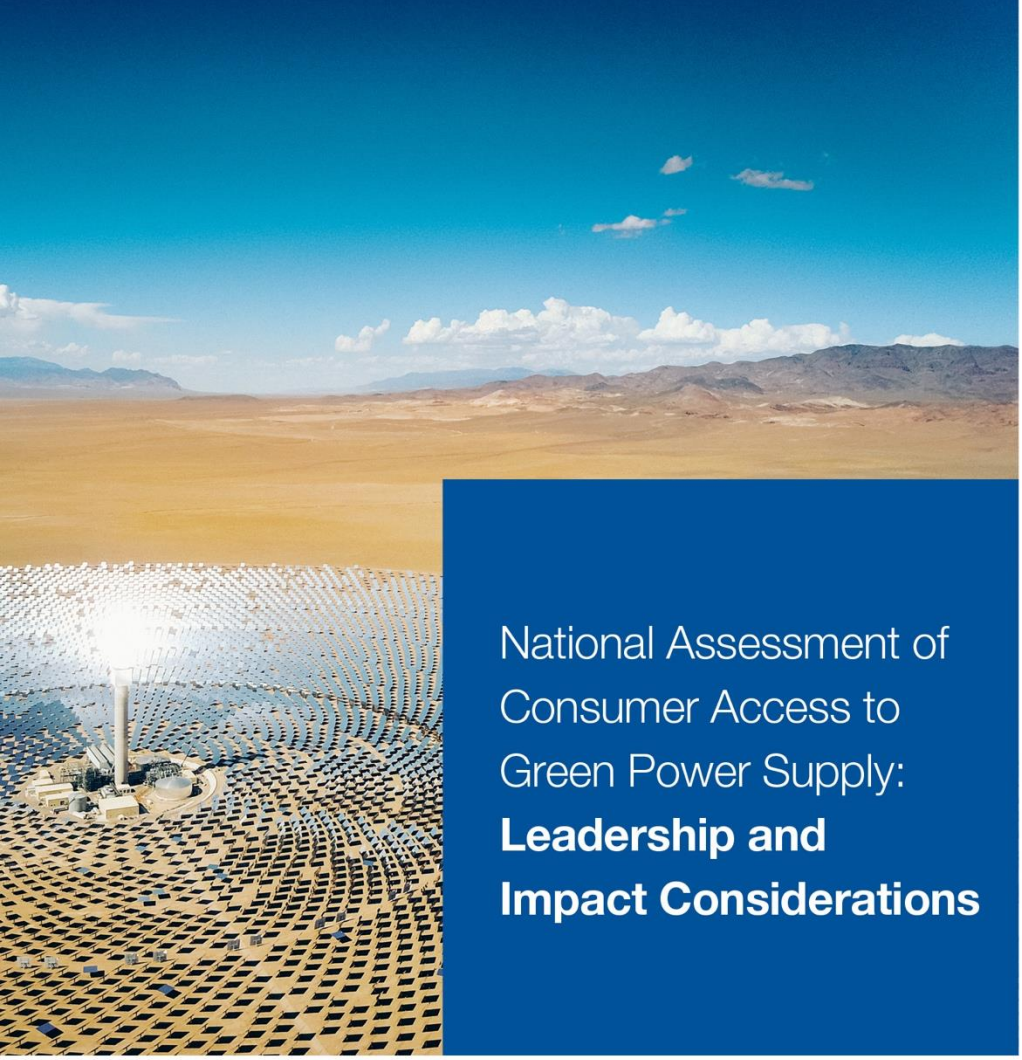
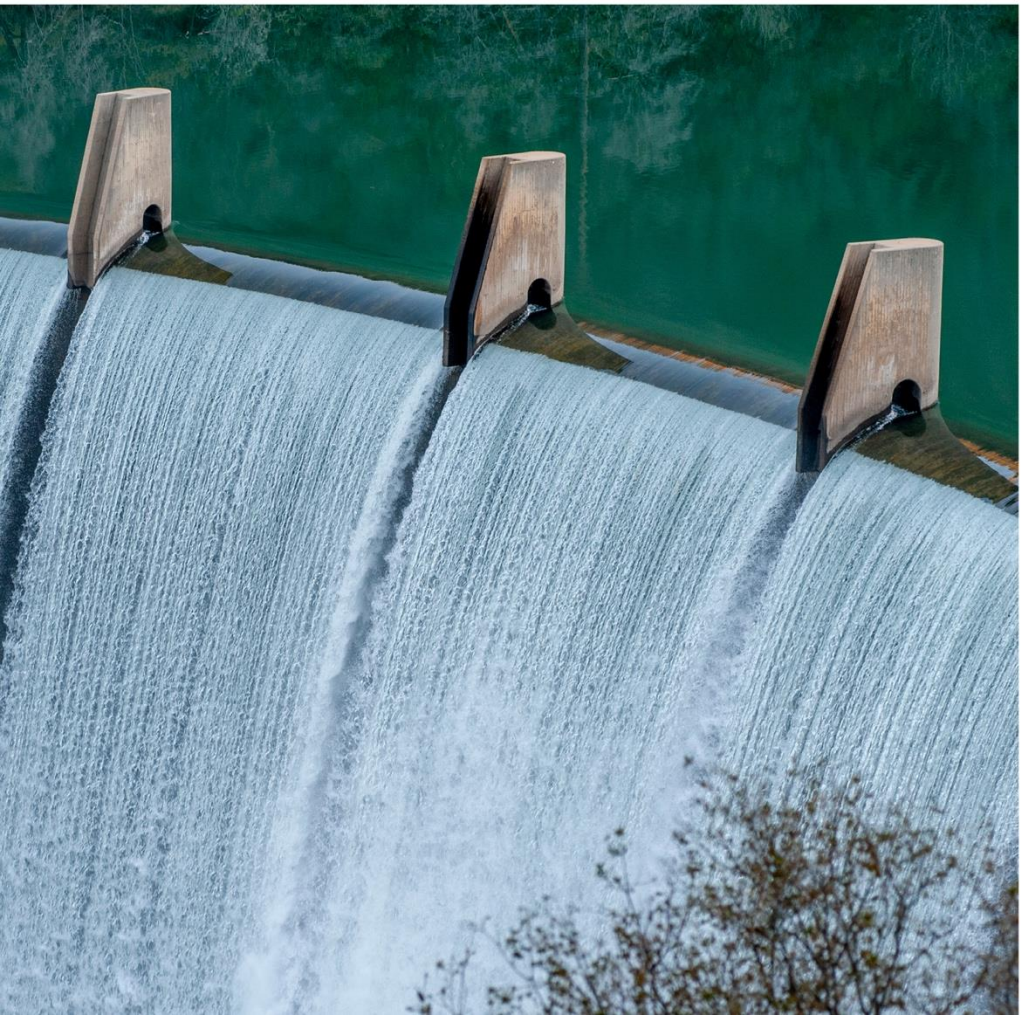


National Assessment of Consumer Access to Green Power Supply: **Leadership and Impact Considerations**



EPA GREEN POWER PARTNERSHIP

Prepared for:

The Green Power Partnership

U.S. Environmental Protection Agency

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EPA 400-R-22-001

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Executive Summary

The market for green power in the United States has grown substantially in recent years. From 2010 to 2019, renewable energy production increased from 8 quadrillion Btu to close to 12 quadrillion Btu per year. This growth represents between 11% and 13% of total annual energy production over this period.[1] Both regulatory and voluntary demand for electricity produced from renewable resources have contributed to the U.S. green power market's growth.

State compliance policies establish a minimum requirement for how much generation must come from renewable resources to serve all ratepayers. The compliance policies are often referred to as renewable energy portfolio standards—, which defines minimum amounts of generation that load-serving entities must provide to consumers from renewable resources. In contrast, voluntary consumer demand is driven primarily by consumer preference for specific resources that offer a benefit they value, such as renewable energy certificates (RECs) ownership.

RECs are a market instrument representing the technology and environmental attributes of electricity generated from renewable sources. A certificate can be sold separately from the underlying generic electricity with which it is associated, either into compliance or voluntary markets. The use of a single market instrument in the United States has several benefits for voluntary consumers, including substantiating claims related to their actions, establishing ownership to generation produced to meet their demand, ensuring that their demand is incremental to what is otherwise available or generated due to a mandate, and avoiding double counting between other consumers and sources of demand for renewable electricity.

Voluntary demand for green power is served by a wide range of green power supply options that offer consumers multiple pathways for accessing green power. Each supply option pathway gives consumers the same underlying market instrument (i.e., REC), which substantiates ownership and green power use claims.

As the voluntary market evolves, questions have emerged regarding the voluntary consumer's role in market transformation. What constitutes leadership in today's market? How can consumers have the greatest impact through their purchase of green power? Is a consumer's choice of supply options a clear indicator of impact? How should consumers talk about their leadership and impact? While these questions are important, there is a tendency to assume that access to green power supply options is relatively uniform and available to all consumers.

For this report, EPA conducted a nationwide analysis of consumer access to green power supply options to evaluate relative access to green power in both residential and non-residential consumer segments. The purpose was to stimulate discussion relating to consumer access and evaluate the need for a wide

[1] U.S. Department of Energy, Energy Information Administration, Electricity, 2020, https://www.eia.gov/electricity

range of credible green power supply options. Several assumptions were made related to supply options, policy effects, and consumer profiles. This report seeks to answer the following questions:

- How many consumers in the U.S. have access to each green power supply option?
- What percentage of consumers have access to different green power options?
- What percentage of utility electricity sales could be covered by each supply option?
- What percentage of consumers have access to at least one green power supply option other than RECs? Does this vary between residential and non-residential consumers?

State policies and state electricity market regulatory structures present challenges and opportunities for accessing green power. Also, technical factors unrelated to state policies influence consumers' access to specific green power supply options. EPA used available data from the National Renewable Energy Laboratory, Center for Resource Solutions, World Resources Institute, Database of State Incentives for Renewables and Efficiency, Energy Information Administration, and other sources in its assessment.

Key findings indicate that access to green power supply options is not uniform across the United States or for specific consumer segments.

- An estimated 19.2 million residential consumers (~16% of total U.S. residential consumers) and 3.7 million non-residential consumers (~22% of total U.S. non-residential consumers) do not have access to any green power supply option other than RECs.
- Except for RECs, no individual procurement option covers more than half of electricity consumers or half of the total U.S. electricity sales.
- There is still much work to be done in today's market to make green power supply more widely accessible.

Lack of access to green power supply options that offer consumers key benefits is a deterrent to faster market transformation. EPA's findings indicate that consumers may have difficulty meeting their green power objectives. Lack of access to a variety of green power supply options can also be a barrier for policymakers hoping to meet long-term environmental objectives.

Findings for each green power supply option are presented in the report (see Table 1).

Introduction

From 2010 to 2019, renewable energy production in the United States grew from 8 quadrillion Btu to close to 12 quadrillion Btu per year, representing between 11% and 13% of annual energy production. During this period, the growth in renewables was primarily from solar and wind resources, with an output increase of 1,140% and 300%, respectively.[2]

In the United States, both compliance policies and voluntary consumer action create demand for renewably generated electricity. Compliance policies establish a minimum requirement for how much generation must come from renewable resources to serve all ratepayers. The resulting renewable energy stemming from compliance policies requires no proactive action by electricity consumers to receive renewable electricity. However, voluntary consumer action and demand for green power builds upon the demand created by compliance policies. Voluntary demand plays a significant role in today's market as a driver for change.

This report assesses the status of consumer access to green power supply options across the United States, including the following procurement options:

- Utility Green Pricing
- Competitive Green Marketing Products
- Community Choice Aggregation
- Power Purchase Agreements (PPAs)
    - Physical
    - Financial
- Renewable (Green) Energy Tariffs
- Community Solar/Shared Renewables
- On-site Generation

The availability of most of these options (outside of on-site generation) depends on applicable policies in a given state. RECs become the only viable option for consumers who do not have access to these options.

Lack of access to specific green power supply options is a potential deterrent to faster market transformation and a potential barrier to policymakers and programs. Thus, the findings of this report can be used to inform the need for additional green power policies and programs.

[2] U.S. Department of Energy, Energy Information Administration, Electricity, 2020, https://www.eia.gov/electricity

Assessment of Consumer Access to Green Power

Consumers have a wide range of options for procuring green power. However, access to these supply options can be limited to a small percentage of consumers based on policy, consumer class, and creditworthiness. This assessment evaluated access to green power supply options, in terms of both the number of consumers and the potential electricity consumption; access is estimated for residential and non-residential consumers across the United States. Appendix A provides details on the methodology used to develop these estimates.

All consumers in the United States have access to green power through RECs. RECS are a credible way for consumers to specify green power use and claim ownership to renewable electricity generated. Because electrons on the grid cannot be distinguished, retaining ownership of RECs allows consumers to make credible claims of using green power. However, some consumers may not be aware of RECs. In contrast, others may choose to purchase green power through utility offerings, generate their own, or directly purchase through a different green power supply option.

While the United States is considered a well-developed renewable electricity market, there are still significant gaps in providing consumer access to renewable electricity.

