# Power Purchasing Agreements

## *A Route Forward for Municipalities and Institutions to Encourage Solar Power*

**Association for Climate Health © 2020**

Say you're a manager at a town or hospital, a school or college campus, even a large business who wants to change the way you buy your electricity. Because you want to cut costs, or lock in the rates, or maybe switch to solar to meet your goals for helping the planet.

Maybe you've considered putting solar panels on the roof or the grounds but that requires substantial up-front costs and on-going maintenance, which doesn't work for you. You may consider finding someone else to own the project and lease it to you, but that presents other risks, and the timing is getting tricky since the clock is ticking on investment tax credits for renewable energy projects.

And maybe you've considered buying renewable power from the grid, but realize that when you buy power in an existing power grid, this simply switches other customers over to take up the same dirty power, allowing you to claim you buy green power but not actually doing anything for the planet.

So, what do you do?

One of the most promising ways to move forward is to work with an energy provider or transporter and create new solar or wind generating capacity to meet your needs.

### Background: How Electricity Markets Work

At home and at work, most of us are customers of the power sector. Which used to be simple – we bought electricity from the local electric utility company, which had a monopoly on our business. In turn, they converted fossil fuels or nuclear material or flowing water into power, sent it across the power lines to our homes and workplaces, lumped us into appropriate rate categories and charged us; we paid our bills and everyone was (more or less) happy. Since there was little to no competition, state regulators kept a loose lid on the rates they charged us, and citizens elected the government officials who appointed the regulators, keeping checks and balances in place.

This changed in some states in the 1990s when the federal government began allowing deregulation for the electric power industry. About a third of the states have followed through with deregulation. Utility companies in these states sold their generating stations to other companies and now mostly run the distribution networks of power lines which bring electricity from power providers to users. Energy suppliers are not owned by utility companies, and residents in those states can choose which supplier they prefer. The resulting competition created generally lower rates and a variety of options to choose from, including more renewable energy for people who want to buy greener power – solar, wind, hydro.

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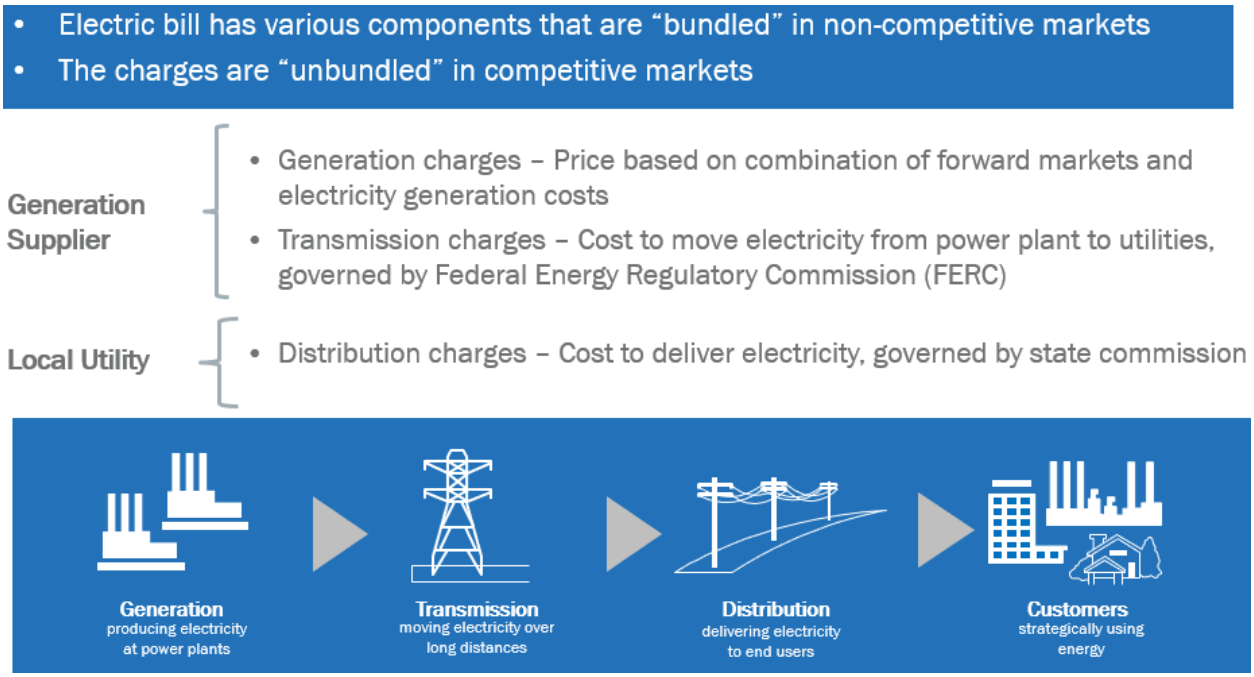



