% and 100% in 2015 and 2016, respectively.

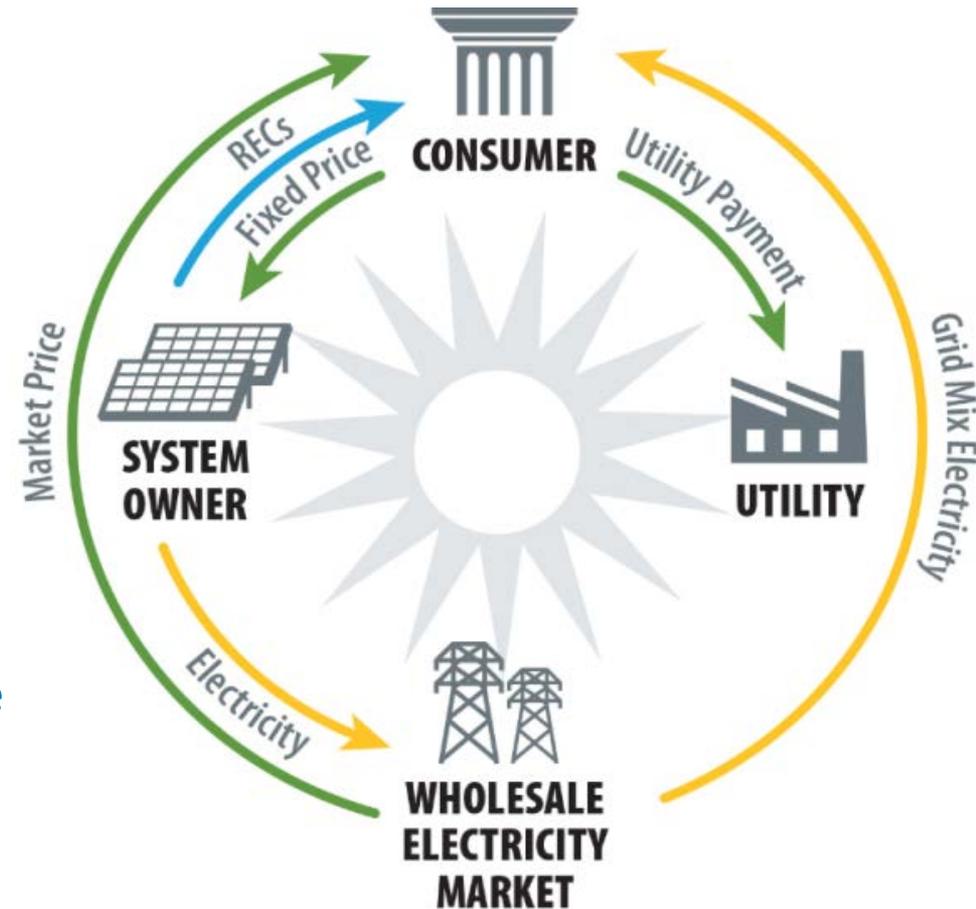
Corporate Purchasing Models

- **Power purchase agreements (PPAs):** Through the use of a PPA, a corporate customer can sign a long-term contract with a developer to secure physical or virtual rights to electricity generation and the environmental attributes of a project.
- **Retail choice:** In states that allow retail choice, a corporate customer has the opportunity to purchase electricity from a competitive supplier on a short-term or long-term basis.
- **Utility partnerships:** Some utility service territories offer green tariff options that allow a corporation to enter into an agreement with their utility to procure renewable energy from a utility-owned or managed project with an established long-term rate; other utilities have established bilateral contracts that allow similar structures but for only one customer.
- **Licensed wholesale electricity seller:** A corporation can seek authority from the Federal Energy Regulatory Commission (FERC) to buy and sell electricity on the wholesale market.

Power Purchase Agreements (PPAs)

How it Works

- Off-site solar PPAs can be either physical or financial in structure
- Under physical PPAs, the solar generation is contracted on a long-term basis by the corporate purchaser and delivered by an energy supplier
- Financial PPAs, also called “virtual” PPAs, are contracts in which a consumer agrees to purchase power but does not have the electricity delivered; instead the electricity is resold into a wholesale market