> **Increased access to available supply options could lead to higher green power market participation, as consumers will be more likely to find options that fit their needs**

In 2018, EPA undertook a national assessment of consumer access to green power. The assessment's primary objective was to provide a snapshot of the current landscape of green power supply options in every state. EPA evaluated access based on the consumer class of residential and non-residential consumers (i.e., commercial and industrial).

This section details EPA's national consumer access assessment to green power and aims to answer the following questions:

- How many consumers in each state have access to each green power supply option?
- What percentage of utility electricity sales could be covered by each supply option?
- How many consumers have access to at least one green power supply option other than retail RECs? How is this different for residential and non-residential consumers?

The consumer access assessment used certain assumptions to account for the lack of comprehensive data, data accuracy, and limited resources. The assumptions were fairly conservative to avoid underestimating the current accessibility of green power. The analysis measures the potential access to green power based on evaluated policies, mandates, and regulations that permit or limit consumer

access. The analysis does not explore economic considerations, incentives, social factors, motivation, and other aspects that may influence consumers' decisions or ability to purchase green power.

ANALYSIS DATA SOURCES

In 2018, EPA obtained data on state policies and programs, along with utility green power purchase options, from the following sources (representing data from 2016 to 2018 depending on the source):

- **The National Renewable Energy Laboratory (NREL)** provided data related to the U.S. voluntary green power markets,[3] the U.S. utilities offering green pricing programs,[4] the policy review of community solar programs across various U.S. states,[5] and the analysis of the technical potential of rooftop photovoltaic (PV) power in the continental United States.[6]
- **The Center for Resource Solutions (CRS)** list of nationally available residential, commercial, and wholesale Green-e certified green power options[7] was used to evaluate consumer access.
- **The World Resources Institute (WRI)** provided data related to various renewable energy green tariff programs in the United States.[8]
- **The Database of State Incentives for Renewables and Efficiency (DSIRE)**[9] provided information on the various federal, state, and local policy programs related to green power.
- **Additional sources of information** on green power options were obtained from several federal and state policy proceedings, renewable energy and environmental stakeholder groups (e.g., Solar Energy Industries Association [SEIA]), nonprofit organizations promoting green power (e.g., Local Energy Aggregation Network [LEAN]), and corporate green power procurement reports.
- **EPA used data from the U.S. Energy Information Administration (EIA)** estimates for the number of applicable consumers and total megawatt-hour (MWh) sales from residential and non-residential consumers. EIA tracks the total number of residential, commercial, and industrial consumers and the total electricity sales for each electric utility in the United States, grouped by state and consumer class.[10] The data was used to estimate the number of residential and non-residential customers with access to green power options through both state and utility-level programs.

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[3] Eric O'Shaughnessy, Jenny Heeter, Jeff Cook, and Christina Volpi, "Status and Trends in the U.S. Voluntary Green Power Market (2016 Data)," National Renewable Energy Laboratory, October 2017. https://www.nrel.gov/docs/fy18osti/70174.pdf

[4] Eric O'Shaughnessy, "Utility Green Pricing Program List," National Renewable Energy Laboratory, January 2018. https://www.nrel.gov/analysis/green-power.html

[5] Jeffrey J. Cook and Monisha Shah, "Focusing the Sun: State Considerations for Designing Community Solar Policy," National Renewable Energy Laboratory, January 2018. https://www.nrel.gov/docs/fy18osti/70663.pdf

[6] Pieter Gagnon, Robert Margolis, Jennifer Melius, Caleb Phillips, and Ryan Elmore, "Rooftop Solar Photovoltaic Technical Potential in the United States: A Detailed Assessment," National Renewable Energy Laboratory, January 2016. https://www.nrel.gov/docs/fy16osti/65298.pdf

[7] "Find Green-e Certified – Renewable Energy," Green-e, Center for Resource Solutions, accessed April 2018. https://www.green-e.org/certified-resources

[8] Letha Tawney, Priya Barua, and Celine Bonugli, "Emerging Green Tariffs in U.S. Regulated Electricity Markets," World Resources Institute, February 2018.

[9] "Database of State Incentives for Renewables & Efficiency," a collaboration between the U.S. Department of Energy, the North Carolina Clean Energy Technical Center, and North Carolina State University. https://www.dsireusa.org/

[10] U.S. Energy Information Administration, *Electricity Sales (Consumption), Revenue, Prices & Customers, by State and Utility*, data released November 6, 2017, accessed March 2018.

- **ICF's Combined Heat and Power (CHP) Technical Potential Database** estimates building energy loads and encompasses all large commercial and industrial facilities capable of supporting a CHP installation of 50 kilowatts (kW) or larger. It identifies applicable buildings based on associated electricity use when access to green power supply options is limited to large customers.

KEY RESULTS—GREEN POWER ACCESS

Results of the Consumer Access Assessment summarize the number of green power supply options available in each state and the aggregate green power access, organized by both the number of consumers and total electricity sales. Key findings include:

- The utility green pricing programs offered in 37 states are available to more U.S. consumers than any other green power supply option outside of RECs.
- Community solar programs are offered in 17 states, and 40% of total U.S. electricity consumers can source this green power supply option.
- Less than a quarter of U.S. electricity consumers are estimated to have access to on-site green power generation through rooftop solar.
- Access to renewable (green) energy tariffs (2.4% of consumers) and community choice aggregation (0.3% of electricity sales) options are currently limited.
- Financial power purchase agreements are available to less than 1% of consumers but could potentially cover close to a quarter of the country's total electricity sales.

Table 1 shows the summary results for green power access through each supply option. For more detail, Appendix B provides estimated percentages of residential and non-residential consumers with access to green power as well as the estimated total electricity consumption by state and green power procurement option.

Table 1. Summary of Results for Green Power Access Green Power Supply Option	Number of States With Green Power Access	Total Green Power Access by Supply Option		Total Green Power Access Compared to Total U.S. Retail Electricity Sales Data	
		Number of Consumers (million)	Electricity Sales (billions of kilowatt-hours [kWh])	Percentage of Consumers	Percentage of Electricity Sales
Utility Green Pricing Programs	37	58.3	1,097	43.0%	35.0%
Competitive Green Power Marketing Products	19	45.2	1,017	33.0%	32.2%
Community Choice Aggregation	7	3.3	9	2.4%	0.3%
Physical Power Purchase Agreements	27	21.8	659	15.9%	20.9%
Financial Power Purchase Agreements	50	0.21	756	0.2%	23.9%
Renewable Energy (Green) Tariffs	16	3.2	76	2.4%	2.4%
Community Solar/Shared Renewables	17	54.3	270	40.0%	8.6%
On-site Generation	48[1]	33.7	570	24.7%	18.1%
Retail (unbundled) RECs[2]	50	All	All	100%	100%

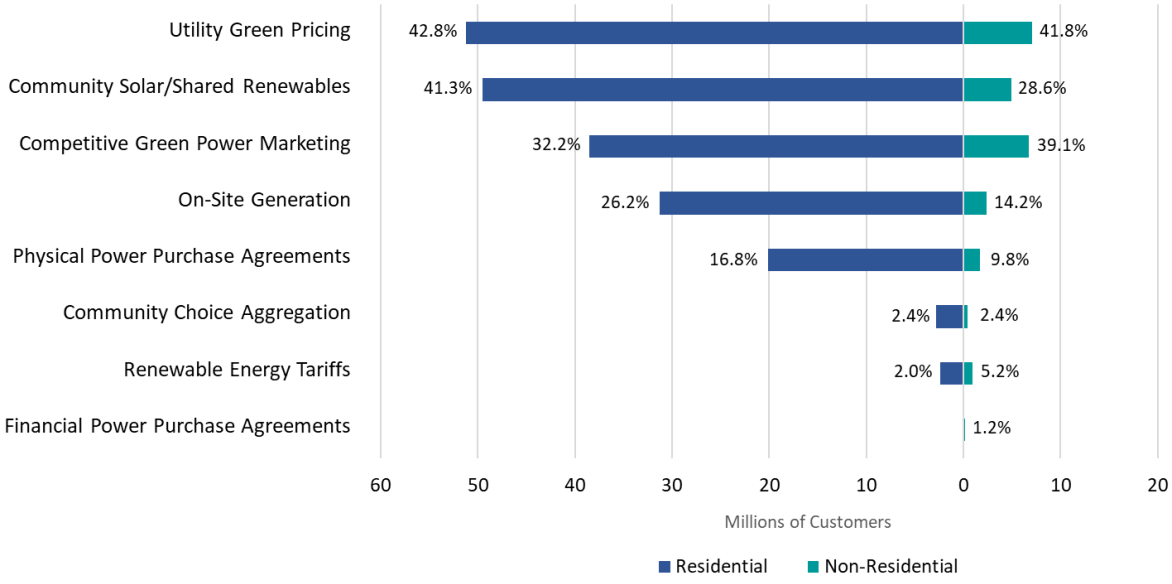
[1] On-site generation excludes Hawaii and Alaska (data available for continental U.S. only).

[2] RECs are accessible to all consumers in the United States. They are a credible way to specify green power use and claim ownership to renewable electricity generated to meet consumer demand.

Although consumers can access green power through several supply options, there is no individual procurement option, except retail RECs, that covers even half of utility consumers or half of total U.S. electricity sales. Increased access to available supply options could lead to higher green power market participation, as consumers will be more likely to find options that fit their needs.

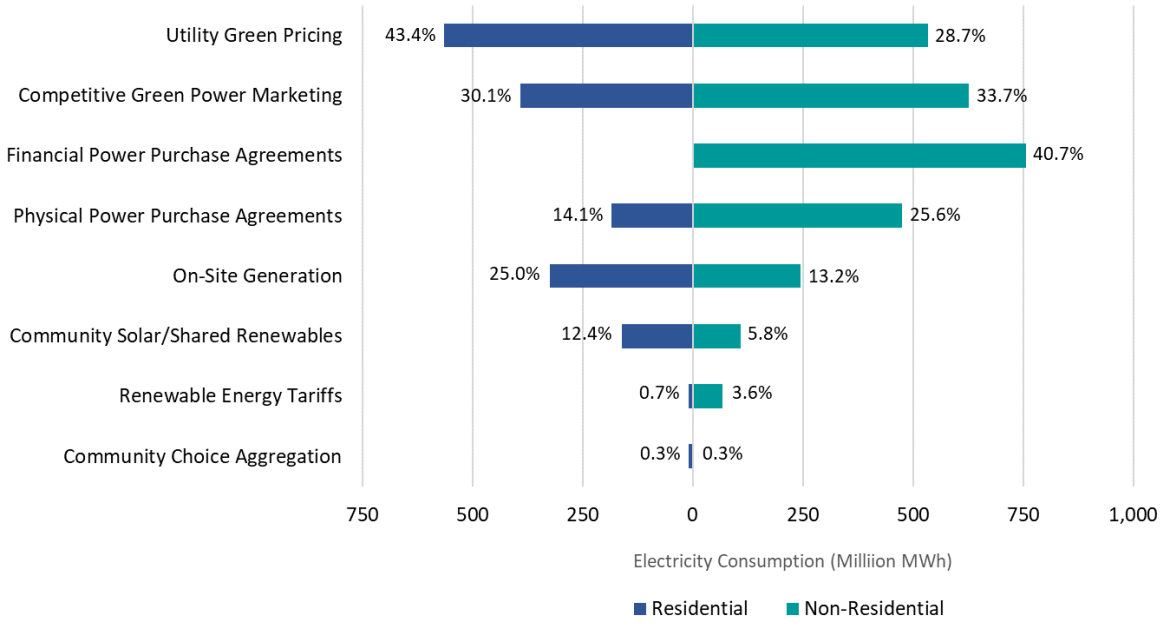
Green power access varies according to consumer type. Figures 1 and 2 illustrate total green power access for residential versus non-residential consumers for each supply option – by the number of consumers and by total electricity consumption. The percentage values in the figures represent the accessibility of each option to either the residential or non-residential consumer class.

Figure 1. Green Power Access by Number of Consumers*



Total residential consumers: 120 million; total non-residential consumers: 17 million (EIA, 2018)

Figure 2. Green Power Access by Potential Electricity Consumption*



Total residential electricity consumption: 1,300 billion kWh; total non-residential consumption: 1,860 Billion kWh (EIA 2018)

The residential sector tends to dominate the number of potential customers. In contrast, the total potential consumption tends to be weighted toward the commercial and industrial sectors. The supply options are assessed in the following sections, with information on applicability, coverage, and key assumptions.

