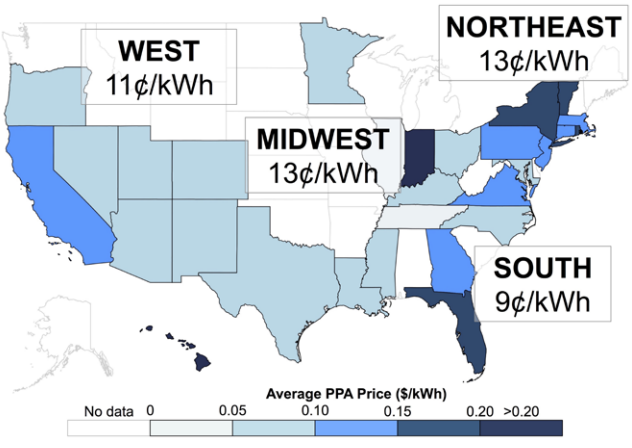
NREL
NATIONAL RENEWABLE ENERGY LABORATORY


# Using Power Purchase Agreements for Solar Deployment at Universities

Solar power purchase agreements (PPAs) have facilitated more than 100 megawatts (MW) of solar deployment on campuses around the country. This brochure provides guidance to universities on the process of using PPAs and how PPAs can make economic sense for campus solar deployment. This document can support university stakeholders charged with the financial planning of campus solar projects.

## What is a Power Purchase Agreement?

In a PPA, a solar purchaser or "offtaker" buys power from a project developer at a negotiated rate for a specified term without taking ownership of the system. The project developer procures, builds, operates, and maintains the system. The solar photovoltaic (PV) system may be physically located on the offtaker's premises (onsite PPA) or located remotely from the offtaker (offsite PPA). In either case, a PPA is a financial mechanism that allows the offtaker to accrue many of the benefits of solar power without owning a system. The PPA conveys the economic benefits, and in some cases the environmental benefits, of solar power to the offtaker regardless of whether the power is physically delivered to serve the offtaker's electric demand.




Average offtaker rates for systems between 100 kW and 5 MW, by state and region in 2015. Regional figures based on non-weighted state averages. Data are a representative sample. *Source: Mercatus*

## PPAs: Key Components and Terms

**Assignability:** The ability of the project developer to transfer site rights to another party.

**Contract term:** The period during which the offtaker agrees to purchase power from the system owner.

**Escalator:** Contract clause under which the PPA price increases over time at a pre-determined rate, generally less than 3%.

**Expiration:** Conditions defining the offtaker's options at the end of the contract term, including whether the offtaker will have the option to purchase the system.

**Environmental attributes:** Contractual instruments representing the environmental attributes (renewable energy certificates) of the system's output.

**Liabilities:** The contract defines the obligations of the offtaker and the system owner for system maintenance, repair, or other liabilities arising from unforeseen events.

**Offtaker:** The purchaser of power and/or renewable attributes of the system.

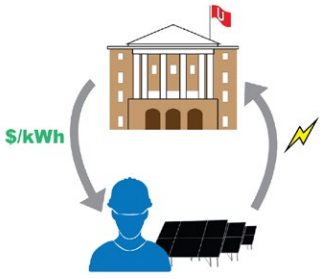
**Performance terms:** The PPA specifies the obligations of both the offtaker and system owner concerning the system's performance, including any exclusions under which either party is exempt from compliance with contract terms (e.g., force majeure events).

**PPA price:** The contract specifies the rate ($/kWh) at which the offtaker will pay the project developer for the system's output.

**Site right agreement:** Agreement defining the developer's rights to access and use the offtaker's property for project development, operation, maintenance, and decommissioning.

**Tax equity:** Capital raised from a taxable entity in return for the receipt of tax incentives.

## How Does a PPA Work?




The university (offtaker) buys power at a negotiated PPA rate ($/kWh) for a specified PPA term without taking ownership of the solar system. The project developer or a tax equity investor owns the system. The developer is responsible for all permitting, installation, maintenance, and decommissioning.