Benefits and Challenges

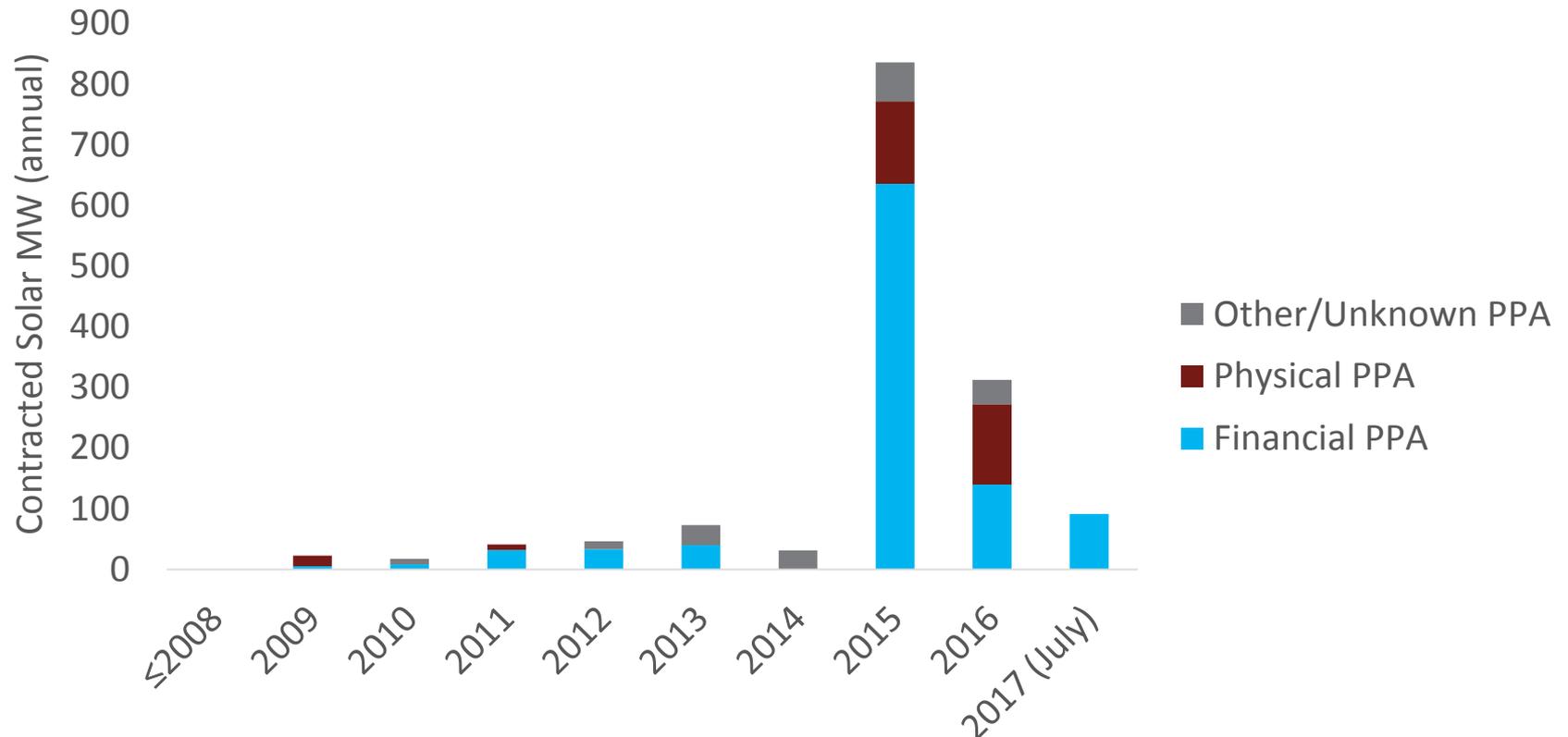
Benefits

- Signing a financial PPA does not require the company to invest capital in a renewable project
- When companies source from renewable projects located close to their electricity load, the project structure can create a hedge against rising electricity costs

Challenges

- High level of energy market expertise is needed
- Financial PPAs must address issues of negative wholesale market prices and determine where the setline price is set

Market Status



- *Off-site nonutility PPAs have resulted in 8,121 MW of demand.*
- *Financial PPAs make up the bulk of transactions; solar financial PPAs peaked at around 800 MW in 2015, but declined in 2016 to approximately 300 MW.*
- *Procurement in 2015 was likely higher because of uncertainty around the investment tax credit extension.*

Case Study: Aggregate Solar Financial PPA

- PPA aggregation is emerging as a method to allow smaller off-takers to participate in larger scale renewable projects.
- In 2016, a financial PPA aggregation was signed by three entities that have smaller loads:
 - The Massachusetts Institute of Technology, Boston Medical Center, and the Post Office Square Redevelopment Corporation signed a 25-year financial PPA for 60 MW of solar located in North Carolina

