Explaining Complexity

Financing the renewable energy future with virtual power purchase agreements

When was the last time you thought of where your electricity actually comes from? Look around and listen. All of the electricity buzzing through your building was created in a generator somewhere and transmitted through a series of cables and wires, eventually making its way to the outlet in your wall. Our need for power is a facet of modern day life, and electricity lets us live our lives with great convenience. Unfortunately, that steady access comes at a cost. Burning fossil fuels, mostly coal and natural gas, to power our world has polluted our air and heated our climate to increasingly dangerous levels.

Many companies and people recognize this problem and actively wish to use more clean, renewable energy to help in the fight against climate change. However, most can't use clean energy, because the electricity they receive from the grid every day is created mostly by burning fossil fuels. In the USA we have virtually unlimited choice to order almost anything and have it delivered to us within a day, from running shoes to bright pink lawnmowers. But electricity is different. Most of the time, you can't choose where your electricity comes from, even if you are willing to pay extra to use renewable energy. However, using a novel form of financial structuring, large users of electricity can claim all of their electricity use as clean, and help developers of renewable energy get their projects built at the same time. This is the beauty of Virtual Power Purchase Agreements (VPPA) and the subject of this essay.

Almost everyone relies on electricity to power their lives, especially Joe the fry guy. Joe runs a highly successful take-out restaurant in Washington's Georgetown neighborhood, where he uses electricity to make and sell his French fries to customers. Joe is environmentally conscious; he uses locally sourced potatoes and cares about the impact of his waste on the community. Recently he decided he would like to use renewable energy to cut his own carbon footprint while, if possible, reduce his electricity costs.

Joe buys his electricity from his local utility called Pepco, and gets charged for the amount of electricity he uses over the course of a month. The price of electricity fluctuates from day to day, so Joe doesn't know what his costs will be in advance. As an example, let's say in the month of May he uses 1,000 kWh and pays $0.09 cents per kWh. Kilowatt hours (kWh) are just a measure of the amount of electricity used. 1000 hours times $0.09 per hour makes Joe's May electricity bill $90 total. Unfortunately, most of that Pepco electricity came from coal plants, which bothers Joe. Why should he be forced to buy into this polluting and outdated system?

Joe could find someone to build solar panels on the roof of his building, and have them connect that electricity to the wires of the building. Solar panels are ideal because they can fit on a small surface and soak up a lot of sunlight. If the roof is exposed to a lot of sun, Joe can save a lot of money on his electricity costs, and start to profit in a few years from the panels. This is a great solution, but the problem is that not everyone has enough roof space, up-front money, or even the know-how to install solar panels. If Joe didn't own his building, Joe couldn't have rooftop solar panels without the agreement of his landlord.

Unfortunately for Joe, his French fry store is located by a large tree that blocks sunlight from falling on his roof, thus he can't set up a rooftop solar array to get clean energy. However, Joe has another option. Joe could buy Renewable Energy Credits (RECs). For a certain amount of money, Joe can offset the carbon emissions of his electricity use by buying RECs from owners of renewable energy plants. While this seems like a win-win situation, it does not actually result in the reduction in the use of fossil fuels. To see why, let's look a little closer at RECs.

Renewable Energy Credits (RECs)

RECs are fairly straightforward: a renewable electricity generator like a solar or wind farm receives renewable energy credits (RECs) from the government based on how much electricity they generate. These RECs can be retired, signifying the energy used will be counted as clean, or they can be traded or sold to someone else who wants to use the REC for marketing purposes. Even though the Pepco electricity that powers Joe's building is mostly from fossil fuels, Joe can buy RECs from the marketplace just like any other corporation, which allows him to legally say he uses clean electricity.

To illustrate how RECs work, let's consider Sarah's renewable power company. Sarah is a wind developer and wants to build a wind farm in Oklahoma. She built her company from the ground up, motivated by her commitment to increasing US renewable energy supply. Once the project is built, Sarah will sell both the electricity generated by her wind turbines and the RECs granted to her for her renewable electricity produced.

Sarah will sell her electricity to the grid, which is owned mostly by power companies who buy a lot of electricity from different sources and subsequently sell the power to end use customers. Separately, Sarah will sell her RECs to corporate buyers who want to seem more environmentally friendly. There are REC markets where companies buy these legal rights to renewable energy. The credits allow companies to say their used energy is clean, because they bought the legal rights to clean energy. If Sarah sells every single one her RECs, the electricity she produced is now treated legally as "brown power", just like any other electricity from fossil fuels. She cannot claim her electricity as renewable because she has sold the renewable aspect granted to her by the government from the electricity she produced.