*Constellation Energy booklet "Efficiency Project Funding for PECO Customers," © 2016.*

For many consumers, it still looks like you are buying power from your local electric utility because your bill for the electricity is combined with the utility company's charge for delivering power. And if you don't actively choose a power provider, the default is provided by the utility's chosen providers. But you can choose a different source, and the utility is required to cooperate with your choice.

The default option in most cases is power from a mix of sources – coal, nuclear, oil, gas, hydro with some wind and solar. And their choice may be based on price and reliability factors, important for them running their utility business, but not necessarily a good match for your needs and values.

Still there are options in most deregulated states to buy electricity from renewable energy sources, sometimes 100% renewable, sometimes less.

On the surface it would appear that having this choice makes it easy for retail customers to buy climate-friendly power. After all, when a customer buys electricity from a 100% renewable energy source, they are supporting solar or wind, right? But unless a huge swath of customers makes this same choice, their choices do not reduce overall fossil fuel use, or increase demand for solar or wind, because all the other customers who did not choose renewable energy simply get a larger share of "brown" power (electricity made at nuclear, coal or fossil fuel plants) and a smaller share of "green" power.

> Example: Let's say there are 1000 customers in a particular utility area using 500,000 kwh per month (an average of 500 kwh each). The utility's default package is made of:
>
> | | |
> |---|---|
> | 300,000 kwh of nuclear | 60% |
> | 150,000 kwh of oil-fired | 30 |
> | 50,000 kwh of solar and wind | 10 |

| | |
|---|---|
| 500,000 kwh in total | 100% |

Now 50 of those customers decide to specify they want renewable energy. So the utility switches them to renewables, which means 25,000 kwh of renewables (still 500 kwh each). Good for them! But that means that the utility's default package now gives the other 950 customers the balance of the default package:

| | |
|---|---|
| 300,000 kwh of nuclear for the default customers | 60% |
| 150,000 kwh of oil for the default customers | 30 |
| 25,000 kwh of solar and wind for the default customers | 5 |
| 25,000 kwh for the 50 customers specifying they want renewable energy | 5 |
| 500,000 kwh in total | 100% |

The 50 customers can pat themselves on the back for choosing greener options, but the net result does not change the amount of greenhouse gases emitted because there has been no actual change in the amount of "brown" energy or "green" energy generated, just a shifting among the customers.

If what you want to do is **increase** renewable energy – primarily solar and wind – then it helps to either be a very large customer or to band together with other customers, and negotiate a brand new energy project using renewables. A joint effort will take work to organize the people or entities. Yet it has some advantages:

- Working together increases the amount of renewable energy capacity in the system, and since renewables (once built) are cheaper to run than other options, they will be used.
- Economies of scale drive the cost of power down significantly as the size of the project increases (see examples below). Cheaper cost means cheaper electric rates. Cheaper electric rates mean that others will see you made a smart decision and decide to follow your lead.
- Size helps attract additional suppliers, who can usually make more money with larger projects.
- More suppliers means more competition, which allows you to choose among more, better and/or cheaper options.

**The On-site Solar Option (a *go-it-alone* option)**

For smaller projects, say a rooftop installation at a particular municipal building, installing solar is much like installing it for a private home. The up-front cost is non-trivial, though it may pay for itself in 5-10 years.

| Size | Avg Installed Cost per Watt in 2020 | Avg Installed Cost before tax credits | Avg Installed Cost after netting out tax credits |
|---|---|---|---|
| 5 kw system | $3.54 | $17,697 | $13,096 |
| 10 kw | $3.05 | $30,472 | $22,549 |
| 20 kw | $2.80 | $56,014 | $41,450 |