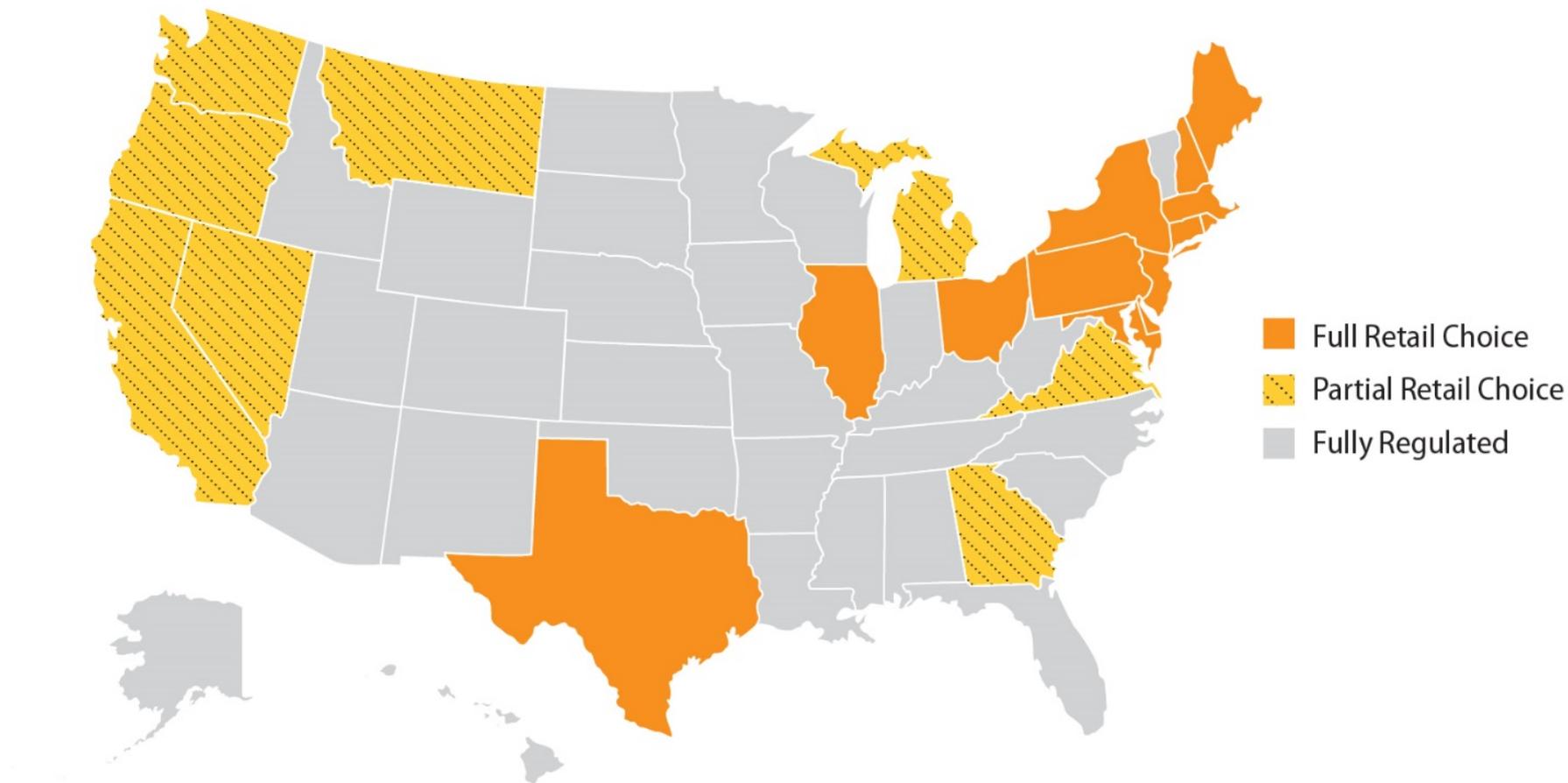
Shares of the Aggregated Solar Financial PPA		
Off-Taker	Share of Solar Array	Percentage of Load Covered
Massachusetts Institute of Technology	73% (44 MW)	40%
Boston Medical Center	26% (16 MW)	100%
Post Office Square Redevelopment Corporation	< 1% (< 1 MW)	100%

Outlook

- PPAs are expected to continue to grow, though are limited geographically
- Corporations seeking to meet their renewable energy commitments will likely seek PPAs for projects that can take advantage of federal tax credits before those tax credits begin to phase down
 - Projects must begin construction in 2019 to receive a 30% investment tax credit

Retail Choice

How it Works



Corporations located in 13 states and Washington, D.C. have access to retail choice and thus the opportunity to purchase electricity from their preferred supplier and technology source; partial retail choice exists in an additional 8 states

Benefits and Challenges

Benefits

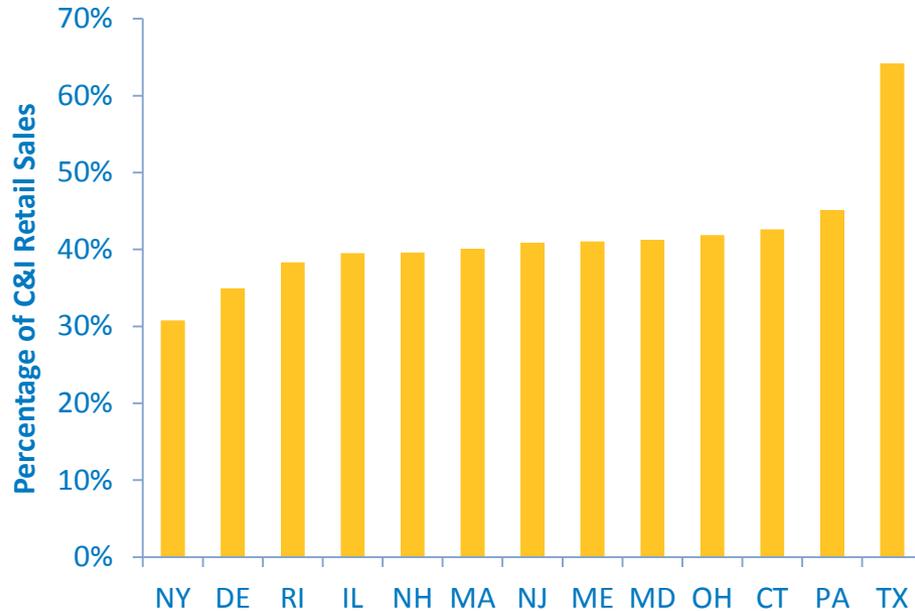
- Having access to several electricity suppliers offers corporations the opportunity to select a supplier that offers the best rate or set of services that meet the needs of the corporate customer
- Ability to negotiate the length of the contract with the supplier