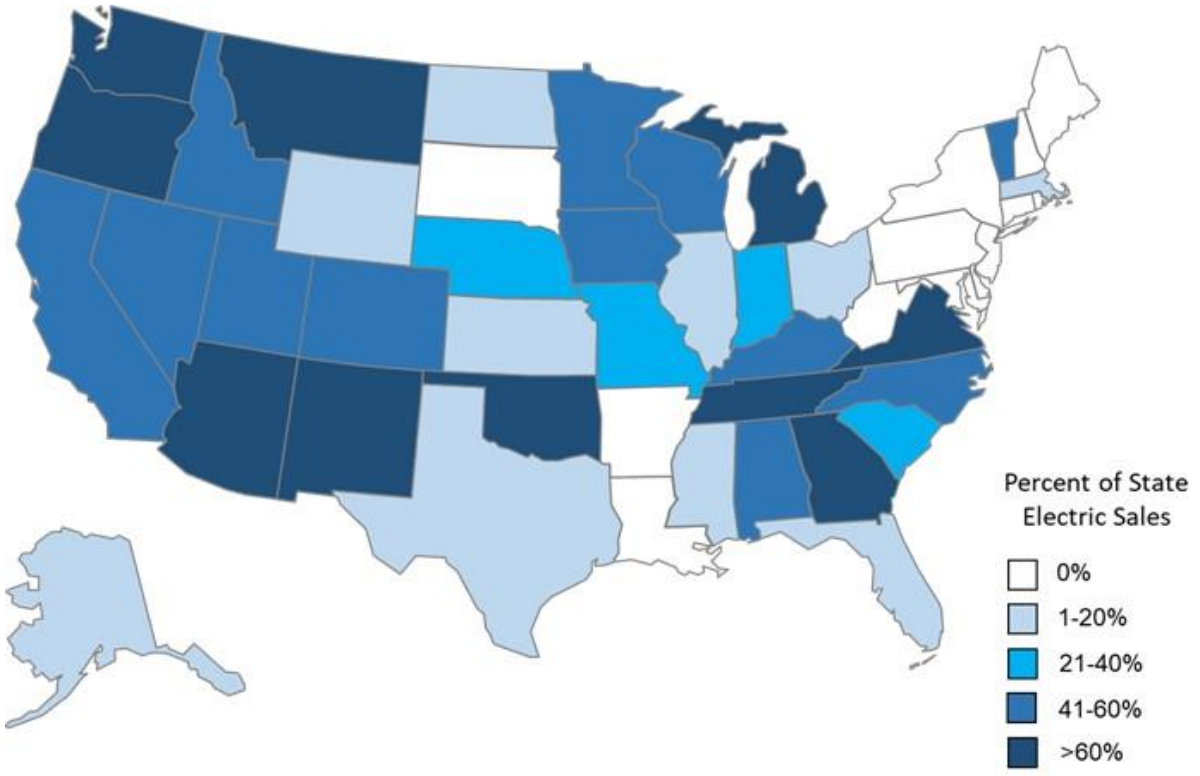
UTILITY GREEN PRICING PROGRAMS

This analysis evaluated utility green power pricing programs using NREL and Green-e data at the utility level. These data sources were used to determine which customer segments have access to a utility green pricing program and how many customers are covered. Additionally, this analysis evaluated the percentage of retail electricity sales relative to the state's total electricity sales.

According to NREL data, utility green pricing programs are offered by more than 450 utilities across 37 states as of 2018.[11] While this option is primarily offered in states with regulated, vertically integrated utilities, some programs are offered by smaller municipal and cooperative (co-op) utilities in deregulated states. The total estimated access for utility green pricing programs in the United States is 58.3 million consumers (43% of U.S. total), which results in 1,097 billion kilowatt-hours (kWh) of potential consumption (35% of U.S. total). Figure 3 shows utility green pricing program access as a percentage of total electricity sales in each state.

[11] Eric O'Shaughnessy, "Utility Green Pricing Program List," National Renewable Energy Laboratory, January 2018. https://www.nrel.gov/analysis/green-power.html

Figure 3. Utility Green Pricing Programs – Green Power Access as a Percentage of Total State Electricity Sales

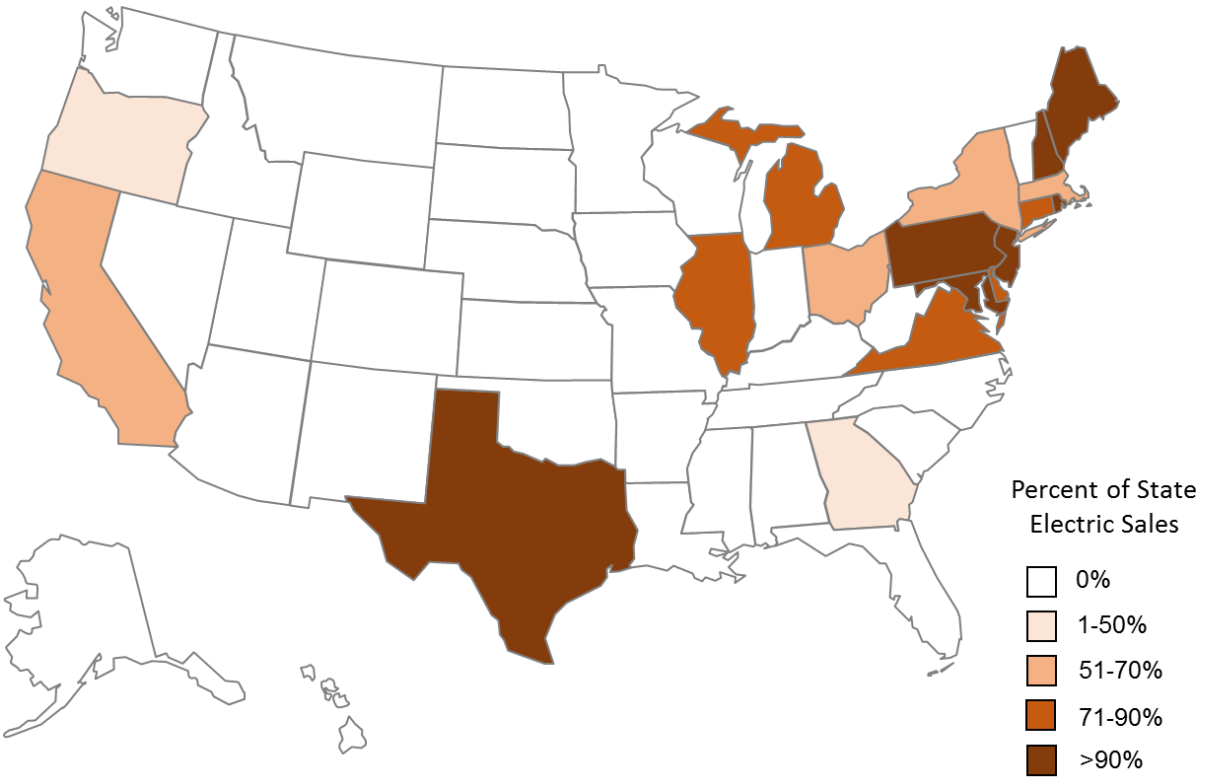


COMPETITIVE GREEN MARKETING PRODUCTS

Competitive retail markets (restructured markets) involve a utility supply option called "green power marketing products." This supply option allows customers to procure green power from a competitive retail electricity supplier that may not be their local distribution utility. This option is usually available to both residential and non-residential customers. Nineteen states allow this green power supply option, which results in an estimated 45.2 million consumers with access (33% of U.S. total), with an estimated potential consumption of 1,017 billion kWh (32.2% of U.S. total). Figure 4 shows the states with competitive retail markets and the percentage of state electricity sales eligible for this option.

To evaluate the number of electricity consumers with access to green power marketing products, the analysis assumes that all consumers within a competitive state have access to green power if multiple retail green power suppliers are identified within the respective state boundaries. The assumption used in this analysis, that all electricity consumers in the state have access, may overestimate the total number of consumers with access. Many suppliers choose to serve limited geographical areas or consumer segments (e.g., large accounts) in a particular state. The evaluation of various competitive retail energy providers and the number of consumers they each serve by geographic region within a state was beyond the scope of this analysis.

Figure 4. Green Power Marketing Products (Competitive Retail Markets) – Green Power Access as a Percentage of Total State Electricity Sales



COMMUNITY CHOICE AGGREGATION

The community choice aggregation (CCA) supply option is primarily available for all consumers within the specified location. As of 2018, only seven states allowed CCAs, with only five– California, Illinois, Massachusetts, New York, and Ohio – providing green power options through a CCA. For this assessment, NREL data related to CCAs[12] were used. For CCAs, there are an estimated 3.3 million consumers with access (2.4% of U.S. total) with an estimated 8.7 billion kWh of potential consumption (0.3% of U.S. total).

Recently, especially in California,[13] CCAs have been developed extensively with the option for green power. The results indicated in this analysis represent a snapshot from 2018. They do not capture this supply option's extensive and evolving changes. As such, findings likely underestimate the total consumer access through the CCA supply option.

[12] Eric O'Shaughnessy, Jenny Heeter, Jeff Cook, and Christina Volpi, "Status and Trends in the U.S. Voluntary Green Power Market (2016 Data)," National Renewable Energy Laboratory, October 2017. https://www.nrel.gov/docs/fy18osti/70174.pdf

[13] Dr. J.R. DeShazo, Julien Gattaciecca, and Kelly Trumbull, "The Growth in Community Choice Aggregation," UCLA Luskin Center for Innovation, Next 10, July 2018. https://innovation.luskin.ucla.edu/wp-content/uploads/2019/03/The_Growth_in_Community_Choice_Aggregation.pdf

POWER PURCHASE AGREEMENTS

In some states, organizations can contract directly with a specific third-party owned generator to obtain green power. Direct purchase options include both physical power purchase agreements (PPAs) and financial PPAs. Both types of arrangements offer an organization a tangible and clear association with a specific renewable energy facility.

The power purchase agreement (PPA) supply options (both physical and financial) present some challenges regarding assessing consumer access. PPAs for on-site generation are limited based on electricity load requirements and the organization's creditworthiness. PPAs for off-site projects are generally only available to large, creditworthy consumers.

For off-site green power generation, this analysis looked at physical PPAs from the perspective of what size load would be required to make a PPA contract viable. PPAs for off-site projects are typically limited to large, creditworthy consumers. For the analysis, the smallest known off-site PPA – a 10-megawatt (MW) wind energy contract – was used to estimate the minimum size for buildings that could support a physical PPA (about 2.5 MW average load considering wind turbine capacity factors). Electric loads from applicable buildings in ICF's CHP Technical Potential Database[14] were estimated for each state, with the total PPA potential capped at EIA electricity sales totals for industrial-scale consumers.[15]

There may be smaller buildings owned by large corporations that could be part of a PPA portfolio, but these potential consumers are not currently captured in estimates based on applicable building sizes. This could lead to underestimating total consumer access to off-site PPAs. Another factor that was not considered is the creditworthiness of potential consumers, which could limit PPA viability.

For on-site generation, smaller physical PPAs of potential rooftop solar installations on the consumer side of the meter were included if authorized by the state. The on-site generation of green power is further driven by other policy constraints, such as net-metering caps. Additionally, limitations are created by nonpolicy constraints, such as a project site's physical suitability. (See the on-site self-generation supply option section for an explanation of the methodology to assess on-site green power potential, along with a discussion of these constraints.)

Physical PPAs

Physical PPAs are long-term contracts (often 10 to 20 years) between an organization purchasing green power and a party that generates that electricity. Both the consumer and producer must be within the same power market to allow for the electricity's physical delivery. State authorization of PPAs can include projects that are located both on-site and off-site.

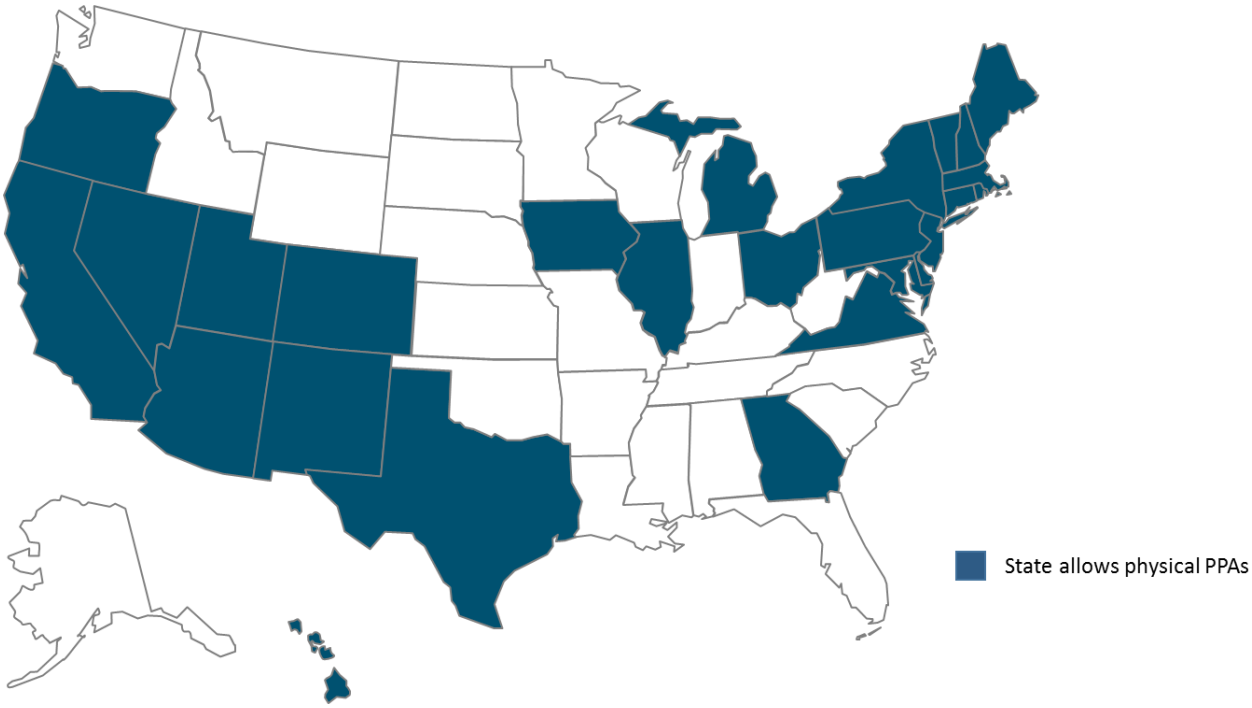
As of 2018, physical PPAs are offered in 27 states (typically states with competitive electricity markets). Based on the total estimated electricity sales for buildings large enough to support off-site PPAs and the

[14] ICF's CHP Technical Potential Database includes estimates for energy loads from commercial, institutional and industrial buildings that are large enough to support a combined heat and power installation sized 50 kW or larger. This includes all buildings that would be sized large enough to support a 10 MW wind energy contract (the smallest known PPA as of March 2018).