*Source:* https://www.solarreviews.com/solar-panels/solar-panel-cost/

Clearly increasing size even by a factor of 4 as above leads to a 20% savings per kw. When you get to utility-scale photovoltaics, average installed costs are even cheaper. Lawrence Berkeley Labs' report on US utility-scale solar installations indicate an average $1.60 per watt of AC power or $1.20 per watt of DC power in 2018. PPA prices for utility-scale solar averaged $53 per MWh (under 6 cents per kwh) with some under $20 per MWh even without the tax credits for projects completed in 2018. https://emp.lbl.gov/utility-scale-solar/ This demonstrates the value of larger size projects – a town or institution interested in going green can benefit from significant cost savings if they can gain access to bigger scale projects.

Clearly, size matters. And so do the Investment Tax Credits, which towns and nonprofit institutions cannot make **direct** use of. But if a private entity builds the project for them before the credits expire, that cost savings can be shared. Sale-and-lease-back is a fairly common option so that the town or institution does not pay up-front costs and the tax credits can help support the economics of the project.

Also please note that geographic location influences cost, largely because of the different cost of labor. For example, in low-cost Tennessee, a 5 kw system may cost under $9400 to install (before tax credits) while a 5 kw system in Hawaii (the highest cost state listed) would average about $20,600.

**The Power Purchase Agreement**

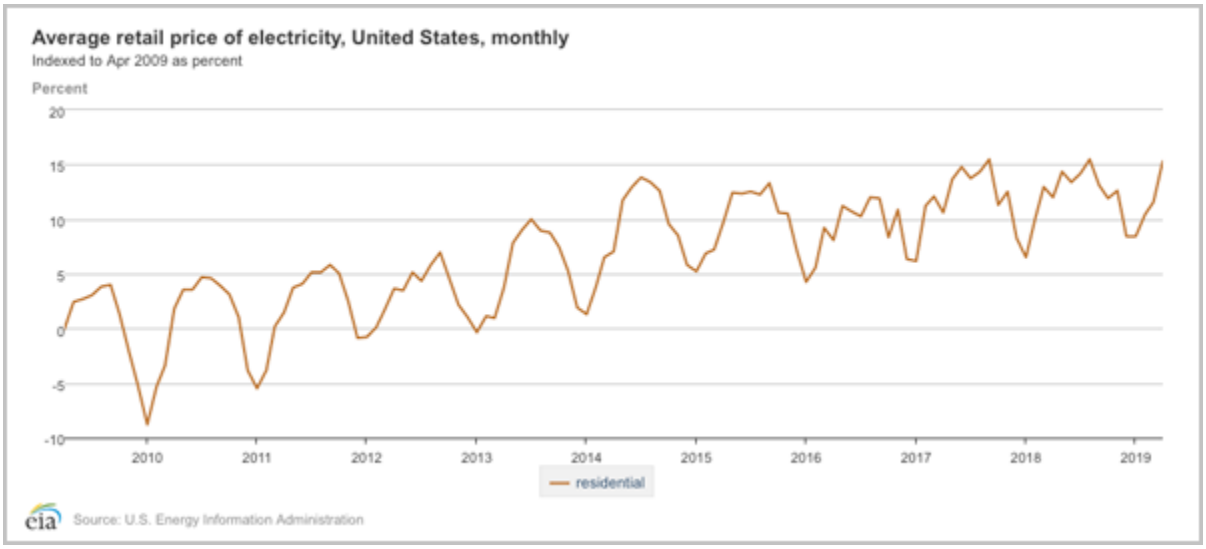
If you don't want to own, manage, or have a solar or wind installation on site, you have to look to other providers. Yes, there is your local utility company's offerings, which are unlikely to actually reduce greenhouse gases for reasons discussed above. In deregulated states you can choose another provider, but these may also not reduce overall greenhouse gases, for similar reasons. Additionally they may be significantly more costly than the default option. So how can you make sure you are reducing the overall climate problem without having to pay premium prices? Some states have created an option called Community Solar, and we encourage you to check that out if it is available. With Community Solar you can opt in on an alternative which will create new renewable energy generation and achieve some of the economies of scale of a larger system. But for locations where this is not available, you may want to consider the Power Purchase Agreement.