Challenges

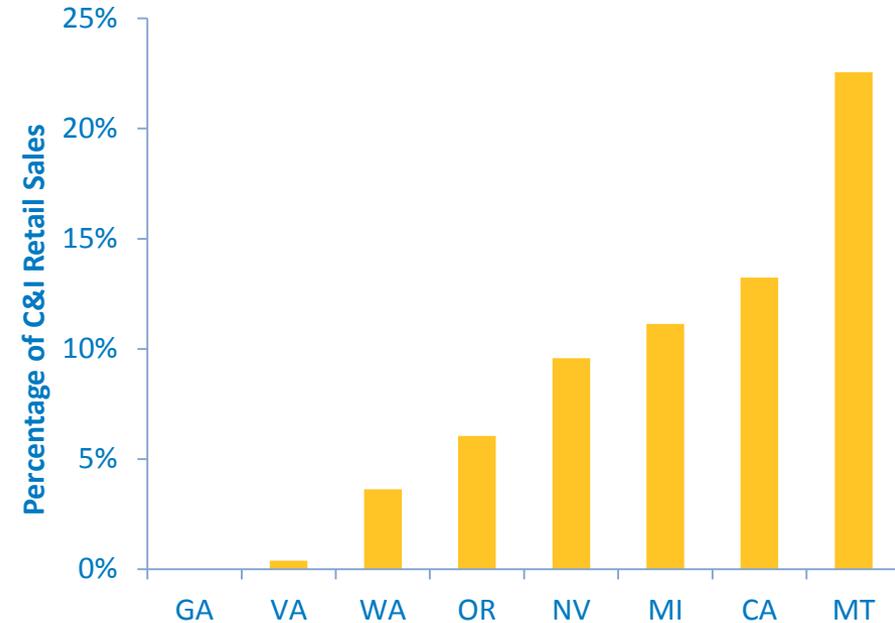
- Lack of accessibility
 - Retail choice is limited to 21 states
- Appropriate solar products may not be offered by the supplier
- Can be subject to energy price volatility

Market Status

Full Retail Choice States



Partial Retail Choice States



The more limited competitive supplier sales in partial retail choice states is the result of customer class and program cap restrictions. Typically, these narrower programs are limited to certain customer classes or are capped and fully subscribed.

