



## Renewable Energy Certificate (REC) Arbitrage

REC arbitrage (also referred to as a REC swap) is a procurement strategy used by electricity consumers to simultaneously meet two objectives: 1) decrease the cost of their renewable electricity use and 2) substantiate renewable electricity use and carbon footprint reduction claims. The strategy is used by consumers installing self-financed renewable electricity projects or consumers who purchase renewable electricity directly from a renewable electricity project, such as through a power purchase agreement (PPA).

### What is REC Arbitrage?

Arbitrage is the near-simultaneous buying and selling of commodities in different markets in order to take advantage of differing prices for the same or similar assets. REC arbitrage occurs when RECs from one renewable electricity project are sold and replaced by less expensive RECs from another renewable electricity project.

A prerequisite of REC arbitrage is that there are differences in REC prices. In the United States, RECs vary in price because while all RECs represent one megawatt-hour (MWh) of renewable electricity, each REC embodies the specific characteristics as to where, when, and what renewable resource produced that particular REC. The specific characteristics embodied in each REC lead to uneven market supply and demand for differing RECs, which in turn results in differences in prices. For example, if consumers prefer wind RECs over landfill gas RECs, then the additional demand for wind RECs will lead to higher prices compared to landfill gas RECs, all else equal.

State renewable portfolio standard (RPS) policies are a major demand driver for RECs and consequently impact REC prices. In general, state RPS policies create demand for RECs by requiring utilities to generate or purchase an increasing number of RECs annually to demonstrate increasing delivery of renewable electricity to their customers. RPS policies also define which RECs are eligible to meet that demand by defining the project types and geographic locations from which utilities must source RECs to use towards compliance. States' distinct RPS eligibility and compliance requirements create distinct state compliance markets with different REC prices (see Figure 1). RPSs may also have special provisions targeting specific resources that further magnify the price differences between RECs meeting the provision's eligibility requirement and those that do not. One common special provision of state RPSs are "solar carveout"

### What is a REC?

A **REC** is a tradeable, market-based instrument that represents the legal property rights to the "renewableness"—or all non-power attributes—of renewable electricity generation.

A REC is issued for every megawatt-hour (MWh) of electricity generated and delivered to the electric grid from a renewable energy resource.

The REC owner has exclusive rights to make claims about "using" or "being powered with" the renewable electricity associated with that REC and thus avoid the double counting of the same generation attributes by another party.

RECs are the instrument used to substantiate the use of renewable electricity for both voluntary and compliance purposes. For voluntary purposes, consumers such as residential households and businesses use RECs to demonstrate claims of using renewable electricity. For compliance purposes, RECs are used to track that utilities are meeting their state-imposed mandates.

policies that require utilities to generate or purchase RECs from in-state or in-region solar facilities. Solar carveouts are the main mechanism that drives up the price of solar RECs (SRECs) and create significant price differentials between various types of RECs. Since RECs are also used to demonstrate voluntary delivery and use of renewable energy in the United States, demand by state compliance can affect REC prices in the voluntary market, albeit for RECs from specific resources and locations.

The larger the price differences between RECs, the more opportunities exist for consumers to engage in REC arbitrage. Renewable electricity project owners in states with RECs that are higher-priced due to high RPS demand and low supply have an incentive to sell their project RECs and buy lower-priced replacement RECs to cover their renewable electricity claims. REC arbitrage, consequently, is most frequently undertaken when projects are located in states with RPS policies. As of February 2017, [29 states and the District of Columbia](#) have an RPS and [22 states](#) have an RPS that has provisions targeting specific renewable energy resources, most commonly solar carveouts.

## Why REC Arbitrage?

REC arbitrage offers consumers in markets with high REC prices a means to simultaneously achieve two competing objectives: (1) improve the economics of their renewable electricity procurement, and (2) substantiate renewable electricity use and carbon footprint reduction claims.

The consumer improves the economics of their renewable electricity procurement by replacing the higher cost project RECs with lower cost replacement RECs from another source. REC arbitrage allows the monetization of the attributes of the renewable electricity generated (which is often necessary to make the project financially feasible) while still enabling the consumer to claim to be using renewable electricity based on the less expensive replacement RECs. A procurement with a third-party can be structured to have the project RECs contractually retained by the project developer and thereby reduce the cost to the consumer for their electricity, since the developer is able to use the project RECs as another source of revenue. By purchasing replacement RECs, consumers can characterize their power as renewable or make renewable electricity use claims based on the renewable electricity attributes of the replacement RECs. Being able to arbitrage RECs enables consumers in markets with high REC prices to improve project economics and make renewable electricity claims, which is outlined in Table 1 below.