A Power Purchase Agreement ("PPA") is a contract made between an energy provider and medium to large scale buyers for long-term purchase of electricity (typically 10 – 25 years). The provider finances, builds and operates a new generating project and sells the power to buyers at a negotiated price, to be delivered to a particular location. In addition to the power, the buyers may also get Renewable Energy Credits (RECs) which they can keep or sell. Selling is primarily for any excess power they have contracted for.[1]

[1] For information about buying and selling RECs, the EPA created this document: https://www.epa.gov/sites/production/files/2017-09/documents/gpp-rec-arbitrage.pdf

**Benefits and considerations of PPAs:**

- Power Purchase Agreements for wind and solar energy projects can deliver fixed-price electricity at competitive rates, limiting a customer's exposure to electricity cost increases over time, while meeting climate change and environmental commitments without any upfront capital commitments.
    - PPA rates in many years have been lower than the retail rates for renewable energy offered by the local utility company or other providers
    - Rates are locked in for several years, in contrast with rates paid by customers in unregulated markets who have no such agreement; these rates will move with the markets and have typically risen over time. Over the past decade retail residential rates have risen about 15% (see table below). Locking your rates in can avoid cost increases, or at least postpone them.




Retail rates fluctuate due to seasonal factors and market factors but have generally increased over time.

- An "off-site" PPA is a good tool for customers who lack space for a sizable on-site project of their own or whose power needs are spread among many locations.
- Government entities and nonprofit institutions pursuing a solar or wind PPA can use the PPA third-party ownership model to take advantage of the federal Investment Tax Credit (ITC) and partly offset the cost. ITCs can only be used by a taxable entity.
- Investment Tax Credit legislation is already phasing out and will expire soon unless Congress agrees to extend it. The previous 30% credit for new solar residential and commercial projects has been reduced to 26% in 2020, will decline to 22% in 2021 and to zero for residential and 10% for commercial and utility-scale projects thereafter. Wind projects have different and more complicated tax incentives.
- Unless Congress extends the ITCs for renewables, the cost of energy from PPA projects will likely increase significantly in 2021 and onward. The clock is ticking.

**Advantages of PPAs for local governments and institutions:**

- Manage their current and future energy costs
- Achieve their clean energy goals
- Demonstrate climate leadership to their own residents and others
- Encourage residents to build renewable energy projects
- Simpler to organize if there is a single entity – a city, a hospital system, a large campus. But doable if you can coordinate with other cooperating entities.

**Steps toward creating and implementing PPAs**

- **Create a municipal or organizational Energy Plan** – this is not a mandatory step, but a plan is often helpful in setting goals and staying the course until completion. A plan also creates a structure for accountability, where local news, citizens or administrators can remind people of the already agreed-on plan – helpful when you encounter inertia or resistance**.** A good starting point for creating a plan is this booklet from Rocky Mountain Institute https://rmi.org/wp-content/uploads/2017/04/Community_Energy_Resource_Guide_Report_2015.pdf Another helpful resource for local governments is the Energy Transition Plan created by Sierra Club's Ready for 100, SE Philadelphia region – theirs is a template where you can fill in your own community's specifics and use their language to organize it.
    - The **City of Philadelphia** created a Municipal Energy Master Plan including their goal of achieving 100% renewable energy by 2030. This was useful in drawing up and passing legislation in 2018 to commit to a Power Purchase Agreement with Community Energy for solar power which will power 22% of Philadelphia's facilities with renewables.
- **Aggregate at least 40 MW of electric demand** – which is the minimum size one provider (Community Energy) estimates is needed to achieve economies of scale in today's market. Smaller sizes are also possible but will result in higher prices per kwh. The City of Philadelphia contracted for 70 MW, hedging their energy bets by locking down their electricity rates in their PPA and using that to provide one fifth of their energy needs. Their project was large enough to be exclusively for their own uses. In contrast, a town of 40,000 people might need only 1-2 MWs for their municipal buildings, police and fire stations, public schools and street lights, so they would need partners for a PPA. If this is your situation, contact neighboring towns, colleges, museums, hospitals, large employers, etc. to achieve critical mass.
    - **Each participant should decide what portion of their demand they want to satisfy through this agreement.** You don't need to risk 100% of your energy supply on this agreement, though if you are a small town, going through all this work may not be worth it unless it is 100%. The City of Philadelphia initially opted for 20%, which allowed for a 70 MW project. They may decide to repeat the process with additional PPAs if the first one is successful, or continue providing the remainder from more traditional sources.
    - **Decide on your goals** – Renewable energy may not be your only consideration. Is cost another major consideration? Do you want location to be a deciding factor? Job creation, flexibility? How much growth do you need to build in? These and other issues