Case Study: MGM Exits Nevada Energy Territory for Wholesale

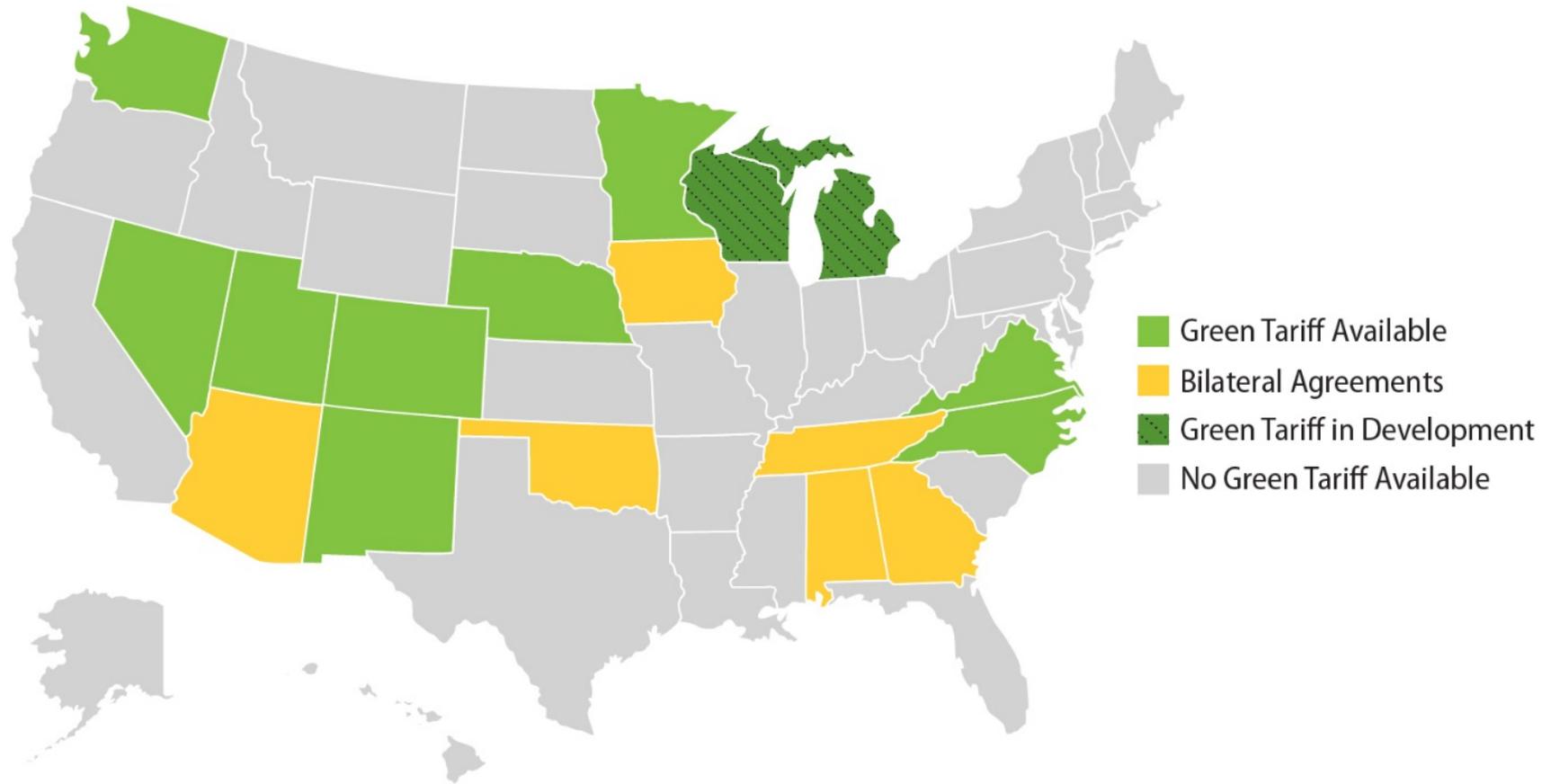
- Corporations can be granted the authority to leave a utility's service territory, such is the case for Nevada
- As of June 2017, MGM Resorts International (MGM), Wynn Resorts, Switch, and Caesars Entertainment Corporation have either left or been approved to leave NV Energy's service territory, and Microsoft proposed leaving Puget Sound Energy's territory in Washington for the retail market
- Complex financial and energy market analyses are needed to determine the possible net benefit of an exit and whether the imposed exit fee might be justified

Outlook

- Retail choice for corporate customers is allowed with relatively unfettered access in 13 states and Washington, D.C., and in 8 other states, some retail choice opportunities exist
- For the other 29 states, statutes prohibit C&I participation in wholesale markets absent an arrangement with the relevant utility. To open this pathway, legislators would need to enact new statutes that allow some form of retail choice
- The low cost of natural gas is driving down wholesale market costs, and generation from these existing facilities can be lower than the cost of new or existing renewables
- Corporations that are interested in achieving renewable generation targets might have an easier path toward meeting RE goals in states that offer retail choice rather than in those that are fully regulated

Utility Partnerships: Green Tariffs and Bilateral Contracts

How it Works



- *In 17 states, utilities have begun to offer corporate customers the option to procure renewables through special green tariffs or bilateral contracts*
- *These partnerships are one way that corporate customers in regulated states can access large off-site solar*

Benefits and Challenges

Benefits

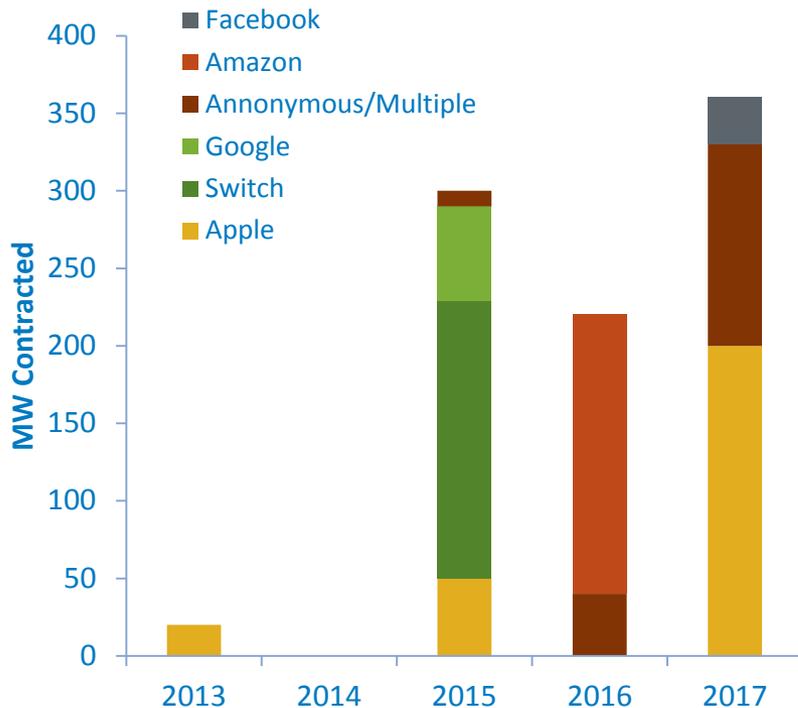
- Offer long-term renewable energy at a set price without requiring corporations to build out energy market expertise
- Having the utility manage the program can thus reduce administrative costs to the corporation as well as bring energy expertise
- Utilities can aggregate corporate customer load to build larger projects that leverage economies of scale