The problem with RECs

If Joe decides to buy RECs from the open market, Joe gets to feel he is doing something to help the planet. However, the real problem is that these REC agreements don't actually lead to any new renewable electricity being generated. Anyone can buy these RECs because they don't cost very much. There is no real increase in the amount of renewable energy being generated because Joe is only buying the rights to say his electricity is clean (by buying the RECs), not actually adding more clean energy (like through building a solar panel). REC markets themselves might make it slightly easier for Sarah to get her wind farm built, but the impact is small and the existing market is not profitable enough for her potential investors.

Joe knows this and it annoys him, because he believes that at the end of the day increasing the amount of renewable energy being used overall is really what is important, not the

marketing benefit of REC ownership. Joe would love to agree in advance to buy Sarah's generated RECs and get her project built, but he can't because he's thousands of miles away in DC. But there is another way to match Joe's interest in green power to Sarah's solar power generation.

Virtual Power Purchase Agreements as a solution

A great hope for increasing alternative energy use in the US is an innovation called virtual power purchase agreements. Virtual power purchase agreements, or VPPAs for short, are a financial mechanism that allows companies like Joe's French fry business to both count their electricity use as clean and help create more clean renewable energy at the same time. In this case, Joe can set up a power purchase agreement with Sarah to buy all of her generated electricity and her renewable energy credits, despite being thousands of miles away. Companies from Google to Dow have done this successfully. Stay with me here, it's not as complicated as you might think.

Power Purchase Agreements

Large companies that need a lot of electricity commonly sign a type of long term contract, known as a Power Purchase Agreement (PPA), to get electricity delivered directly to their buildings at an agreed-upon price. Many companies do this because it assures them a steady supply of electricity at a fixed price, making accounting much easier month by month. For example, Sarah's soon-to-be-built wind farm may find a company in Oklahoma that needs to power its buildings, and transmission wires will directly send her generated electricity through her local grid to power that company's operations. This contractual guarantee to buy electricity from developers is how PPAs provide banks the confidence they need to finance electricity projects. This concept is known as "additionality", that is, the new renewable power that otherwise would not have existed is now actively being added to the overall electrical grid. Thus PPA's allow developers to prove to investors they will be able to sell their electricity and RECs, and add renewable energy sources that would not have otherwise been built.

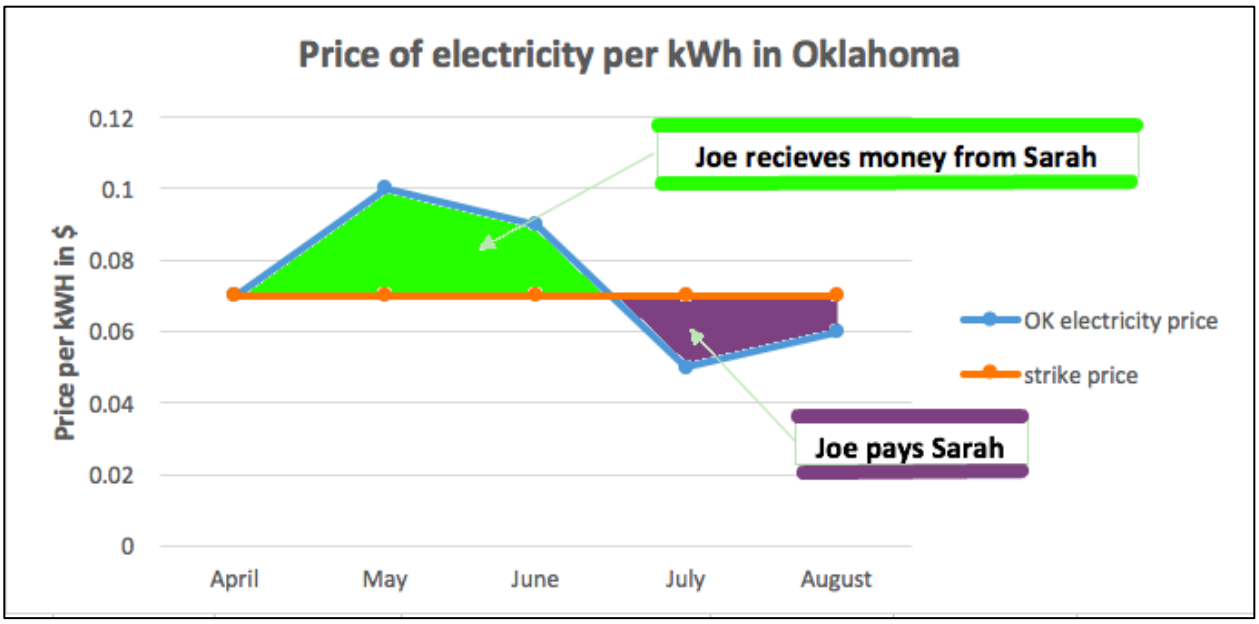
Here's the catch of regular PPAs – finding companies nearby in Oklahoma that want all of Sarah's power and RECs is difficult. This is why virtual PPAs are so important. Setting up a "virtual" power purchase agreement allows Sarah to sell her electricity and RECs at a pre-set price to companies outside of Oklahoma that are not attached to the same grid, and work even as far away as Joe's French fry company in DC. The electricity generated by Sarah's wind farm will never actually reach Joe's business because of limits on how far electricity can travel on the grid. But by using virtual power purchase agreement, their lack of a physical connection no longer matters.