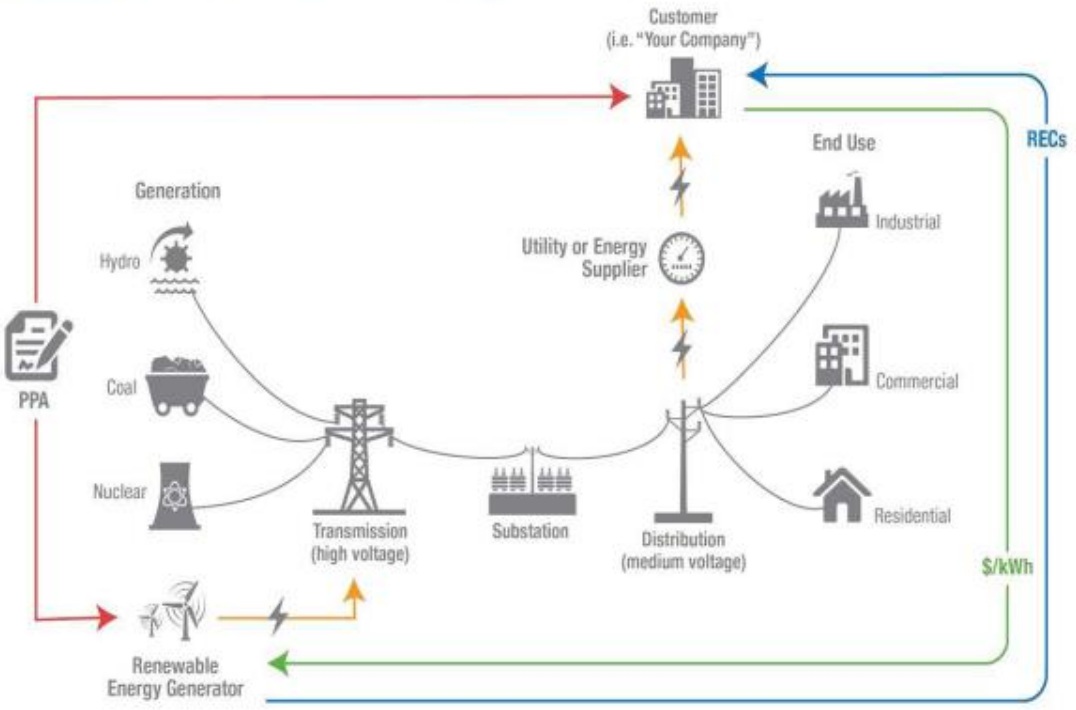
will probably many discussions with stakeholders. A good starting point is https://cityrenewables.org/overview/

    - **Decide how you and your fellow participants will interact.** If you take on partners, you will need to work out such issues as voting and representation among the partners. Are there escape clauses? Will there be proportional voting? What if the different participants have different credit ratings – will that affect the pricing for the group, and if so, should there be compensation for the stronger partners? Can municipalities sell their Renewable Energy Credits (RECs) or their Solar RECs on the market if they don't use them all? Such issues should be worked out in a written agreement of some kind.
- **Decide on the type of contract needed.** If you are doing an off-site project, you will need to decide between two types of PPAs – the Physical Power Purchase Agreement ("Physical Power Purchase Agreement") and the Virtual Power Purchase Agreement ("vPPA"). Warning: the discussion below is going to be somewhat technical.

**The Physical Power Purchase Agreement –** an agreement where the contract specifies that power will come from a **particular** power generating site in the **same** electrical power grid. The power may also (for legal reasons) need a third party to transmit it from that delivery point to the buyers' particular location(s).