Challenges

- Higher costs coupled with exposure to market risk and are subject to long-term contracts
- Utilities must demonstrate to regulators that nonparticipating customers are not negatively impacted or that this action is in the public interest
- Utilities may be inflating the costs of administering these programs while limiting the generation and capacity credits that subscribers receive for their renewable purchase

Market Status

Green Tariff Deals



Bilateral Agreements

State	Corporation	Utility	Capacity
AL	Google	Tennessee Valley Authority	Unknown
AL	Walmart	Alabama Power	72 MW
AZ	IO	Arizona Public Service	Unknown
AZ	EBay	Arizona Public Service	Unknown
GA	Proctor & Gamble	Georgia Power	50 MW
IA	Facebook	MidAmerican Energy	139 MW
IA	Google	MidAmerican Energy	407 MW
NE	Becton Dickinson	Nebraska Public Power District	30 MW
OK	Google	Grand River Dam Authority	48 MW
TN	Google	Tennessee Valley Authority	Unknown

- *Green tariff deals ramped up in 2015 and have continued through 2017, totaling 900 MW.*
- *Bilateral agreements total more than 700 MW; additional projects exist but the sizes are unknown or yet to be determined.*

Case Study: Alabama Power Renewable Procurement Program

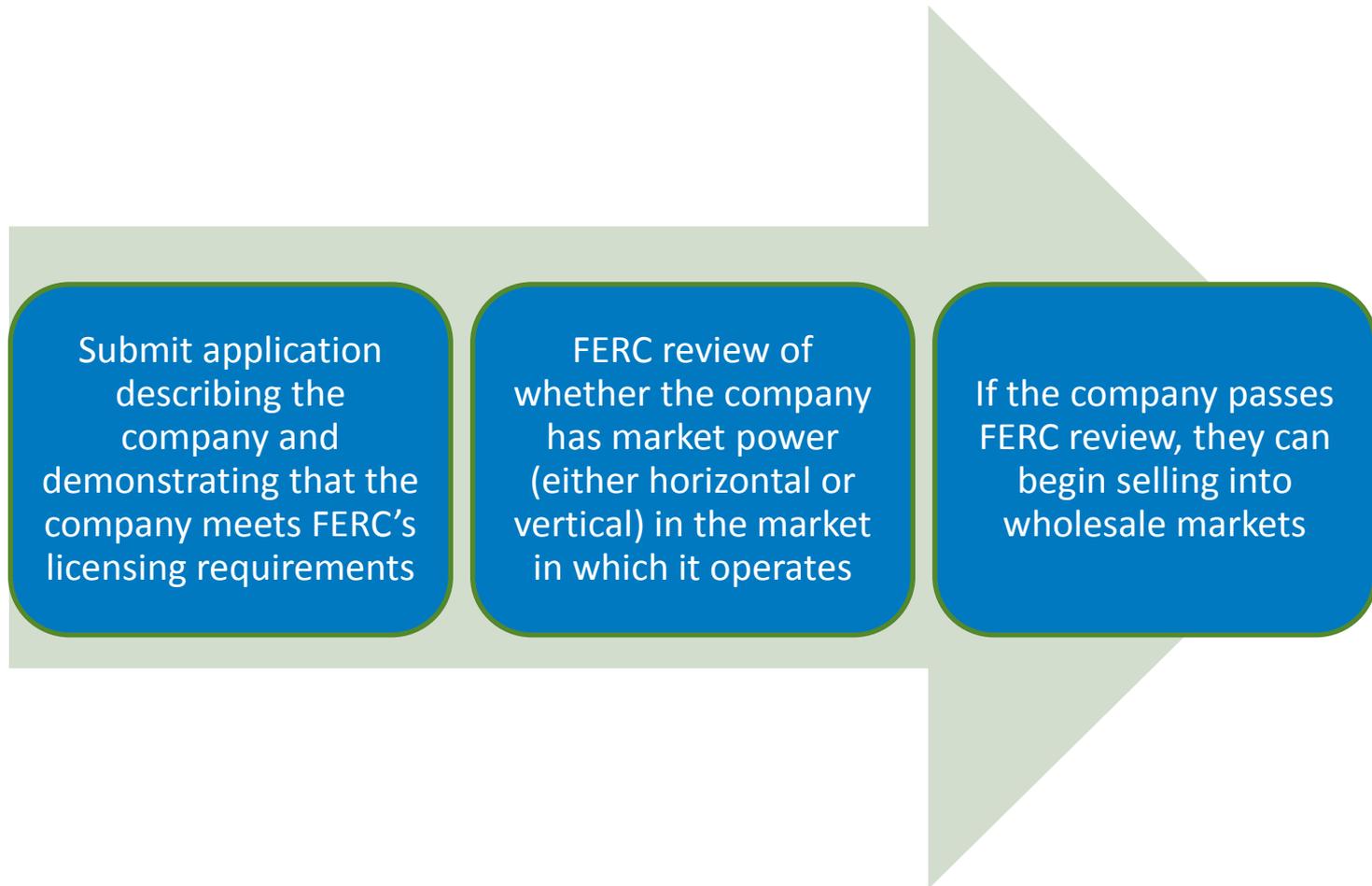
- The lone solar project included in the bilateral agreements category was signed between Alabama Power and Walmart in 2016
- The Alabama Public Service Commission (PSC) granted Alabama Power the authority to pursue up to 500 MW of renewable energy for interested customers via the utility's integrated resource planning procedure
- The PSC approved Alabama Power's LaFayette solar project in 2016, which was in partnership with Walmart and the utility's first corporate-driven project
 - Walmart agreed to a 15-year participation contract with Alabama Power
 - Walmart contributed financial support to enhance the PPA's positive economic benefits to all customers
 - In exchange, Alabama Power retired the projects' corresponding RECs that are associated with Walmart's subscription