*Table 1. Economic and Claim-based Tradeoffs of Non-arbitrage and Arbitrage Scenarios*

	Improves economics of electricity procurement	Enables electricity consumer to substantiate renewable electricity “use” claims
<b>Project REC retained by developer (No arbitrage)</b>	Yes (by the amount of the REC price)	No
<b>Project REC retained by electricity consumer (No arbitrage)</b>	No	Yes (using the project RECs)
<b>REC arbitrage</b>	Yes (by the difference between the project REC price and the replacement REC price)	Yes (using the replacement RECs)

## REC Arbitrage Impact on Claims

REC arbitrage affects the types of renewable electricity use and environmental claims a consumer can make. A REC conveys to its owner the rights to the specific environmental attributes of that REC and all associated claims regarding the delivery and “use” of that specific renewable electricity. Consequently, under a REC arbitrage scenario a consumer’s claims about renewable electricity use must align with the attributes of the replacement REC it owns, and not with the RECs associated with their project. Any claim or public statement by a consumer engaged in REC arbitrage about their use of renewable electricity should avoid giving the impression that they are using the renewable electricity associated with the project. The claim should be specific to the replacement RECs. For example, if a consumer is arbitraging solar RECs from their onsite solar system with replacement wind RECs, any claim should clearly convey that the renewables the consumer is using are sourced from wind or more generally a renewable resource.

To illustrate, let’s examine the following example: *“Our facility is home to an onsite solar array. We are using renewable electricity.”* Both sentences are technically correct, however, the overall claim by is deceptive since it gives the impression that the consumer is using solar electricity, when they are in fact using wind electricity as a result of REC arbitrage. As a best practice, consumers should clearly qualify any statement about their renewable electricity use to ensure stakeholders fully understand their renewable electricity arrangement. For more information on how to make accurate claims regarding your renewable electricity use refer to Green Power Partnership’s [Guide to Making Claims about Your Solar Power Use](#) document.

## Arbitrage Impacts on GHG Emissions Accounting

Organizational consumers undertaking a greenhouse gas (GHG) inventory that have engaged in a REC arbitrage should calculate their emissions using the replacement RECs, not the original project RECs. For more information on GHG emissions accounting, please visit World Resource Institute’s [GHG Protocol Scope 2 Guidance](#).

## Who Should Consider REC Arbitrage?

REC arbitrage is a good option for electricity consumers in markets with high REC prices interested in installing self-financed renewable energy generation systems as well as electricity consumers who purchase directly from a renewable energy project, such as through a power purchase agreement (PPA). An electricity consumer considering these electricity procurement options should also consider REC arbitrage:

- Anytime the economics of the renewable energy project or procurement requires that the associated RECs be sold to achieve an acceptable return on investment or cost of electricity to the consumer.
- Anytime the electricity consumer wants to make renewable electricity use or carbon footprint reduction claims.

## How Are REC Arbitrage Arrangements Structured?

There are a number of variations on how REC arbitrage arrangements can be implemented and structured. An arbitrage can be **contractually specified** in a procurement contract, such as a PPA, between an electricity consumer and a renewable energy developer. For example, under contract with a third-party the electricity consumer may negotiate in the PPA to have replacement RECs provided in place of the project

RECs when the parties involved in the contract decide that selling the project RECs obtains a better delivered cost of electricity to the consumer. These replacement RECs may be subject to additional conditions and terms negotiated between the parties, such as the replacement RECs are sourced from another of the developer’s renewable energy projects, similar vintage, third-party certified, or meet EPA’s definition of [green power](#). By monetizing the project RECs and instead providing the consumer replacement RECs, the project developer is able to reduce the cost of the consumer’s delivered renewable electricity.

REC arbitrages can also take the form of a **separate transaction** by a consumer that owns a renewable generation facility but is monetizing the project RECs or engaged in a PPA where the project RECs are contractually retained by the project developer. In these cases, the consumer can execute REC arbitrage by proactively engaging in a separate transaction with a renewable energy provider, such as a REC marketer, to purchase replacement RECs for their self-financed renewable energy project or the RECs associated with their PPA.