- **Physical PPAs are the original form of PPA agreement** – these started with large corporate buyers who may have had previous experience managing their energy needs**.**
- **Large buyers may create this by direct purchase –** and this can save more money but requires the buyer to be under significant federal regulation, including that they would need to join the regional power grid, obtain and maintain a license from the Federal Energy Regulatory Commission as a Power Marketer. These requirements are enough trouble that generally only utilities or very large customers (Google, the University of Pennsylvania) go this route.
- **More often, buyers contract with an existing Load Servicing Entity (LSE)** which simultaneously contracts with the power generator for that power to be delivered. LSEs take on the regulatory burden of the Power Marketers described above, saving the customer from these substantial demands, but in turn require the customer to make an agreement with a third party.
- **Your local utility is generally an LSE but there are other LSEs as well in deregulated states.** One of the ways competitors can distinguish themselves is their willingness to enter into such agreements with customers.
- **Complication** – the Physical PPA agreements are typically many years (15 years is common). Contracts with LSEs are typically 3-5 years and at the end of that time the PPA customer continues to be obligated to pay for the power under their PPA, but will need to renegotiate terms with an LSE, either the same one or a replacement. So the cost of the power may be fixed over 15 years but the LSE's fees may change. This creates two risks – a risk of rising costs charged by the LSE and a risk of having to switch LSEs which may have different outlooks and reputations for customer service.

**FIGURE 1: Physical PPA Stakeholders and Processes**



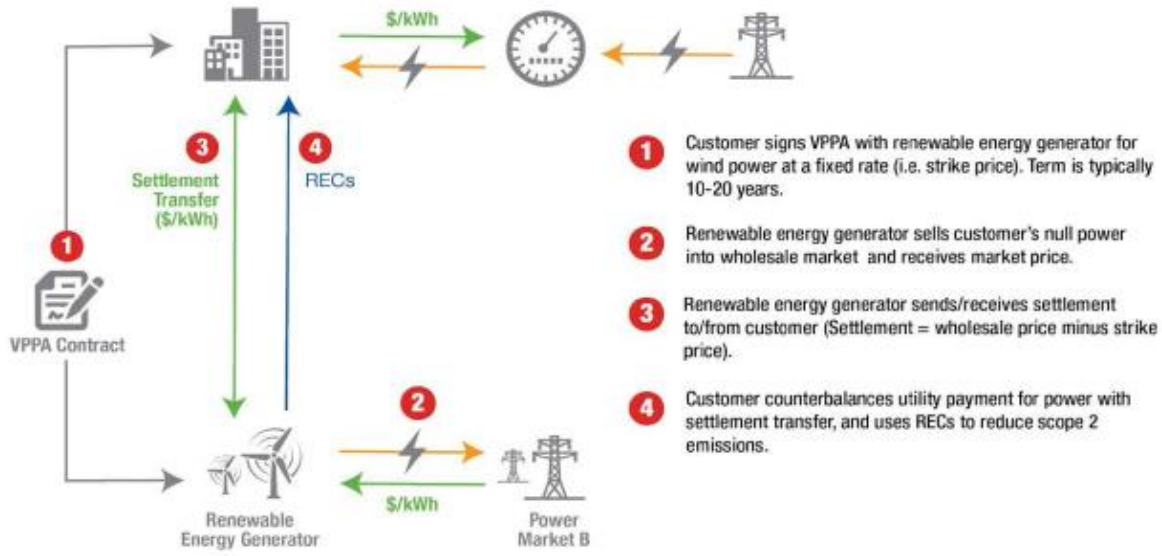

The physical PPA transactions between the customer and the project developer ("renewable energy generator") and how these parties fit into the larger electricity grid.

*Source: EPA Green Power Partnership, Introduction to Vitual Power Purchase Agreement*

- **Pros of a Physical PPA:**
  - Provides a hedge against power prices increasing – keeps the price of power flat for several years for the power you choose to contract for
  - Scalable if your community is growing, or if you want to start small and add more as you get more comfortable with this option
  - Helps achieve energy, environmental and sustainability goals
  - Demonstrates leadership to constituents and to those outside
  - Puts more renewable energy into the grid
- **Cons:**
  - Timing: Renewables may provide power at times when your own power needs are low (late night, weekends), and may not always provide enough supply when your power needs are higher (often midday, especially during summer air conditioning hours).
  - By buying from one particular facility, you are locked into their supply issues. If a plant goes down for maintenance, or the lines in that area have an outage, you may be shunted off to higher cost alternatives.
  - May require Dodd-Frank reporting and record-keeping as a "swap" agreement
  - Buyers should understand some financial risks continue due to energy market factors – transmission and distribution grid downtime, regulatory changes, severe weather occurrences, etc.