*Cover photos courtesy of University of California-Irvine, Colorado State University, Mount St. Mary's University, and Arizona State University.*

**NREL is a national laboratory of the U.S. Department of Energy,
Office of Energy Efficiency and Renewable Energy, operated by the Alliance for Sustainable Energy, LLC.**

## The PPA Process

### Step 1: Preliminary Assessment

Like any solar procurement process, the PPA process begins with a preliminary assessment of PV suitability on campus. Universities typically begin by studying whether PV is an economically viable option or whether PV is in line with other university goals. Universities can conduct preliminary site assessments to provide potential developers with information on proposed sites. Universities can use *NREL's System Advisor Model (SAM)* to perform preliminary assessments and work with NREL staff to identify cost effective solar options using *NREL's Renewable Energy Optimization (REopt)* tool.

### Step 2: Finding a Project Developer

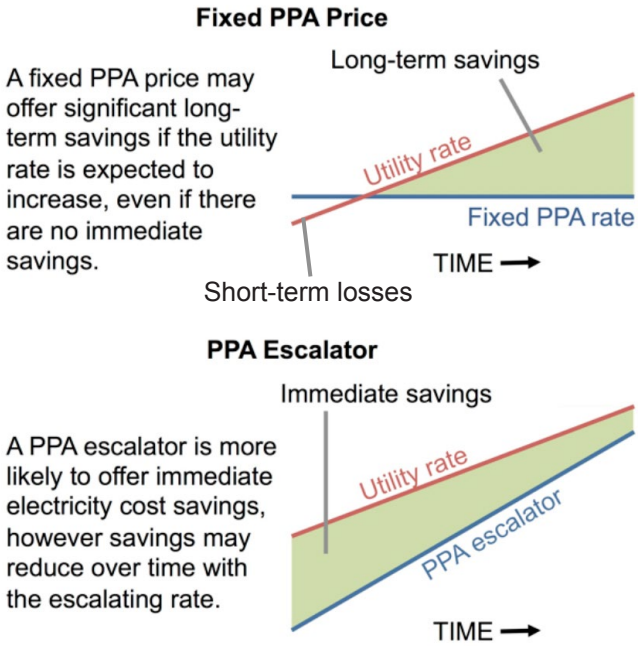
Offtakers typically use a Request For Proposal (RFP) to solicit competitive PPA bids. The RFP is one of the most important steps of the process as subsequent issues can arise if the RFP terms result in a PPA that does not satisfy the university's needs. RFPs must be sufficiently prescriptive but also flexible enough to ensure a successful RFP. Universities can identify which elements of the RFP terms will be negotiable and non-negotiable during PPA development. Universities may want to base their selection on developer's project development experience, financial stability, and willingness to provide performance guarantees, among other possible criteria.

### Step 3: PPA Negotiation

After a winning bid has been selected, the offtaker negotiates a long-term contract with the developer to purchase the system's power. The parties negotiate site rights (i.e., license, easement, or lease), the contract term, the PPA price structure, and the ownership of the environmental attributes of the project.

PPA contract terms generally range from 15 to 25 years, roughly in line with the expected lifetime of solar PV modules. The PPA typically specifies the offtaker's options at the end of the contract, which usually consist of contract termination and system removal, contract renewal, or the option to purchase the system at fair market value.

Determining a PPA pricing structure is a crucial step in the successful outcome of the PPA process. The objective of the PPA price structure can be maximizing long-term cost savings or immediate electricity cost savings. A fixed PPA price that is currently higher than the incumbent utility electricity rate may make sense if the utility rate is expected to increase above the fixed PPA rate some time in the future (the Energy Information Administration projects that average retail electricity prices will rise by about 0.6% per year over the next 25 years). A PPA escalator is another form of PPA price where the PPA price increases over time at some negotiated rate (generally less than 3%).




Last, PPA negotiation generally addresses ownership of the environmental incentives and attributes of the project embodied in renewable energy certificates (RECs). In order to claim to be using solar power, make environmental claims, and credit the renewable attributes towards one's greenhouse gas reporting, the university (offtaker) must receive and retain the associated RECs from the project. If the university wants to use their purchase towards their Climate Leadership Commitment goals or join the EPA's Green Power Partnership, they will need to retain ownership of the RECs. However, developer ownership of RECs may significantly improve project economics, depending on the market. For more information on RECs, see NREL's *Renewable Electricity: How do you know you are using it?*