Through a VPPA, Joe and Sarah will enter into a financial contract that allows each of them to meet their goals. Joe wants the environmental benefit derived from RECs and wants to help finance new renewable power generation. Sarah wants a steady buyer for her electricity and doesn't need the RECs. There are a number of different ways to structure this type of deal, but here's the basics of a Contracts for Difference agreement, a typical structure between a developer

like Sarah and an off-taker (electricity buyer) like Joe. If you aren't interested in the complicated mechanics of how the contract works, skip down to the next section.

The Strike Price and Contracts for Differences

Contracts for Differences allow Joe's demand for RECs to directly match Sarah's supply. Sarah and Joe agree to a "strike price" at which they will settle their payments, say $0.07 per kilowatt hour (kWh). When the price of electricity in Oklahoma is above $0.07 cents, for example $0.10 cents per kWh, Sarah will sell her electricity in Oklahoma and receive payments for her electricity. She will pay the extra money she makes above the strike price directly to Joe, in this case an extra $0.03 cents per kWh, plus giving him the RECs from her electricity. In this scenario, Joe is receiving both RECs and money from Sarah. While this is happening, Joe will buy his electricity normally from Pepco in DC to meet his electricity demand, let's say paying $0.09 cents per kWh. Because of the money he receives from Sarah, Joe is effectively paying $0.06 cents per kWh, plus receiving RECs from Sarah for all of his electricity purchasing. This is the best of both worlds for Joe. Legally, he is able to classify all of his electricity as coming from a renewable source, plus receive money for doing so. In this scenario in the month of May, there are three effects. First, if Joe's electricity demand is still 1,000 kWh a month, he is now paying $60 a month, rather than $90 a month for electricity, thus he is paying less for electricity. Second, he can now say all of his electricity is renewable. Third and most essentially, Joe can now accurately claim the contract he signed is actually increasing the overall amount of renewable electricity, which is the critical additionality of the project.



You might ask why would Sarah agree to such a situation. Sarah's pretty savvy, couldn't she be keeping the extra money from high prices in Oklahoma for herself instead? The answer is yes, she could, but that would be a good business decision only if prices will stay high in Oklahoma forever. If prices start to decline, let's say to $0.05 cents per kWh, Sarah is going to find her business becoming unprofitable very quickly. For Sarah to get investors on board to build the wind plant and profit off of it, having someone to buy her electricity and RECs at a set

price over the life of the project is absolutely critical. For Sarah, a virtual power purchase agreement allows her to hedge the initial price risk to get her project up and running. Sarah won't just take an offer from anyone, however, and Sarah will diligently ensure Joe is creditworthy enough to continue purchasing her RECs, especially when Joe is already paying extra to subsidize Sarah's revenues.

In this case, if prices decline in Oklahoma to $0.05 cents per kWh in the month of July, Joe will now pay Sarah the $0.02 cents per kWh difference from the strike price of $0.07 cents for every kWh that Joe uses, effectively subsidizing her falling revenues. Sarah will continue to give Joe the RECs for the electricity he uses, but now Joe is paying Sarah to help her meet her bills. Joe is still paying $0.09 cents per kWh to buy his power from Pepco in DC, plus $0.02 cents per kWh to help Sarah break even at the agreed-upon strike price so he can still say his electricity is clean. Through virtual power purchase agreements, Sarah is assured payment at a specific rate over a number of years, facilitating her ability to build the renewable electricity project in the first place, and thus adding more renewable energy to the US electricity grid. In this scenario, Joe is now paying $110 a month for his electricity and RECs, more than his baseline $90.