**The Virtual Power Purchase Agreement** (vPPA) – a newer form of agreement which has become more popular due to its greater flexibility. Under a vPPA, a municipality or institution enters into a contract with the renewable energy provider, which sets a price for the renewable energy. The electric utility continues to transmit the power and to bill you at their regular rates for the delivery. But the organization has paid for (and added to the system) more renewable energy capacity and in turn gets the equivalent amount of power at a set negotiated price. The energy they bought is put into the grid for the utilities to distribute.

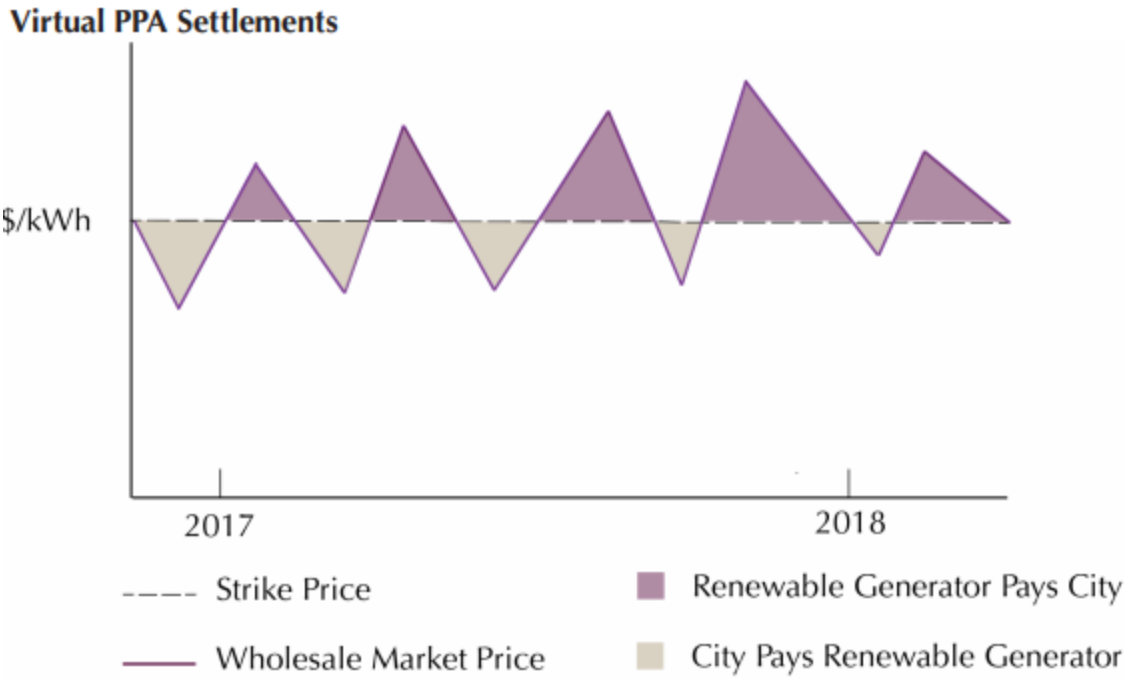
**FIGURE 2: Virtual PPA Stakeholders and Processes**




A vPPA transaction between the customer, the project developer ("renewable energy generator"), and the power markets where the electricity is sold.

*Source: EPA Green Power Partnership, Introduction to Virtual Power Purchase Agreements*

- If the average price of power is lower than your negotiated price, the organization still has to pay the price you negotiated. Sorry! But if the average price of power goes up, the utility pays you to use your cheaper power, and the organization gets that revenue – a windfall. (see illustration below). This is expected to be a good deal overall, as over time the average price of electric power has generally gone up.




The above graph shows market price fluctuations over a one-year period and their effects on the customer of a vPPA. The "strike price" or negotiated price is shown by the dotted line. While a PPA would typically last 10 to 20 years, in the time frame illustrated, the customer has a net-positive economic gain from this deal (minus transaction costs) because the sum of all the purple areas where the customer received payment would be greater than the sum of the beige areas where the town or institution paid the generator.

Source: EPA Green Power Partnership, Introduction to Virtual Power Purchase Agreements.