[15] U.S. Energy Information Administration, *Electricity Sales (Consumption), Revenue, Prices & Customers, by State and Utility*, data released November 6, 2017, accessed March 2018.

estimated potential for on-site rooftop solar installations, physical PPAs could provide access to an estimated 21.8 million consumers (15.9% of U.S. total) while providing approximately 659 billion kWh of renewable energy consumption (20.9% of U.S. total). These figures do not account for the project's financial feasibility or the creditworthiness and technical and spatial limitations of eligible consumers. Figure 5 shows the states that allow physical PPAs.

Figure 5. States Authorizing Physical PPAs (third-party ownership)



Financial PPAs

Financial PPAs for green power, also known as "virtual PPAs," are financial contracts between a green power generator (seller) and a green power consumer (buyer). Under this supply option, the buyer often receives the RECs associated with the project, but the physical power is sold into the wholesale power market by the project developer. Given the complexity of negotiating, transacting, and executing a financial PPA, this green power supply option is limited to large, creditworthy commercial and industrial consumers.

Financial PPAs are not regulated by states[16] and can be considered as a nationwide green power procurement option. For the analysis, the same methodology for off-site physical PPAs was applied: Estimating the total potential for buildings that could support a 10 MW wind energy contract in each state and capping the total potential at EIA-reported industrial-scale electricity sales.[17] While this analysis assumed that each building was a potential PPA consumer, data limitations prevented the analysis from looking at the aggregation of multiple facilities for a single buyer, which is likely to be the

[16] If not structured properly, financial PPAs can trigger special accounting requirements under federal tax regulations.

[17] U.S. Energy Information Administration, *Electricity Sales (Consumption), Revenue, Prices & Customers, by State and Utility*, data released November 6, 2017, accessed March 2018.

most practical approach for this supply option. Therefore, this analysis may not reflect the true access potential of this supply option. However, it is also true that financial PPAs are primarily only in the domain of large corporate or institutional buyers.

The analysis identified an estimated 756 billion kWh of potential for financial PPAs (23.9% of U.S. total). However, with minimum annual consumption set to output from a 10 MW wind energy project, only approximately 212,000 estimated consumers are eligible in the United States (0.2% of U.S. total). These figures do not account for the financial feasibility of projects or the creditworthiness and technical limitations of eligible consumers. Despite the data limitations of this analysis, it is still reasonable to assume that financial PPAs are only accessible to larger, more sophisticated buyers, even if aggregation was considered. Financial PPAs provide a strong mechanism for a small number of businesses to make a large impact on green power adoption.

RENEWABLE (GREEN) ENERGY TARIFFS

Renewable (green) energy tariffs, also called "sleeved contracts," are utility-facilitated offerings that allow individual consumers to purchase green power from a renewable generator through a long-term contract. This option is mostly only available to commercial and industrial consumers,[18] sometimes with a minimum size requirement put in place. This supply option analysis used data from WRI,[19] utility rate-cases, and state proceedings to determine the number of utilities offering this supply option and associated limitations such as capacity, consumer class, and length of contracts.

As of 2018, 16 utilities were offering renewable (green) energy tariffs, providing access to an estimated 3.2 million consumers (2.4% of U.S. total) and the potential for an estimated 76 billion kWh (2.4% of U.S. total). Renewable (green) energy tariffs are typically targeted toward large consumers in traditional, non-competitive markets. Some utilities have program caps that limit the total permitted RECs allowed. Although these caps can potentially be expanded in the future, this analysis assumed the current caps as the limit on access to this green power option.[20]

COMMUNITY SOLAR AND SHARED RENEWABLES

Community solar and shared renewables are supply options that allow multiple consumers to buy, lease, or subscribe to a portion of a shared renewable electricity project often located off site from their home or business. The program can be local community-owned, utility-owned or facilitated, or third-party owned. This option is primarily for residential and commercial consumers and is offered in 17 states, shown in Figure 6 below. However, some states do not allow consumers to retain REC ownership. In contrast, in some states, the REC ownership is determined on a project-by-project basis.

For this supply option, the analysis assumes that the consumers have REC ownership in those states where the community solar policies do not explicitly clarify or determine the ownership of RECs. While

[18] Xcel Energy tariffs are open to the residential consumer class in Colorado and Minnesota.

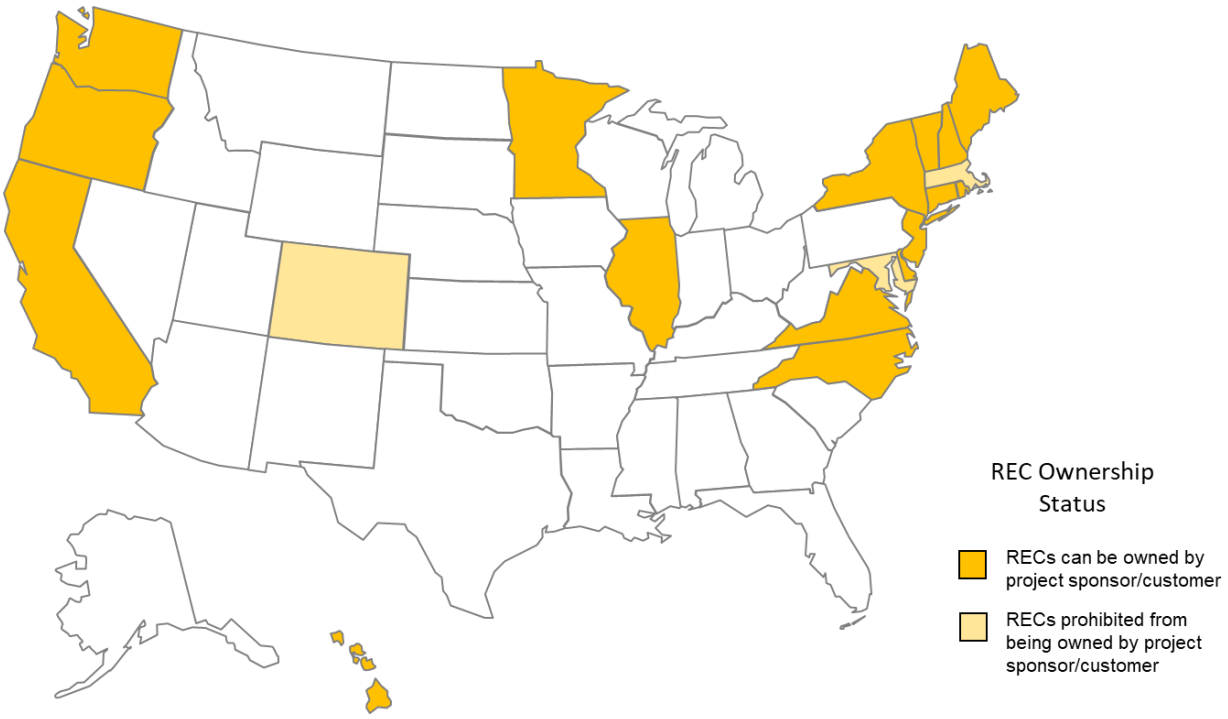
[19] Letha Tawney, Priya Barua, and Celine Bonugli, "Emerging Green Tariffs in U.S. Regulated Electricity Markets," World Resources Institute, February 2018.

[20] "U.S. Renewable Energy Map: A Guide for Corporate Buyers," World Resources Institute, May 2017. http://www.wri.org/resources/maps/us-re-corporate-buyers-map

consumers could potentially receive the RECs, most are not likely to do so in practice. Either through lack of awareness or based on developer interests to improve the economic opportunity for subscribers only. Thus, potential consumer access to RECs may be limited, as the ownership of RECs might be determined by the transactions or contracts of each community solar or shared renewables project.

In states that allow consumer-owned RECs from community solar and shared renewables projects, more than 54 million consumers have access (40% of U.S. total) and approximately 270 billion kWh of potential green power use (8.6% of U.S. total). Figure 6 shows the states that allow community solar and shared renewables, distinguished by whether the consumers are allowed to own the RECs.

Figure 6. States With Community Solar and Shared Renewables State Policies



ON-SITE GENERATION

On-site generation is when a consumer either owns or leases a renewable electricity project housed on the consumer's property. Leasing a green power project is also considered a physical PPA, although this can also be located off site.

The on-site generation option is available to all consumer segments in all states, limited only by site suitability characteristics. However, physical PPAs are limited to 27 states, as discussed in the "Physical PPAs" supply option section. For this analysis, only on-site solar PV potential was considered[21] since it is the most common form of on-site generation and can be used as a proxy to measure the total green

[21] Pieter Gagnon, Robert Margolis, Jennifer Melius, Caleb Phillips, and Ryan Elmore, "Rooftop Solar Photovoltaic Technical Potential in the United States: A Detailed Assessment," National Renewable Energy Laboratory, January 2016. https://www.nrel.gov/docs/fy16osti/65298.pdf

power potential in a state. Because the results are based only on the rooftop technical potential from the NREL analysis[22] for solar PV generation, the assessment underestimates the potential to install PV panels on parking lot canopies, or privately owned land suitable for solar power generation. Additionally, the analysis limits the potential to generate green power only to solar PV, thus underestimating the total access to green power. However, the analysis does not include economic factors, site load limitations, or net metering caps that may influence the size and viability of on-site generation options. This may lead to some overestimating of on-site generation potential, particularly in the residential sector.

Based on NREL's solar technical site potential estimates, an estimated 33.7 million consumers can access green power through on-site generation (24.7% of U.S. consumers), and there is an estimated 570 billion kWh of potential green power use (18.1% of U.S. electricity sales).[23] The residential sector accounts for more than 90% of potential consumers for on-site green power and an estimated 57% of the total potential for electricity consumption from on-site generation.

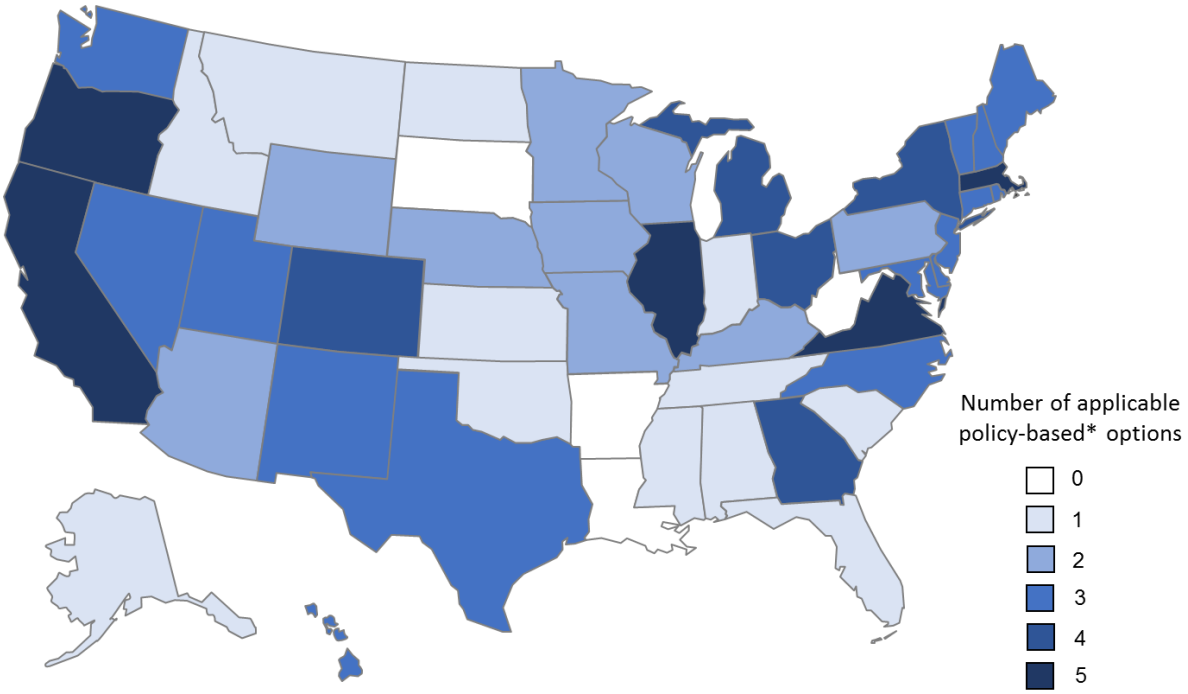
SUMMARY OF U.S. GREEN POWER ACCESS

Some states have several renewable energy procurement options available to residential and/or non-residential consumers, while others are more limited. Data for each green power supply option was assembled and consolidated, considering potential overlap in states with multiple green power access options to avoid double-counting. The total number of consumers with access to a green power option outside of retail RECs is estimated for each state. States with multiple policy-based procurement options are more likely to provide extensive green power access than states with one or zero policy-based options. The number of policy-based options for green power access is quantified in Figure 7. Note that the presence of a policy-based option does not indicate full coverage for a state, as most policies only apply to certain utilities or consumer classes.