Outlook

- Corporations are beginning to take advantage of these green tariff programs with 900 MW of existing capacity and an additional 465 MW in the pipeline
- Of the 29 fully regulated states, 17 have utilities that have worked with corporations to procure renewable energy
- Utility adoption of these programs is becoming more frequent and some utilities are discussing “2.0” tariffs
- Corporate access to renewable energy in regulated markets is likely to expand

Licensed Wholesale Electricity Seller

How it Works



Companies need Federal Energy Regulatory Commission (FERC) approval to sell electricity into wholesale markets

Benefits and Challenges

Benefits

- For companies that have significant energy expenses, becoming a federally-regulated wholesale electricity supplier can allow them to better manage electricity costs as well as sell renewable energy that they own into wholesale markets
- Affords the ability to better manage their energy projects

Challenges

- Complexity of implementation and high risk assumed
- Requires investment in either building an energy team or hiring out these capabilities
- Wholesale sellers are subject to the price volatility of the energy market into which they are selling

Market Status

- FERC approved more than 2,000 organizations to use wholesale market-based rates, primarily utilities and project developers.
- Corporations approved include:
 - Alcoa Power Marketing, Inc., a subsidiary of Alcoa, the aluminum manufacturer (2002)
 - Texas Retail Energy, a subsidiary of Walmart (2005); it was operating in the Electric Reliability Council of Texas in 2004 (Hendrix 2006).
 - Safeway Inc., the grocery chain (2006)
 - Google Energy (2010)
 - Apple Energy (2016)

Case Study: Google Energy's Market-Based Rate Authority

- Google was looking for ways to source renewable power for its operations in the United States, so it formed a subsidiary, Google Energy, LLC
- Google Energy received FERC approval, which allowed them to sign a PPA in 2010 for 114 MW of wind in Iowa, then sell that electricity back to the grid while retaining the RECs
- Google Energy also noted in its February 2017 update to FERC that it has six long-term PPAs, all for wind energy, including the 114 MW of wind in Iowa and five projects

Outlook

- Corporate customers that have large electricity demands and interest in developing in-house energy expertise, or contracting for it, could benefit from this purchasing model
- Because most corporate customers are not interested in being involved in the energy business, this pathway is not likely to be pursued broadly