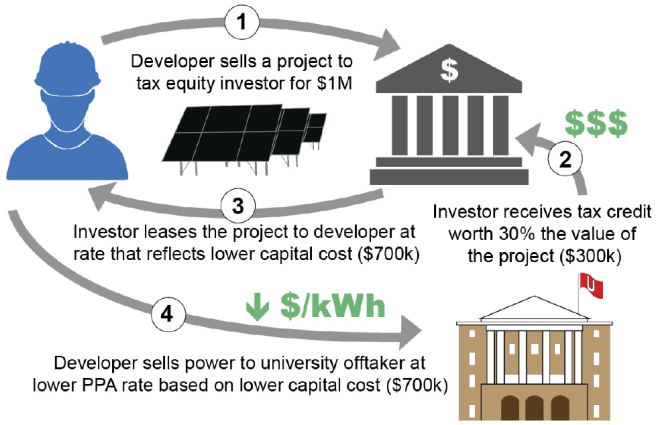
## Why Use PPAs? – Tax Equity

Several federal and state policies allow investors to reduce their tax liabilities in proportion to an investment in a solar project. Universities, as public agencies or 501(c)(3) non-profit organizations, generally do not pay taxes. Thus, university ownership of solar systems inevitably leaves "money on the table" in the form of un-monetized tax benefits. PPAs allow universities to benefit indirectly from tax incentives through lower electricity prices by using tax equity.

> "PPAs made the most sense for our large projects. As a nonprofit that cannot take advantage of tax incentives, we simply couldn't leave that much money sitting on the table."
>
> – Carol Dollard, Colorado State University (CSU). CSU signed a PPA for 5.3 MW in 2009.

Tax equity investors are taxable entities that fully or partially purchase solar projects in return for the receipt of tax incentives. Project developers either invest tax equity themselves or sell the system to a tax equity investor, who then monetizes the tax incentives (typically within five years). The tax equity investor leases the project to the developer at a lease rate that reflects the lower capital cost achieved through the tax incentives. The project developer can then pass the lower capital cost to the university offtaker via a lower PPA price.

**Tax Equity Example for a $1M Project**




> "PPAs are the model we use. There is no money up front. We don't need to bring in new in-house expertise. There is stable pricing."
>
> – Rick Coulon, University of California-Irvine. UC-Irvine has signed a 3.2 MW PPA.

### Primary Federal Tax Incentives

The federal solar investment tax credit (ITC) provides 30% of the value of an investment in a solar system. Following an extension in 2015, the ITC is set to ramp down in 2020 and will fall to 10% in 2022. Solar projects are also eligible for accelerated depreciation. Project developers can make deductions for the full basis of project cost (after accounting for the ITC deduction) within five years of project operation.

## Other PPA Benefits

***No up-front cost:*** PPAs allow universities to consume power produced from a solar system without tying up capital in a large up-front investment. The zero-up-front-cost makes PPAs an easier sell to university boards and financial planners concerned about returns on investments.

***No additional budgetary outlays:*** Existing budgetary outlays for electricity can be converted directly into PPA expenditures, thus PPAs do not require the creation of a new capital source to cover the solar investment. Further, PPAs do not require budgetary outlays for system operation and maintenance.

***Electricity price certainty and hedging opportunities:*** Long-term PPA contracts improve cost certainty in university budgets relative to volatile utility electricity rates.

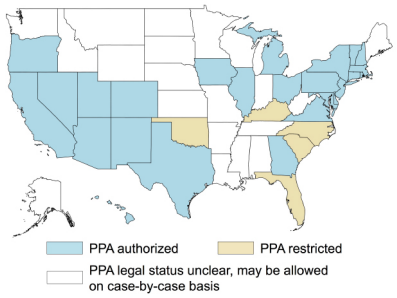
***Procedural simplicity and maintenance:*** PPAs allow universities to install solar without any requirement for in-house solar expertise. The project developer is responsible for all system interconnection procedures during installation and all maintenance during system operation.

## Challenges to PPAs

- PPAs are not available in all states (see next page)
- PPAs entail a learning curve for university staff
- Some university CFOs may be hesitant to enter into a long-term contract for power
- Low university creditworthiness can result in higher PPA prices.