[22] Ibid.

[23] The data evaluated cover only the continental United States, excluding Alaska and Hawaii due to credible data limitations, etc.

Figure 7. Number of Policy-based* Green Power Access Options by State

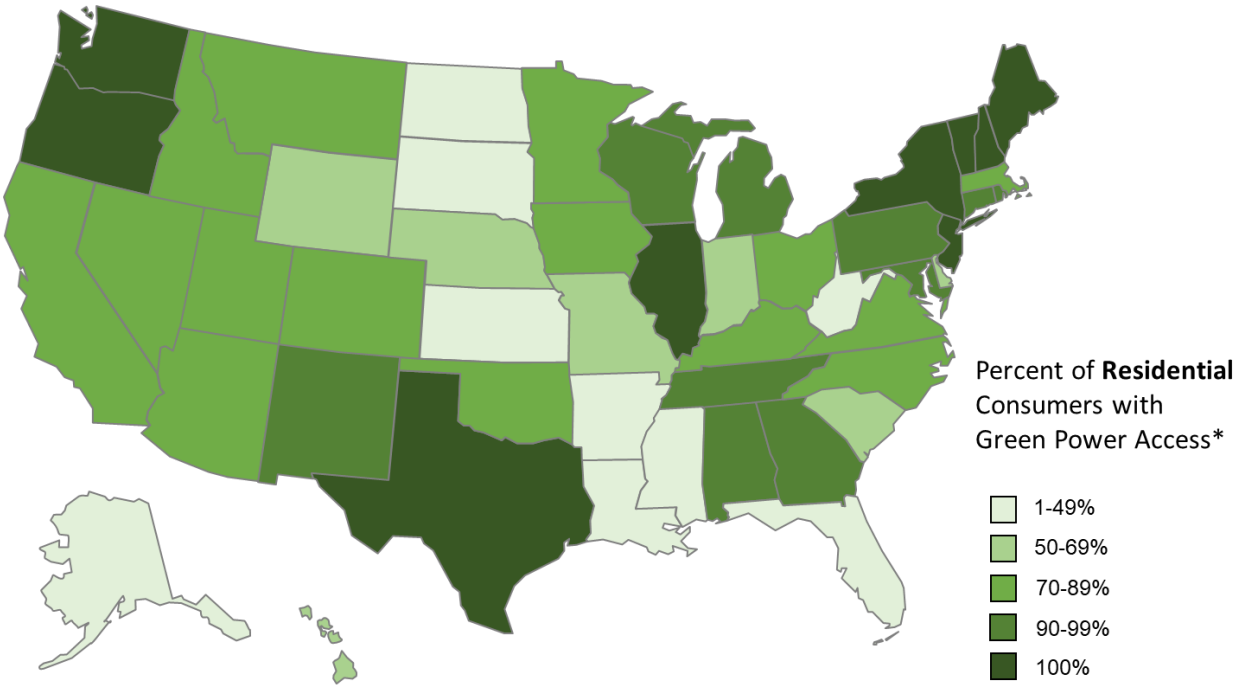


* Financial PPAs , On-site generation, and Unbundled RECs are not included, as they are not considered to be policy-based options

Residential Green Power Access

When the different green power supply options are combined, approximately 84% of residential consumers have access to at least one green power option outside of retail RECs. Nine states are estimated to provide all residential electricity consumers with green power access through a combination of green power supply options, and several more are close to providing access to all consumers. Only four states – Arkansas, Louisiana, South Dakota, and West Virginia – do not provide access to green power options outside of self-generation and retail RECs. Residential access to green power by state is illustrated in Figure 8.

Figure 8. Aggregate Green Power Access* for Residential Consumers as a Percentage of Total State Residential Electricity Sales



*Estimated access to one or more renewable energy options, not including access to retail RECs

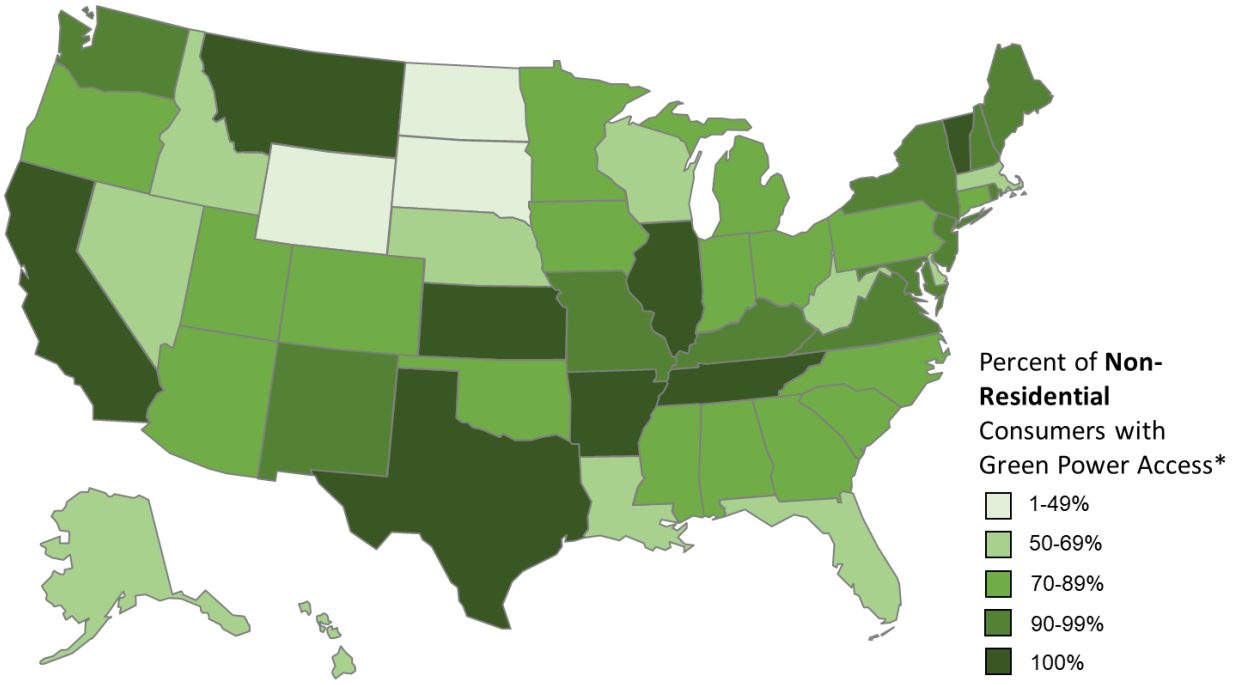
While a high percentage of residential consumers nationwide have access to green power supply options, many of these consumers have access to a limited number of options that may or may not suit their needs. Utility green pricing programs are the most predominant green power access option for residential consumers; however, these programs often represent a cost premium to the residential consumer compared to standard electricity service.

Non-Residential Green Power Access

Compared to the residential sector, different procurement options are available to commercial and industrial consumers. Unlike residential consumers, large non-residential customers have access to physical and financial PPAs. These options cover a relatively small number of consumers but could be applied to a relatively high percentage of electricity sales. As noted earlier, PPAs require scale, creditworthiness, and a level of knowledge and sophistication to navigate some technical and market aspects of these supply options.

The same four states – Arkansas, Louisiana, South Dakota, and West Virginia – that did not have access to options outside of self-generation and retail RECs in the residential sector also offer no policy-based options for non-residential consumers. However, large and credit-worthy consumers in these states could potentially access financial PPAs. Eight states are estimated to provide all non-residential electricity consumers with green power access through various supply options, and several more are close to providing this same level of access. As discussed earlier, certain green power supply options such as financial PPAs, physical PPAs, and renewable green tariffs are almost exclusively offered or suitable to large non-residential consumers. The results of the analysis are summarized in Figure 9.

Figure 9. Aggregate Green Power Access* for Non-Residential Consumers as a Percentage of Total State Non-Residential Electricity Sales



*Estimated access to one or more renewable energy options, not including access to retail RECs

Excluding retail RECs, green power supply options are available to approximately 78% of non-residential consumers in the United States and could be applied to 85% of non-residential electricity sales. Utility green pricing programs are prominent for non-residential consumers. They are the only policy-based green power access option in 12 states.

Consumers With Retail RECs as the Only Green Power Access Option

Retail RECs are a viable and credible option for procuring green power. They are the only supply option for consumers who do not have access to the various other green power supply options reviewed in this analysis. Retail RECs are available to all consumers without restriction. Consumers can access green power by purchasing RECs that have been unbundled and are sold or billed separately from the underlying electricity. Retail RECs are the only green power option for about 20% of U.S. consumers nationwide.

- For **residential** consumers, retail RECs are the only green power option for:
  - **19.2 million consumers** (~16% of total U.S. residential consumers)
  - **286 billion kWh of electricity sales** (~22% of total U.S. residential electricity sales)
- For **non-residential** consumers, retail RECs are the only green power option for:
  - **3.7 million consumers** (~22% of total U.S. non-residential consumers)

- **277 billion kWh of potential green power** (~15% of total U.S. non-residential electricity sales)

Overall, retail RECs are the only option for many consumers. For significantly more consumers, only one or two additional green power access options are available. Therefore, increasing the number of viable options will ensure more consumers have access to green power.

Conclusions

The opportunity for compliance and voluntary demand to drive the electricity sector's transformation and increase green power production is significant. However, drivers for the voluntary market inherently rely on consumers having access to green power supply options. This report assessed the relative access that U.S. consumers have to a range of voluntary green power supply options across residential, commercial, and industrial consumer segments in each of the 50 U.S. states.

The analysis showed that green power supply options are not uniformly or equally accessible either geographically or across residential, commercial, and industrial consumer segments. Individual state policies play a significant role in providing consumers access to green power supply options. Due to the highly variable state policy landscape, consumer access to green power is also decidedly uneven.

- Approximately 16% of residential and 22% of commercial consumers have access to only one green power supply option (e.g., retail RECs).
- Except for retail RECs, no individual procurement option covers even half of the electricity consumers or half of total U.S. electricity sales in the United States.
- There is still much work to be done in today's market to make green power widely accessible.

The implications of these findings are important. Administrators of national programs that seek to recognize environmental performance based on a voluntary green power use criterion should consider whether specifying a narrow range of eligible green power supply options would either help or hinder market transformation. Since many green power supply options are not widely available regionally or to some consumer segments, narrow eligibility criteria tends to discourage voluntary demand.

The transformative market effect of voluntary demand relies on aggregated voluntary consumer action. Voluntary green power use is still relatively uncommon in today's market, representing only about 3% of total U.S. retail electricity sales.[24] While some consumers have access to more than one green power supply option, many do not have access to supply options that provide cost savings or economic benefits compared to the consumers' standard electricity service offering.

Green power consists of three main attributes: energy benefits, economic benefits, and environmental benefits. The procurement methods outlined in this paper feature different benefits related to energy and economics. As the market continues to expand, consumers will weigh benefits differently. Consumers must gain access to the benefits most important to them through multiple voluntary procurement options to reduce barriers and continue expanding green power access.

[24] U.S. Department of Energy, National Renewable Energy Laboratory, "Status and Trends in the Voluntary Market," 2019.

Appendix A. Approach and Methodology for Green Power Access Analysis

Below are the approaches to assessing the access to green power supply options, including the resources and the assumptions underlying each assessment.

GENERAL ASSUMPTIONS

- The analysis estimates only potential access to green power supply.
- The analysis evaluates policies, mandates, and regulations that permit or limit consumer access to green power.
- The analysis evaluates consumer access to green power based on building type (i.e., residential vs. non-residential) and relative building location within the state, utility, and market contexts.
- The report does not explore economic considerations, incentives, social factors, motivation, and other traits that may influence the decision to purchase green power.
- The report aims to quantify current access to green power options and does not provide any analysis or recommendations for renewable electricity policy or regulatory actions.

RENEWABLE (GREEN) ENERGY TARIFFS (SLEEVED CONTRACTS)

Assessment Approach

- **Step 1:** Identify all states and corresponding utilities with current and pending Renewable (Green) Tariffs.
- **Step 2:** Identify consumer segments and other restrictions (minimum consumer loads, consumer class, program caps, etc.) for all the identified renewable (green) energy tariff programs in Step 1.
- **Step 3a:** Utilize EIA data to evaluate green power access based on States' restrictions (with no electrical size limitations) and corresponding utilities identified in Step 2.
- **Step 3b:** For states with electrical size limitations, utilize the ICF CHP Technical Potential Database to determine the total number of buildings and electricity sales eligible for renewable (green) energy tariffs.
- Total electricity sales in MWhs calculated are limited by program caps for each renewable (green) tariff, though the number of consumers with green power access remains the same.