Pathway Comparison and Outlook

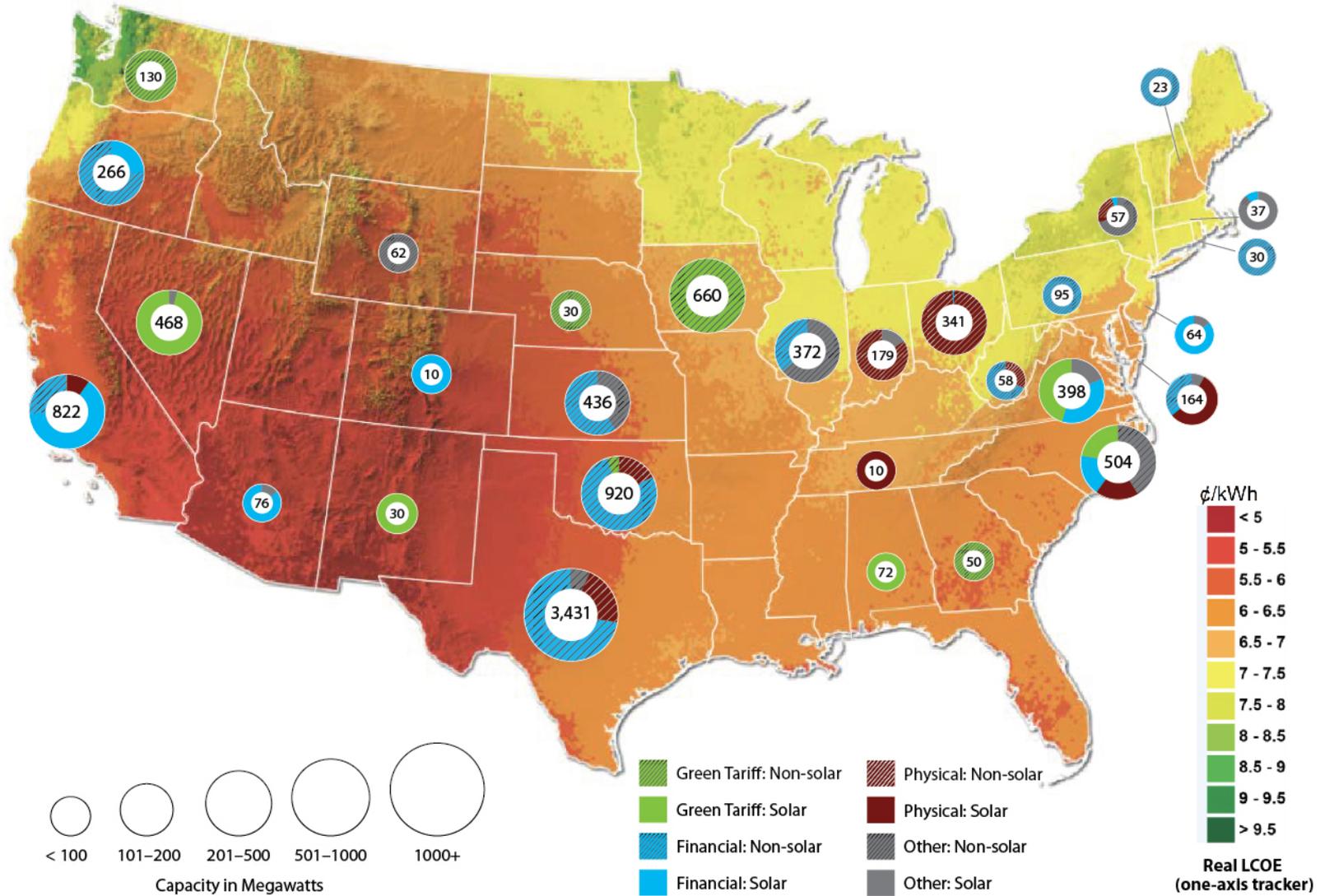
Procurement Model Comparison

	Power Purchase Agreements	Retail Choice	Utility Partnership	Licensed Wholesale Electricity Seller
Availability	Typically requires wholesale market access	Full or partial access in 21 states	Certain utility jurisdictions in 17 states	Any company that owns or has interest in owning utility-scale generation
Corporate Access	Large corporate customers, and emerging aggregation opportunities	All or certain large corporate customers, no aggregation opportunities	Certain large corporate customers and emerging aggregation opportunities	Any company, no aggregation opportunities
Energy Market Expertise and Corporate Approval Requirements	Medium–high	Medium–low	Low–low	Very high–Very high
Contract Control	Corporation manages the contract	Corporation manages the contract	Utility (in some cases with input from corporation) manages the contract	Corporation manages the contract
Contract Length	10–20 years	Negotiable	Varies by utility program	Negotiable (typically longer term, 10–20 years)
Hedging Opportunity and Risk Profile	High, but subject to wholesale market hub or node price volatility	Opportunity depends on length of contract and is subject to retail market price volatility	Opportunity depends on length of contract, credit structure, and/or wholesale market price volatility	High, but subject to wholesale market hub or node price volatility
Reliability requirements	Utility delivers firm, reliable power	Supplier delivers firm, reliable power	Utility delivers firm, reliable power	Corporation might need to establish contracts to secure firm, reliable power
Title to Power	Supplier	Supplier	Utility	Corporation

Expanding PV Procurement Options

- **PPAs**
 - To enable PPAs in new markets, state policymakers could open electricity markets to wholesale access
- **Retail Choice**
 - State policymakers could also open markets to retail choice, either for some (e.g. large commercial) or all retail customers
- **Utility Partnerships**
 - Utilities have primarily been adopting green tariffs voluntarily, but state policymakers could direct utilities under their purview to create and provide a green tariff
- **Wholesale Electricity Supplier**
 - Corporations that have large electricity loads might be interested in learning from the experience of those that have undertaken the option to better evaluate whether it would be a feasible option

To Expand Solar Procurement, Better Purchasing Options Needed in Areas Where Solar is Lowest Cost



Full publication:

**Heeter, Jenny, Jeffrey J. Cook, and Lori Bird. 2017. Charting the Emergence of Corporate Procurement of Utility-Scale Solar. NREL/TP-6A20-69080. Golden, CO: National Renewable Energy Laboratory.
<http://nrel.gov/docs/fy17osti/69080.pdf>.**

Fact sheet:

**Pathways for Off-Site Corporate PV Procurement. 2017. NREL/TP-6A20-69081. Golden, CO: National Renewable Energy Laboratory.
<http://nrel.gov/docs/fy17osti/69081.pdf>.**

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