Consumers investigating REC arbitrage may want to consider these possible variations in how the arrangement is structured:

### Ratio of Energy Equivalency

Arbitrage arrangements for RECs are often executed on a one-to-one energy equivalency ratio, with one REC (equivalent to one MWh) being replaced with one replacement REC (equivalent to one MWh). However, consumers can structure their arbitrage at different exchange ratios to fit their needs and objectives.

For example, as depicted in Figure 1, a consumer with a self-financed solar array producing 10,000 kWh/year, or 10 percent of their annual electricity needs, can sell the 10 solar RECs associated with their array for \$50 each into the state’s RPS driven market (\$500 revenue generated). That consumer can then make a replacement REC purchase of 100 nationally-sourced wind RECs that cost \$2 each, or \$200 total, equivalent to 100 percent of their total annual electricity needs. In this example, the consumer realizes a \$300 net-gain by selling the 10 solar RECs and purchasing 100 replacement RECs. The ten-to-one ratio of replacement RECs to project RECs also allows the consumer to claim that they are 100 percent powered by renewables.

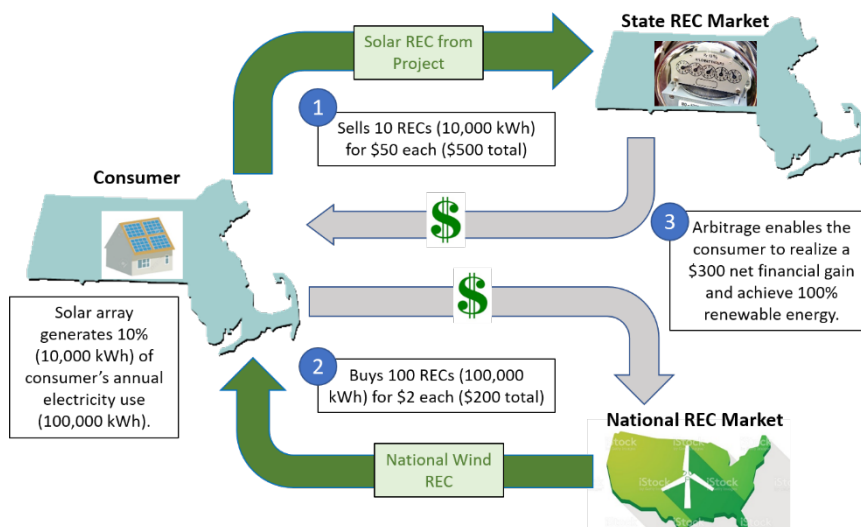


Figure 1. Ratio of Energy Equivalency

## Term of REC Arbitrage

A consumer can shorten the length of the arbitrage arrangement relative to the full term of their purchase contract or ownership of the renewable energy project in order to fine tune a procurement strategy to meet economic and environmental objectives. By shortening the length of the arbitrage, the consumer only receives replacement RECs from another project for the first portion of their electricity purchase term, then receives the project's RECs for the second portion, each of which affording the consumer different financial values and environmental claims.

A consumer may consider this type of adjustment to the timeframe of the arbitrage since renewable energy project developers in their financial modeling of their projects often significantly depreciate the value of the project's RECs after the first few years of project's operation given the time value of money and uncertainty of future REC prices. Consequently, a consumer negotiating a PPA with a renewable energy developer may consider shortening the term of the REC arbitrage in the PPA to coincide with the period when the developer most values the project's RECs. In this way, the consumer reduces their cost of procurement by leveraging the value of the RECs when they are considered most valuable by the developer. Then, during the latter years of the PPA contract when the RECs are considered less valuable by the developer, the consumer can contractually receive the project RECs via the PPA and can thus make renewable electricity use claims specific to the renewable energy project.

For example, as depicted in Figure 2, a consumer could arbitrage the project's REC with lower cost replacement RECs for the first 5 years of a PPA. For years 6 through 20, the PPA contractually conveys REC ownership to them.