Assumptions

- Renewable (green) energy tariff contracts in Alabama, Arizona, Iowa, Oklahoma, and Tennessee have not been included in the database since these states do not have renewable tariff policies

and/or were involved in renewable contracts implemented separately between a third-party organization and a utility.

- The ICF CHP Technical Potential Database covers mainly commercial and industrial consumers. Thus the data are provided in terms of buildings rather than individual companies.

Resources

- WRI,[25] NREL,[26] individual utility websites, EIA data, and ICF CHP Technical Potential Database.

UTILITY GREEN PRICING PROGRAMS

Assessment Approach

- **Step 1:** Gather the list of utility green pricing programs from NREL's Utility Green Pricing Programs database.
- **Step 2:** Utilize EIA data to evaluate green power access for each utility providing green pricing programs, as identified in the NREL database discussed in Step 2.

Assumptions

- Utility green pricing programs are assumed to be renewable energy procurement options for the residential sector and commercial sector consumers only.

Resources

- NREL[27,28] and EIA data

COMPETITIVE GREEN POWER MARKETING PRODUCTS

Assessment Approach

- **Step 1:** Identify all restructured states that provide electricity retail choice/direct access tariffs and limitations by consumer segment class.
- **Step 2:** Identify states with more than one retail renewable energy provider to ascertain accessibility to green power across the state.
- **Step 3:** Utilize EIA data to calculate the number of consumers and total electricity sales utilizing the information provided in Step 1 and Step 2.

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[25] Letha Tawney, Priya Barua, and Celine Bonugli, "Emerging Green Tariffs in U.S. Regulated Electricity Markets," World Resources Institute, February 2018.

[26] Eric O'Shaughnessy, Jenny Heeter, Jeff Cook, and Christina Volpi, "Status and Trends in the U.S. Voluntary Green Power Market (2016 Data)," National Renewable Energy Laboratory, October 2017. https://www.nrel.gov/docs/fy18osti/70174.pdf

[27] Eric O'Shaughnessy, "Utility Green Pricing Program List," National Renewable Energy Laboratory, January 2018. https://www.nrel.gov/analysis/green-power.html

[28] Eric O'Shaughnessy, Jenny Heeter, Jeff Cook, and Christina Volpi, "Status and Trends in the U.S. Voluntary Green Power Market (2016 Data)," National Renewable Energy Laboratory, October 2017. https://www.nrel.gov/docs/fy18osti/70174.pdf

Assumptions

- The green power access assessment assumes that all consumers within a restructured state have access to green power if more than one retail renewable energy provider has been identified within the respective state boundaries.
- Evaluating the retail energy providers by specific geographic region within a restructured state to assess the number of consumers with green power access is beyond this task's scope.

Resources

- Green-e certified resources database (CRS),[29] American Coalition of Competitive Energy Suppliers (ACEES),[30] Database of State Incentives for Renewables & Efficiency (DSIRE),[31] individual state utility commissions, NREL,[32] EIA data, and ICF CHP Technical Potential Database.

PHYSICAL POWER PURCHASE AGREEMENTS (PPA)

Assessment Approach

- **Step 1:** Identify all states that allow physical PPAs (authorization of third-party ownership of power resources).
- **Step 2a:** For off-site applications, within states identified in Step 1, utilize the 10 MW wind installation (the lowest PPA by electric size implemented) – with an estimated 25% capacity factor as the threshold criteria to evaluate the accessibility of green power within the large commercial and industrial consumer segments.
- **Step 2b:** Utilize the ICF CHP Technical Potential Database to apply electrical size limitations to determine total number of buildings and electricity sales feasible for physical power purchase agreements. However, the ICF database includes some facilities that self-generate electricity, so each state's total potential is then capped at the reported industrial-scale electricity sales from EIA. This represents the potential electricity sales to large consumers that could be converted to PPAs.
- **Step 3:** For on-site applications, within states identified in Step 1, include all residential and non-residential consumers with measured on-site rooftop solar PV potential as evaluated under the on-site self-generation green power supply options that utilizes the NREL analysis.[33]

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[29] "Find Green-e Certified – Renewable Energy," Green-e, Center for Resource Solutions (CRS), retrieved April 2018. https://www.green-e.org/certified-resources

[30] "State-by-state Information," American Coalition of Competitive Energy Suppliers, retrieved April 2018. http://competitiveenergy.org/consumer-tools/state-by-state-links

[31] "Database of State Incentives for Renewables & Efficiency," a collaboration between the U.S. Department of Energy, the North Carolina Clean Energy Technical Center, and North Carolina State University. https://www.dsireusa.org/

[32] Eric O'Shaughnessy, Jenny Heeter, Jeff Cook, and Christina Volpi, "Status and Trends in the U.S. Voluntary Green Power Market (2016 Data)," National Renewable Energy Laboratory (NREL), October 2017. https://www.nrel.gov/docs/fy18osti/70174.pdf

[33] Pieter Gagnon, Robert Margolis, Jennifer Melius, Caleb Phillips, and Ryan Elmore, "Rooftop Solar Photovoltaic Technical Potential in the United States: A Detailed Assessment," National Renewable Energy Laboratory (NREL), January 2016. https://www.nrel.gov/docs/fy16osti/65298.pdf

- **Step 4:** Combine data from on-site and off-site applications measured in previous steps to evaluate total access to green power through Physical PPA supply option.

Assumptions

- Beyond Scope: Measuring the creditworthiness, financial feasibility, technical limitations, and spatial limitations of an organization to be able to procure green power through physical PPAs.
- Currently not considering corporations with potential for multi-state PPA portfolios due to lack of available data.
- The current analysis represents a snapshot in time and thus is limited by the information available. For instance, in the future, the size of PPAs implemented might decrease further, which will reduce the threshold criteria utilized as a part of this analysis. Furthermore, innovations in aggregating demand could also change the findings.

Resources

- Database of State Incentives for Renewables & Efficiency (DSIRE) – Third-party Solar PPA Policies,[34] NREL,[35] EIA data, and ICF CHP Technical Potential Database.

FINANCIAL PPAs

Assessment Approach

- **Step 1:** All states allow financial contracts (NREL).
- **Step 2:** Within states identified in Step 1, utilize a 10 MW wind installation (the lowest PPA by electric size implemented) with an estimated 25% capacity factor as the threshold criteria to evaluate the accessibility of renewable energy within the large commercial and industrial consumer segments.
- **Step 3:** Utilize the ICF CHP Technical Potential Database to apply electrical size limitations to determine the total number of buildings and electricity sales feasible for financial power purchase agreements. However, the ICF database includes some facilities that self-generate electricity, so each state's total potential is then capped at the reported industrial-scale electricity sales from EIA. This represents the potential electricity sales to large consumers that could be converted to PPAs.

Assumptions

- Beyond Scope: Measuring the creditworthiness, financial feasibility, technical limitations, and spatial limitations of an organization to be able to procure green power through physical PPAs.

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[34] "Database of State Incentives for Renewables & Efficiency', a collaboration between the U.S. Department of Energy," the North Carolina Clean Energy Technical Center, and North Carolina State University. http://ncsolarcen-prod.s3.amazonaws.com/wp-content/uploads/2018/03/DSIRE_3rd-Party-PPA_March_2018.pdf

[35] Eric O'Shaughnessy, Jenny Heeter, Jeff Cook, and Christina Volpi, "Status and Trends in the U.S. Voluntary Green Power Market (2016 Data)," National Renewable Energy Laboratory (NREL), October 2017. https://www.nrel.gov/docs/fy18osti/70174.pdf

- Currently not considering corporations with potential for multi-state PPA portfolios due to lack of available data.
- The current analysis is just a snapshot in time and thus limited by the information available currently. For instance, in the future, the size of PPAs implemented might decrease further, reducing the threshold criteria utilized as part of this analysis.

Resources

- NREL,[36] Database of State Incentives for Renewables & Efficiency (DSIRE),[37] EIA data, and ICF CHP Technical Potential Database.

COMMUNITY SOLAR/SHARED RENEWABLES

Assessment Approach

- **Step 1:** Identify states that currently have policies that promote community solar/shared renewables projects.
- **Step 2:** Identify limitations within each community solar/shared renewable projects, including based on policies in states identified in Step 1, with regards to:
    - Renewable Energy ownership (e.g., REC ownership)
    - Consumer class and electricity sale size
    - Minimum/maximum number of participants
- **Step 3:** Utilize EIA data to calculate renewable energy access by the number of consumers and electricity sales based on the limitations identified.
    - Ratios of residential to commercial consumers by each state were utilized along with solar irradiance and program caps specific to each state to calculate renewable energy access.

Assumptions

- States without legal policies that enable community solar/shared renewable projects have not been considered for the Consumer Access to Green Power Supply assessment.
- Consumers are assumed to have renewable energy ownership in states with community solar policies that do not provide explicit clarification on renewable energy ownership or states where the renewable energy ownership can vary by project.
- Both residential and non-residential consumer segments are assumed to have access to participation in community solar programs unless specified by the individual community solar policy in the state.

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[36] Ibid.

[37] "Database of State Incentives for Renewables & Efficiency," a collaboration between the U.S. Department of Energy, the North Carolina Clean Energy Technical Center, and North Carolina State University. https://www.dsireusa.org/

Resources

- NREL,[38] Solar Energy Industries Association (SEIA),[39] Shared Renewables website,[40] and EIA data.

COMMUNITY CHOICE AGGREGATION (CCA)

Assessment Approach

- **Step 1:** Identify the states that have mandatory CCA policies – 7 states only. Within the states, identify regions/counties that have access to and/or are currently pursuing CCA programs.
- **Step 2:** Utilize the data available from "Status and Trends from Voluntary Green Power Markets (2016)" report to estimate the number of consumers and total electricity sales (MWh) with green power access via community choice aggregation.
    - Since all the identified CCA programs are opt-out, it is assumed that the total number of consumers enrolled in CCA programs are equal to the total number of consumers with CCA access.

Assumptions

- States without legal policies that enable community choice aggregation have not been considered for the Consumers Access to Green Power Supply Assessment.
- Measuring the number of consumers who opted out of a CCA program (or the consumers with access to renewabel energy through CCA but not utilizing the option) is beyond the scope of this analysis.

Resources

- NREL,[41] Local Energy Aggregation Network (LEAN),[42] and EIA data.

ON-SITE GENERATION

Assessment Approach

- **Step 1:** Utilize NREL study on total solar potential by each state and building size to host on-site generation as reference for total green power access for consumers in residential and non-residential.
- **Step 2:** Utilize EIA data to apply the percentage of buildings, total number of consumers, and total electricity sales that can be generated using solar by consumers.

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[38] Jeffrey J. Cook and Monisha Shah, "Focusing the Sun: State Considerations for Designing Community Solar Policy," National Renewable Energy Laboratory (NREL), January 2018. https://www.nrel.gov/docs/fy18osti/70663.pdf

[39] "Community Solar," Solar Energy Industries Association (SEIA), retrieved April 2018. https://www.seia.org/initiatives/community-solar

[40] "USA Shared Energy Map," Shared Renewables HQ, retrieved April 2018.

[41] Eric O'Shaughnessy, Jenny Heeter, Jeff Cook, and Christina Volpi, "Status and Trends in the U.S. Voluntary Green Power Market (2016 Data)", National Renewable Energy Laboratory (NREL), October 2017. https://www.nrel.gov/docs/fy18osti/70174.pdf

[42] "CCA by State," Local Energy Aggregation Network (LEAN), retrieved April 2018. http://www.leanenergyus.org/cca-by-state

Assumptions

- Solar is used as a proxy to estimate the total green power potential.
- Identifying states that allow on-site generation of green power and identifying restrictions based on generation size, location, etc., is beyond the scope of this study.
- Percentage of small buildings (< 5000 sq. ft.) with solar potential is used to estimate potential green power generation at the residential level.
- Percentage of medium and large buildings (>5000 sq. ft.) is used to estimate potential green power energy generation at the non-residential level.

Resources

- NREL,[43] IPOPScience,[44] and EIA data.

[43] Pieter Gagnon, Robert Margolis, Jennifer Melius, Caleb Phillips, and Ryan Elmore, "Rooftop Solar Photovoltaic Technical Potential in the United States: A Detailed Assessment," National Renewable Energy Laboratory (NREL), January 2016. https://www.nrel.gov/docs/fy16osti/65298.pdf

[44] Pieter Gagnon et al., "Estimating rooftop solar technical potential across the US using a combination of GIS-based methods, lidar data, and statistical modeling", 2018 Environ. Res. Lett. 13 024027. http://iopscience.iop.org/article/10.1088/1748-9326/aaa554/pdf

EFFECT OF ASSUMPTIONS ON ESTIMATES FOR GREEN POWER ACCESS

Some of the assumptions made in assessing consumer access to green power may have led to overestimating the potential, while other assumptions may have led to under-estimating the potential, in terms of the number of consumers, the total electricity consumption, or both of these metrics. Table A.1 summarizes the primary assumptions made for each green power procurement option and whether these assumptions are believed to over or underestimate the potential access to green power.