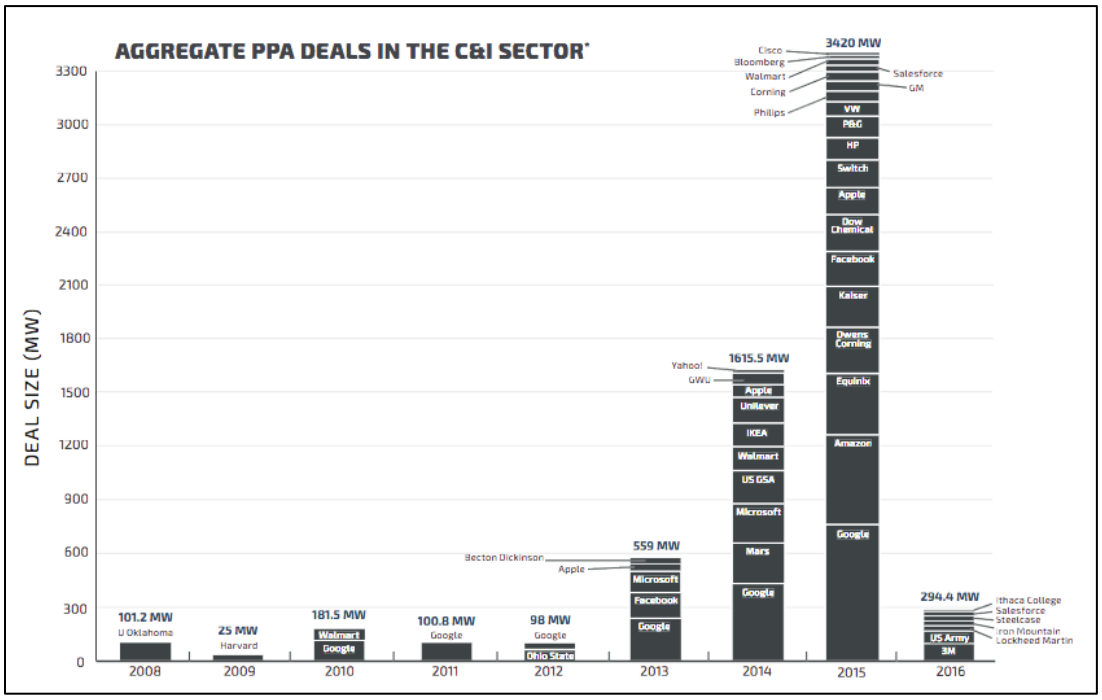
Sarah now has pricing certainty, while Joe must live with a real degree of pricing exposure. Joe is happiest when Oklahoma electricity prices are high, and DC electricity prices are low. Joe must be very cognizant of the future pricing of electricity markets, because pricing disparities affect his bottom line profits or losses. If the agreed-upon strike price is too high, Joe may be stuck paying a premium throughout the course of the contract life. Sarah and Joe may agree to have the strike price float up or down depending on how electricity prices change, to prevent potentially excessive burdens on either side. Joe's risk is limited because it is unlikely that electricity prices will go negative, but it is worth noting this has happened in Germany. Prices can hit zero in times of peak renewable generation, and Joe must be prepared to subsidize this possibility.

Through virtual power purchase agreements, Joe has a chance to get RECs, add renewable energy to the grid, and make money for doing so, especially if he is able to negotiate a low strike price with Sarah. Given current low costs for building renewable power plants, this is very possible, and works to the benefit of all parties involved. VPPAs harness the power of market incentives and the autonomy of the forward thinking corporation to create more green power, revolutionizing the playing field for sustainable energy.

Who has taken advantage of virtual power purchase agreements?

A number of large corporations have seized upon these deal structures as both a way to add renewable energy as well as a way to save a lot of money assuming future electricity prices rise. VPPA's are not at all limited to only the environmentally committed, but rather to companies seeking to enhance their bottom line. Companies that know they will need a lot of energy, such as tech companies with massive servers, actively seek out these deals to protect themselves from being at the mercy of swinging electricity prices. Notable examples of VPPA users include Google, Mars, Amazon, Facebook, and Apple. Well-structured virtual power purchase agreements are a way to reduce uncertainty, and include the possibility of profit in the

near future. It is absolutely critical to have good lawyers structuring your deals, and to put time into initial negotiations so as to reach a mutually agreeable strike price. Given the advantages, companies that think they will be around for a while and care about sustainability and the environment should jump at this opportunity, provided the risks align well with their business. Below is a chart of the history of deals that have already been inked (up to early 2016).



One important barrier to the deals does exist: currently these deals may only be structured in states that have deregulated electricity markets (about 23 states fall into this category). Intricacies and overlapping rules and regulations between electricity markets make due diligence and good research essential to any VPPA. When done right, VPPAs help speed the advance of renewable energy generation in the US, connect likeminded buyers and sellers, and mitigate against the looming danger of climate change.

Despite the seeming complexity, Virtual Power Purchase Agreements are a surprisingly straightforward way to increase our use of green energy, decrease fossil fuel generation that contributes so much to climate change and air pollution, and bring profit to innovative businesses. It is time to tie the power of financial engineering to increasing renewable electricity generation for the benefit of a more sustainable planet.