- **Virtual PPAs are a newer form of PPA** and make it easier for smaller buyers to enjoy the lower costs of wholesale renewable energy.
- The presumption is that you buy it and the cost of electricity goes up over time – your town invests in order to save money later (plus you save greenhouse gas emissions now **and** later).
- The energy provider gets a stable price and guaranteed sales which helps them borrow money to finance the project.
- **Pros of a VPPA:**
    - Can choose a provider anywhere connected on the grid – more potential providers offering lower prices, higher reliability, greener supply or other characteristics.
    - Provides a hedge against power price increases – your organization gets paid when energy prices rise for whatever portion of power you choose to contract for.
        - A warning from consultant 3degrees Inc, "Be wary of VPPAs with hockey stick forward energy price curves promising high net present values (NPVs)!"
    - Helps achieve energy and climate goals

    - Demonstrates leadership to constituents and to those outside
    - Puts more renewable energy into the grid
    - Not locked into power from any particular generating source in contrast to the physical PPA; not subject to outages from that particular generating site.
- **Cons:**
    - May require Dodd-Frank reporting and record-keeping as a "swap" agreement
    - Buyers should understand there continue to be financial risks due to energy market factors – supply and demand, regulatory changes, severe weather occurrences, etc.

**Some considerations for Implementing your project**

**Decide who is going to help build your renewable energy project** – Large solar and wind projects may take 3-5 years from idea to full readiness, can require large tracts of land, and are complex enough that it helps to find a company with experience designing, building and operating similar projects. Make sure they've done more than one! If you decide to pay a consultant, make sure they too have experience with multiple projects. If your project is large, there may be many interested energy providers and energy consultants – Philadelphia had to sort through about 30 submissions after putting out their RFP. Small projects may have a hard time finding even one or two potential candidates.

**Other factors to consider*:***

- **Nearby sites provide the benefits** of visibility to the community and lower transmission costs.
- **Remote sites may be cheaper** to site and develop. These cost savings may dwarf the additional cost of transmission from farther away.
- **Provider and location decisions may be intertwined,** with some providers more restricted in their service areas than others.
- **Review the planning process used by your peers who've gone through this**. Did they create a Request for Proposal (RFP)? Did they simply ask a trusted provider? What criteria did they use for selection? Who is doing this administrative work? Who needs to approve decisions? If you lean on others with experience, you won't need to start from scratch; you can learn from their mistakes and good judgment calls.
- **Study EPA's best practices for renewable energy contracts** – you don't have to reinvent the wheel! EPA provides a great set of links – includes a discussion of what to include in your RFP, best practice bidding procedures, what guarantee language to include, and more: https://www.epa.gov/repowertoolbox/renewable-energy-contract-development-best-practices
- **Negotiate your contract(s)**
    - **Pricing** including any variable costs
    - **What charges are included** – e.g. does this include transmission charges?
    - **Is there an initial sign-up or initiation fee?** Are these fees per buyer or based on size of participation?
    - **Is there a mechanism to leave the contract early** or to sell the share to others?

- **And other factors including …**
  - **Financing issues**
  - **Ongoing supervision of the contract**
  - **Ongoing relations with the others in your group**

**Some Additional Resources**

The Association for Climate Health has many ideas for sustainability at its searchable Idea Forum at https://www.a4ch.org/ideas. Resources specifically useful for communities can be found at https://www.a4ch.org/climate-resources-for-communities.

Bloomberg Philanthropies – www.cityrenewables.org – provides a guidebook on PPAs and some case studies at https://cityrenewables.org/tools-resources/

ICLEI provides software for greenhouse gas inventories and monitoring, climate action plans and related background help. https://icleiusa.org/clearpath/ You may need to become a member, costing $600 in annual fees for municipalities < 50,000 in population.

Philadelphia as a case study:

- Their Energy Master Plan can be found at https://www.phila.gov/media/20170927092513/MunicipalEnergyMasterPlan.pdf
- Their Request for Proposal can be found at https://philaenergy.org/public_bids/renewable-energy-power-purchasing-agreement-request-for-proposal/
- An on-going group of interested parties has a link at https://phillyclimatecollab.com/

Sierra Club of SE Pennsylvania is working on a customizable template for an Energy Transition Plan for towns with goals of 100% renewable energy. I will include this link when it becomes available.