Table A.1: Assumptions Made and Estimated Impact on Green Power Access Results

Impact of Assumptions on Green Power Access Assessment Results			
Green Power Supply Option	**Key Assumption**	**Potential Impact on Assessment Results**	**Additional Notes**
Utility Green Pricing Programs	Assumes only residential and commercial customers of utilities have access to green pricing programs.	Underestimate	Utility green pricing programs are typically offered to residential and commercial customers, but some utilities may offer this supply option to industrial customers, which could increase the total green power access results.
Competitive Green Marketing Products	Assumes that all consumers within a restructured state have access to green power if more than one retail green power provider has been identified within the respective state boundaries.	Overestimate	Though more than one competitive retail green power supplier may be identified in a particular state, many of these suppliers may serve limited geographical areas or consumer segments (e.g., large accounts) in any specific state and may increase the total green power access results.
Community Choice Aggregation (CCA)	2016 NREL data used for analysis due to lack of other credible and updated information.	Underestimate	CCA assessment reflects a snapshot in time of the total green power access, as of 2016, underestimating the total consumer access in the subsequent year of 2017.
Physical Power Purchase Agreements	Beyond Scope: Measuring the creditworthiness, financial feasibility, technical limitations, and spatial limitations of an organization to be able to procure green power through physical PPAs.	Overestimate	Typically, financial feasibility and creditworthiness play a key role in entering a PPA agreement. Thus the assessment overestimates the total access to green power through physical PPA.

Impact of Assumptions on Green Power Access Assessment Results			
Green Power Supply Option	**Key Assumption**	**Potential Impact on Assessment Results**	**Additional Notes**
	Assessment does not account for consumer load aggregation. A single PPA can be entered by a single consumer for a portfolio of buildings spread across multiple regions.	Underestimate	While a portfolio of buildings may be part of large commercial establishments, this assumption (due to a lack of credible data resources) underestimates total consumer access to the physical PPA supply option, both in terms of the amount of retail sales and the total number of consumers.
	The smallest known off-site PPA – a 10 MW wind energy contract as of March 2018 – was used as a proxy to estimate potential suitability to large commercial and industrial consumers to execute a physical PPA.	Underestimate	Since the analysis represents a snapshot in time, smaller PPA contracts may be executed from the time of this analysis, opening up a larger set-off for companies that may access green power through PPA contracts.
Financial Power Purchase Agreement	Beyond Scope: Measuring the creditworthiness, financial feasibility, technical limitations, and spatial limitations of an organization to be able to procure renewable energy through financial PPAs.	Overestimate	Typically, financial feasibility and creditworthiness play a key role in entering a PPA agreement. Thus the assessment overestimates the total access to green power through financial PPA.
	Assessment does not account for consumer load aggregation. A single PPA can be entered by a single consumer for a portfolio of buildings spread across multiple regions.	Underestimate	While a portfolio of buildings may be part of large commercial establishments, this assumption (due to a lack of credible data resources) underestimates total consumer access to the financial PPA supply option, both in terms of the amount of retail sales and the total number of consumers.
	The smallest known off-site PPA – a 10 MW wind energy contract as of March 2018 – was used as a proxy to estimate potential suitability to large commercial and industrial consumers to execute a financial PPA.	Underestimate	Since the analysis represents a snapshot in time, smaller PPA contracts may be executed from the time of this analysis, opening up a larger set-off for companies that may access green power through PPA contracts.

Impact of Assumptions on Green Power Access Assessment Results			
Green Power Supply Option	**Key Assumption**	**Potential Impact on Assessment Results**	**Additional Notes**
	Limiting the option to off-site non-residential consumers.	Negligible	Though unlikely, residential consumers could feasibly enter into a financial PPA agreement.
Renewable (Green) Energy Tariffs	States without official renewable tariff policies and separately negotiated renewable tariffs (between utility and third-party) have not been included.	Underestimate	Renewable energy tariff contracts in Alabama, Arizona, Iowa, Oklahoma, and Tennessee[45] have not been included in the assessment since these states do not have renewable tariff policies or involve renewable contracts implemented independently between a third-party organization and utility.
	Overall green power caps and individual limits to accessing renewable tariff programs are not assessed.	Overestimate	The analysis to evaluate renewable tariff access by program cap or individual limits was beyond the scope of this effort, and as such overestimates the total access to renewable tariff supply option.
Community Solar/ Shared Renewables	States without legal policies that enable community solar/shared renewable projects have not been considered for the Consumer Access to Green Power Supply assessment.	Underestimate	Measuring accessibility to community solar/shared renewables in states without legal policies can be inaccurate due to lack of information on ownership of RECs associated with the community solar programs, which may vary across each project. This assumption (due to lack of data on legal regulations) may underestimate total green power access.
	Consumers are assumed to have REC ownership in states with community solar policies that do not provide explicit clarification on REC ownership or in states where the REC ownership can vary by project.	Overestimate	While consumers could potentially receive the RECs, in practice, most are not likely to receive either through lack of awareness or based on developer interests to improve the economic opportunity for subscribers by avoiding the cost of REC purchase. Thus the potential consumer access to RECs may be overestimated, as the ownership of RECs might be determined by the transactions/contracts of each community solar/shared renewables project.

[45] Letha Tawney, Priya Barua and Celine Bonugli, "Emerging Green Tariffs in U.S. Regulated Electricity Markets," World Resources Institute, February 2018.

Impact of Assumptions on Green Power Access Assessment Results			
Green Power Supply Option	**Key Assumption**	**Potential Impact on Assessment Results**	**Additional Notes**
	Both residential and non-residential consumer segments are assumed to have access to participate in community solar programs unless specified by the individual community solar policy in the state.	Overestimate	May overestimate the total access to green power.
On-site Generation	Only rooftop solar PV potential was considered.	Underestimate	The results might underestimate the ability to generate green power through other green power resources. Though typically limited, the assessment underestimates the potential to generate RECs on privately owned land suitable for solar power generation.
	The analysis did not include local and state limitations related to net-metering caps.	Overestimate	Net-metering limits the economic and interconnection limits to renewable energy generation on-site but not the ability to generate renewable energy for self-consumption, thereby accessing RECs. Since economic incentives play a role in self-financed green power generation, this assumption might overestimate the total accessibility to green power.

EVALUATING STATEWIDE AGGREGATE GREEN POWER ACCESS

The green power access assessment evaluated the aggregate green power access for each state by the number of consumers and total electricity sales from each green power access option available in each state. Below is the approach utilized to account for the overlap in green power access by consumers and total electricity sales.

As described earlier, retail RECs are a valid green power procurement option available to all consumers across the United States without restrictions. Thus, retail RECs are assumed to be the default option for consumers who do not have access to various greenpower procurement options discussed in this analysis.

Assessment Approach

- **Step 1:** Identify green power access options available in each state by residential and non-residential consumer segments in each state and corresponding limitations in electricity sales.
- **Step 2:** Identify overlap by consumers and electricity sales in states with multiple green power access options to estimate aggregate green power access.
    - For instance, some residential consumers in Illinois have green power access to Utility Green Pricing programs, Shared Community Solar, Community Choice Aggregation, and Competitive Retail Choice.
- **Step 3:** Utilize EIA and the ICF CHP Technical Potential Database (to apply the percentage of buildings) to estimate the total aggregate green power access by consumers and electricity sales in each state by consumer segment (excluding on-site generation potential).
- **Step 4a:** For all states with less than 100% green power access estimated in Step 3, the on-site generation potential is multiplied with the difference between total state electricity sales and total electricity sales with green power access (evaluated in Step 3).
    - Residential on-site generation potential is applied to the residential consumer segment and similarly to the non-residential consumer segment.
- **Step 4b:** The value calculated in Step 4a is added to the value estimated in Step 3 to calculate the total green power access by state from the various green power procurement options discussed in this analysis.
- **Step 5:** Estimate the percentage of aggregate green power access by state by comparing with total consumers and electricity sales data from EIA (2016).

Assumptions

- Since the EIA data (utility data) and the ICF CHP Technical Potential Database (site-by-site electricity load data) are not interchangeable, in cases where the aggregate green power access analysis has conflict in the source data (EIA vs. ICF CHP Technical Potential Database), EIA data was preferred and utilized.

Thus, for some states data calculated in Step 3, the ICF CHP Technical Potential Database is replaced with the corresponding state's EIA data.

Appendix B. Percentage of Consumers With Access to Voluntary Green Power* and Potential Consumption by State

Table B.1: Percentage of States' Consumers With Access to Green Power Supply Options*

State	Green Power Supply Options																	
	Utility Green Pricing Programs		Competitive Green Marketing Products		Community Choice Aggregation		Physical Power Purchase Agreements		Financial Power Purchase Agreements		Renewable Energy (Green) Tariffs		Community Solar/Shared Renewables		On-site Self Generation		Total *At least one option available*	
	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res
Alabama	88%	84%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	19%	11%	90%	87%
Alaska	14%	13%	0%	0%	0%	0%	0%	0%	0%	2%	0%	0%	0%	0%	0%	0%	14%	14%
Arizona	74%	71%	0%	0%	0%	0%	32%	4%	0%	1%	0%	0%	0%	0%	32%	3%	82%	72%
Arkansas	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	23%	11%	23%	12%
California	51%	45%	0%	100%	4%	4%	44%	32%	0%	1%	0%	0%	100%	0%	44%	31%	100%	100%
Colorado	78%	77%	0%	0%	0%	0%	27%	18%	0%	1%	55%	57%	0%	0%	27%	17%	84%	81%
Connecticut	0%	0%	94%	88%	0%	0%	28%	24%	0%	2%	0%	0%	100%	98%	28%	22%	100%	100%
Delaware	0%	0%	86%	79%	0%	0%	22%	11%	0%	2%	0%	0%	100%	98%	22%	9%	100%	99%

State	Green Power Supply Options																	
	Utility Green Pricing Programs		Competitive Green Marketing Products		Community Choice Aggregation		Physical Power Purchase Agreements		Financial Power Purchase Agreements		Renewable Energy (Green) Tariffs		Community Solar/Shared Renewables		On-site Self Generation		Total *At least one option available*	
	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res
District of Columbia	0%	0%	100%	100%	0%	0%	4%	11%	0%	0%	0%	0%	100%	100%	4%	11%	100%	100%
Florida	8%	8%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	30%	16%	36%	23%
Georgia	94%	88%	0%	0%	0%	0%	22%	14%	0%	1%	0%	0%	0%	0%	22%	12%	95%	90%
Hawaii	63%	54%	0%	0%	0%	0%	0%	1%	0%	1%	0%	0%	100%	99%	0%	0%	100%	99%
Idaho	87%	70%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	22%	4%	90%	72%
Illinois	2%	3%	84%	81%	56%	56%	24%	14%	0%	1%	0%	0%	100%	99%	24%	13%	100%	99%
Indiana	62%	61%	0%	0%	0%	0%	0%	0%	0%	2%	0%	0%	0%	0%	20%	9%	70%	65%
Iowa	81%	80%	0%	0%	0%	0%	25%	12%	0%	2%	0%	0%	0%	0%	25%	11%	86%	83%
Kansas	27%	20%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	27%	14%	47%	32%
Kentucky	76%	71%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	16%	9%	80%	74%
Louisiana	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	18%	12%	18%	13%
Maine	0%	0%	96%	93%	0%	0%	40%	22%	0%	2%	0%	0%	100%	97%	40%	20%	100%	100%

State	Green Power Supply Options																	
	Utility Green Pricing Programs		Competitive Green Marketing Products		Community Choice Aggregation		Physical Power Purchase Agreements		Financial Power Purchase Agreements		Renewable Energy (Green) Tariffs		Community Solar/Shared Renewables		On-site Self Generation		Total *At least one option available*	
	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res
Maryland	0%	0%	99%	97%	0%	0%	21%	20%	0%	2%	0%	0%	0%	0%	21%	17%	99%	98%
Massachusetts	2%	2%	82%	80%	33%	33%	26%	24%	0%	2%	0%	0%	0%	0%	26%	22%	88%	73%
Michigan	87%	84%	83%	79%	0%	0%	31%	16%	0%	1%	0%	0%	0%	0%	31%	15%	91%	87%
Minnesota	78%	69%	0%	0%	0%	0%	0%	0%	0%	2%	48%	47%	100%	97%	23%	15%	83%	74%
Mississippi	24%	30%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	21%	11%	39%	38%
Missouri	44%	43%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	28%	15%	60%	52%
Montana	79%	73%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	27%	1%	85%	74%
Nebraska	40%	22%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	20%	14%	52%	34%
Nevada	70%	65%	0%	0%	0%	0%	22%	19%	0%	1%	0%	94%	0%	0%	22%	18%	77%	72%
New Hampshire	0%	0%	99%	99%	0%	0%	32%	23%	0%	2%	0%	0%	100%	97%	32%	21%	100%	100%
New Jersey	0%	0%	98%	98%	0%	0%	25%	17%	0%	2%	0%	0%	100%	98%	25%	16%	100%	100%
New Mexico	89%	83%	0%	0%	0%	0%	33%	12%	0%	1%	0%	0%	0%	0%	33%	11%	93%	85%
New York	0%	0%	81%	83%	2%	2%	25%	13%	0%	0%	0%	0%	100%	100%	25%	13%	100%	100%