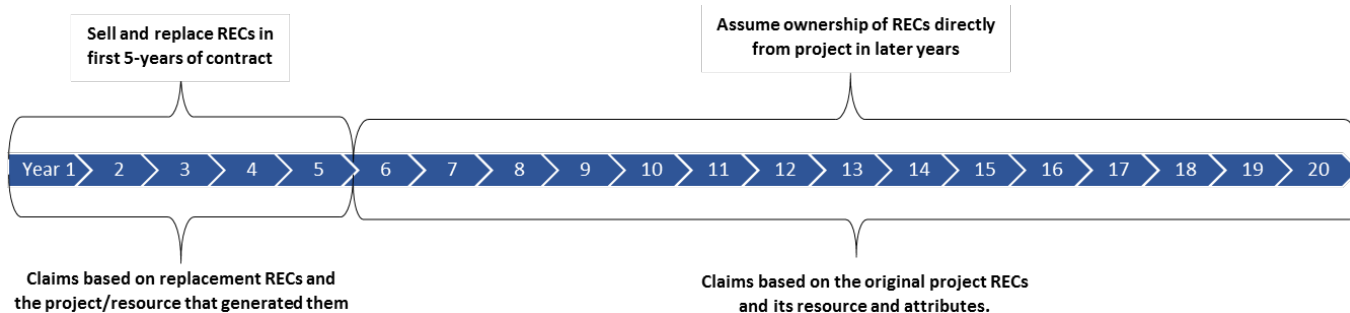


Figure 2. Term of REC Arbitrage

Likewise, consumers who own their renewable energy projects may decide to monetize the project's RECs when they feel it's most advantageous, and replace them with RECs through arbitrage in order to substantiate their renewable energy use claims. For example, a consumer may decide to arbitrage their project RECs with replacement RECs for the first years of the contract to quickly recoup their capital investment. Once the cost of the project is recouped by the consumer, they begin to retain the project RECs.

## Summary

REC arbitrage is an accepted strategy and can be economically advantageous for electricity consumers in markets with high REC prices. However, consumers must make sure their messaging and claims align with their REC ownership. The advantages as well as the challenges of REC arbitrage are covered below (see Table 2).

*Table 2. Advantages and Challenges of REC Arbitrage*

Advantages
<ul style="list-style-type: none"> <li>• Decreases the relative cost of using renewable electricity.</li> <li>• Enables consumers a means to legally substantiate renewable electricity use claims.</li> <li>• Reduces a consumer's carbon footprint and a universally accepted accounting practice in standard GHG accounting protocols.</li> <li>• Can be easily executed through a PPA or separate contract.</li> <li>• Provides flexibility and optimization of environmental and economic objectives.</li> <li>• Allows consumers to support a robust national voluntary REC market.</li> </ul>
Challenges
<ul style="list-style-type: none"> <li>• Increases the complexity of an organizations "story" to stakeholders about its renewable electricity use.</li> <li>• Since renewable electricity use claims must be associated with the replacement RECs, arbitrage creates a disconnect between the consumer and their renewable electricity project</li> <li>• For consumers purchasing electricity directly from a renewable energy project, REC arbitrage requires additional contract language and negotiations with the project developer.</li> <li>• For consumers who own a renewable energy project, REC arbitrage may require additional transactions to sell project RECs and then purchase replacement RECs.</li> </ul>

## Additional Resources

Center for Resource Solutions 2015. *The Legal Basis for Renewable Energy Certificates*. <https://resource-solutions.org/wp-content/uploads/2015/07/The-Legal-Basis-for-RECs.pdf>

Center for Resource Solutions 2016. *Solar Energy on Campus - Part II: Solar Purchasing Options and Communicating Renewable Energy Use*. <https://resource-solutions.org/wp-content/uploads/2016/09/Solar-Energy-on-Campus-II.pdf>

U.S. Environmental Protection Agency's Green Power Partnership. *RECs: Making Green Power Possible*. [https://www.youtube.com/watch?v=\\_12VYXms6-c](https://www.youtube.com/watch?v=_12VYXms6-c)

U.S. Environmental Protection Agency's Green Power Partnership. *Guide to Making Claims About Your Solar Power Use*. <https://www.epa.gov/greenpower/guide-making-claims-about-your-solar-power-use>

World Resources Institute. *Greenhouse Gas Protocol Scope 2 Guidance*: [http://www.ghgprotocol.org/scope\\_2\\_guidance](http://www.ghgprotocol.org/scope_2_guidance)