State	Green Power Supply Options																	
	Utility Green Pricing Programs		Competitive Green Marketing Products		Community Choice Aggregation		Physical Power Purchase Agreements		Financial Power Purchase Agreements		Renewable Energy (Green) Tariffs		Community Solar/Shared Renewables		On-site Self Generation		Total *At least one option available*	
	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res
North Carolina	67%	59%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	100%	99%	24%	11%	100%	99%
North Dakota	21%	12%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	18%	6%	36%	19%
Ohio	14%	13%	77%	74%	4%	4%	23%	15%	0%	3%	0%	0%	0%	0%	23%	12%	84%	79%
Oklahoma	83%	77%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	27%	17%	88%	81%
Oregon	91%	82%	0%	72%	0%	0%	23%	12%	0%	1%	0%	42%	100%	90%	23%	11%	100%	96%
Pennsylvania	0%	0%	94%	95%	0%	0%	23%	14%	0%	2%	0%	0%	0%	0%	23%	11%	95%	95%
Rhode Island	0%	0%	99%	98%	0%	0%	31%	28%	0%	2%	0%	0%	100%	97%	31%	25%	100%	100%
South Carolina	55%	54%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	19%	7%	63%	58%
South Dakota	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	30%	9%	30%	11%
Tennessee	97%	96%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	22%	10%	98%	97%
Texas	6%	5%	100%	100%	0%	0%	22%	14%	0%	1%	0%	0%	0%	0%	22%	13%	100%	100%
Utah	83%	76%	0%	0%	0%	0%	25%	11%	0%	2%	0%	0%	0%	0%	25%	9%	87%	79%
Vermont	72%	76%	0%	0%	0%	0%	40%	20%	0%	0%	0%	0%	100%	100%	40%	20%	100%	100%

State	Green Power Supply Options																	
	Utility Green Pricing Programs		Competitive Green Marketing Products		Community Choice Aggregation		Physical Power Purchase Agreements		Financial Power Purchase Agreements		Renewable Energy (Green) Tariffs		Community Solar/Shared Renewables		On-site Self Generation		Total *At least one option available*	
	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res
Virginia	65%	60%	78%	77%	0%	0%	21%	13%	0%	1%	0%	59%	100%	99%	21%	12%	100%	80%
Washington	90%	83%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	100%	93%	18%	9%	100%	94%
West Virginia	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	17%	6%	17%	7%
Wisconsin	88%	86%	0%	0%	0%	0%	0%	0%	0%	1%	0%	6%	0%	0%	28%	13%	91%	88%
Wyoming	54%	48%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	13%	2%	60%	49%
Total U.S.	**43%**	**42%**	**32%**	**39%**	**2%**	**2%**	**17%**	**10%**	**0%**	**1%**	**2%**	**5%**	**41%**	**29%**	**26%**	**14%**	**84%**	**78%**

**Voluntary green power by definition means that the supply option gives REC ownership to the consumer and ensures that the use of green power goes above and beyond what would have otherwise occurred absent voluntary procurement and goes beyond regulatory requirements.*

[1] Not including retail RECs.

[2] Hawaii and Alaska were not evaluated for on-site self-generation as data was available only for the continental U.S.

Table B.2: Percentage of States' Total Electricity Consumption Covered by Different Voluntary Green Power Supply Options*

State	Green Power Supply Options																	
	Utility Green Pricing Programs		Competitive Green Marketing Products		Community Choice Aggregation		Physical Power Purchase Agreements		Financial Power Purchase Agreements		Renewable Energy (Green) Tariffs		Community Solar/Shared Renewables		On-site Self Generation		Total *At least one option available*	
	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res
Alabama	89%	37%	0%	0%	0%	0%	0%	0%	0%	56%	0%	0%	0%	0%	19%	11%	91%	82%
Alaska	14%	3%	0%	0%	0%	0%	0%	0%	0%	34%	0%	0%	0%	0%	0%	0%	14%	68%
Arizona	79%	55%	0%	0%	0%	0%	32%	36%	0%	33%	0%	0%	0%	0%	32%	3%	86%	80%
Arkansas	0%	0%	0%	0%	0%	0%	0%	0%	0%	57%	0%	0%	0%	0%	23%	11%	23%	68%
California	53%	41%	0%	100%	1%	1%	44%	59%	0%	28%	0%	0%	1%	0%	44%	31%	73%	100%
Colorado	77%	48%	0%	0%	0%	0%	27%	59%	0%	42%	0%	0%	0%	0%	27%	17%	83%	81%
Connecticut	0%	0%	94%	65%	0%	0%	28%	43%	0%	21%	0%	0%	0%	0%	28%	22%	95%	73%
Delaware	0%	0%	87%	47%	0%	0%	22%	45%	0%	36%	0%	0%	0%	0%	22%	9%	56%	52%
District of Columbia	0%	0%	100%	100%	0%	0%	4%	11%	0%	0%	0%	0%	100%	100%	4%	11%	100%	100%
Florida	8%	8%	0%	0%	0%	0%	0%	0%	0%	15%	0%	0%	0%	0%	30%	16%	36%	62%
Georgia	95%	53%	0%	49%	0%	0%	22%	53%	0%	40%	0%	0%	0%	0%	22%	12%	96%	89%

State	Green Power Supply Options																	
	Utility Green Pricing Programs		Competitive Green Marketing Products		Community Choice Aggregation		Physical Power Purchase Agreements		Financial Power Purchase Agreements		Renewable Energy (Green) Tariffs		Community Solar/Shared Renewables		On-site Self Generation		Total *At least one option available*	
	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res
Hawaii	63%	32%	0%	0%	0%	0%	0%	55%	0%	55%	0%	0%	100%	45%	0%	0%	63%	61%
Idaho	86%	37%	0%	0%	0%	0%	0%	0%	0%	43%	0%	0%	0%	0%	22%	4%	89%	68%
Illinois	3%	4%	78%	62%	11%	11%	24%	39%	0%	26%	0%	0%	100%	74%	24%	13%	100%	90%
Indiana	62%	21%	0%	0%	0%	0%	0%	0%	0%	66%	0%	0%	0%	0%	20%	9%	69%	88%
Iowa	78%	29%	0%	0%	0%	0%	25%	66%	0%	55%	0%	0%	0%	0%	25%	11%	84%	74%
Kansas	26%	16%	0%	0%	0%	0%	0%	0%	0%	42%	0%	0%	0%	0%	27%	14%	46%	64%
Kentucky	76%	31%	0%	0%	0%	0%	0%	0%	0%	59%	0%	5%	0%	0%	16%	9%	80%	91%
Louisiana	0%	0%	0%	0%	0%	0%	0%	0%	0%	59%	0%	0%	0%	0%	18%	12%	18%	64%
Maine	0%	0%	96%	92%	0%	0%	40%	32%	0%	12%	0%	0%	100%	88%	40%	20%	100%	97%
Maryland	0%	0%	99%	96%	0%	0%	21%	23%	0%	6%	0%	0%	0%	0%	21%	17%	99%	97%
Massachusetts	3%	4%	78%	52%	2%	2%	26%	54%	0%	33%	0%	0%	0%	0%	26%	22%	86%	63%
Michigan	87%	52%	84%	81%	0%	0%	31%	57%	0%	42%	0%	23%	0%	0%	31%	15%	91%	86%

State	Green Power Supply Options																	
	Utility Green Pricing Programs		Competitive Green Marketing Products		Community Choice Aggregation		Physical Power Purchase Agreements		Financial Power Purchase Agreements		Renewable Energy (Green) Tariffs		Community Solar/Shared Renewables		On-site Self Generation		Total *At least one option available*	
	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res
Minnesota	77%	41%	0%	0%	0%	0%	0%	0%	0%	47%	40%	0%	6%	3%	23%	15%	82%	89%
Mississippi	24%	11%	0%	0%	0%	0%	0%	0%	0%	53%	0%	0%	0%	0%	21%	11%	40%	68%
Missouri	46%	35%	0%	0%	0%	0%	0%	0%	0%	31%	0%	1%	0%	0%	28%	15%	61%	71%
Montana	75%	58%	0%	0%	0%	0%	0%	0%	0%	28%	0%	0%	0%	0%	27%	1%	82%	86%
Nebraska	38%	18%	0%	0%	0%	0%	0%	0%	0%	48%	0%	3%	0%	0%	20%	14%	51%	64%
Nevada	76%	24%	0%	0%	0%	0%	22%	66%	0%	48%	0%	1%	0%	0%	22%	18%	81%	51%
New Hampshire	0%	0%	99%	98%	0%	0%	32%	33%	0%	12%	0%	0%	100%	88%	32%	21%	100%	99%
New Jersey	0%	0%	98%	96%	0%	0%	25%	25%	0%	10%	0%	0%	100%	90%	25%	16%	100%	98%
New Mexico	96%	53%	0%	0%	0%	0%	33%	57%	0%	46%	0%	0%	0%	0%	33%	11%	97%	97%
New York	0%	0%	74%	63%	0%	0%	25%	21%	0%	9%	0%	0%	100%	91%	25%	13%	100%	97%
North Carolina	68%	50%	0%	0%	0%	0%	0%	0%	0%	35%	0%	1%	0%	0%	24%	11%	75%	88%
North Dakota	26%	4%	0%	0%	0%	0%	0%	0%	0%	29%	0%	0%	0%	0%	18%	6%	40%	35%

State	Green Power Supply Options																	
	Utility Green Pricing Programs		Competitive Green Marketing Products		Community Choice Aggregation		Physical Power Purchase Agreements		Financial Power Purchase Agreements		Renewable Energy (Green) Tariffs		Community Solar/Shared Renewables		On-site Self Generation		Total *At least one option available*	
	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res
Ohio	14%	8%	75%	47%	1%	1%	23%	58%	0%	46%	0%	0%	0%	0%	23%	12%	82%	73%
Oklahoma	83%	47%	0%	0%	0%	0%	0%	0%	0%	41%	0%	0%	0%	0%	27%	17%	88%	78%
Oregon	89%	54%	0%	65%	0%	0%	23%	54%	0%	43%	0%	2%	100%	57%	23%	11%	100%	90%
Pennsylvania	0%	0%	94%	88%	0%	0%	23%	30%	0%	19%	0%	0%	0%	0%	23%	11%	95%	90%
Rhode Island	0%	0%	99%	97%	0%	0%	31%	37%	0%	11%	0%	0%	1%	1%	31%	25%	99%	98%
South Carolina	57%	21%	0%	0%	0%	0%	0%	0%	0%	55%	0%	0%	0%	0%	19%	7%	65%	84%
South Dakota	0%	0%	0%	0%	0%	0%	0%	0%	0%	38%	0%	0%	0%	0%	30%	9%	30%	49%
Tennessee	97%	57%	0%	0%	0%	0%	0%	0%	0%	40%	0%	0%	0%	0%	22%	10%	98%	93%
Texas	6%	3%	100%	100%	0%	0%	22%	56%	0%	43%	0%	0%	0%	0%	22%	13%	100%	100%
Utah	84%	47%	0%	0%	0%	0%	25%	54%	0%	45%	0%	33%	0%	0%	25%	9%	88%	82%
Vermont	75%	45%	0%	0%	0%	0%	40%	62%	0%	42%	0%	0%	100%	58%	40%	20%	100%	100%
Virginia	64%	61%	77%	86%	0%	0%	21%	38%	0%	26%	0%	61%	0%	0%	21%	12%	82%	94%

State	Green Power Supply Options																	
	Utility Green Pricing Programs		Competitive Green Marketing Products		Community Choice Aggregation		Physical Power Purchase Agreements		Financial Power Purchase Agreements		Renewable Energy (Green) Tariffs		Community Solar/Shared Renewables		On-site Self Generation		Total *At least one option available*	
	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res
Washington	87%	47%	0%	0%	0%	0%	0%	0%	0%	45%	0%	0%	100%	55%	18%	9%	100%	96%
West Virginia	0%	0%	0%	0%	0%	0%	0%	0%	0%	53%	0%	0%	0%	0%	17%	6%	17%	56%
Wisconsin	88%	45%	0%	0%	0%	0%	0%	0%	0%	50%	0%	0%	0%	0%	28%	13%	92%	52%
Wyoming	56%	12%	0%	0%	0%	0%	0%	0%	0%	51%	0%	2%	0%	0%	13%	2%	62%	16%
Total U.S.	**43%**	**29%**	**30%**	**34%**	**0%**	**0%**	**14%**	**26%**	**0%**	**41%**	**1%**	**4%**	**12%**	**6%**	**25%**	**13%**	**78%**	**85%**

**Voluntary green power by definition means that the supply option gives REC ownership to the consumer and ensures that the use of green power goes above and beyond what would have otherwise occurred absent voluntary procurement and goes beyond regulatory requirements.*

[1] *Not including retail RECs.*

[2] *Hawaii and Alaska were not evaluated for on-site self-generation as data was available only for the continental U.S.*