## Where are PPAs Allowed?

State regulations limit or restrict non-utility providers from selling electric power in regulated electricity markets. Twenty-five states and Washington, D.C. have facilitated PPAs by clarifying that third-party system owners are not subject to regulation as a utility. Consult the *Database for State Incentives for Renewables and Efficiency* for the PPA policy in your state.




## Campus PPAs by the Numbers

Many campuses have already used PPAs to procure more than 100 MW of solar capacity. Below are some key numbers and figures that summarize universities' experience with PPAs to date.

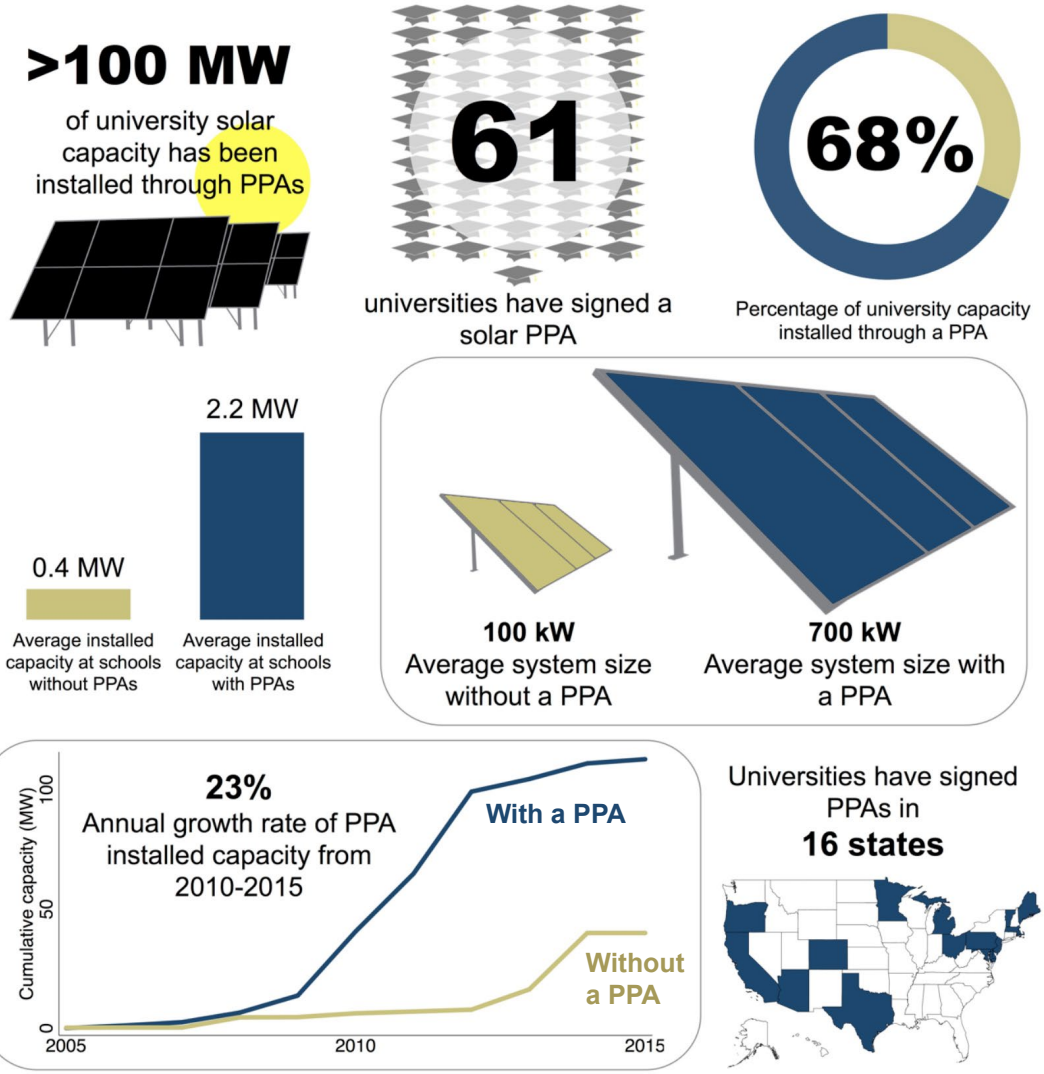



Figure based on data from The Association for the Advancement of Sustainability in Higher Education Campus Solar Photovoltaics Installation Database (2015). Data are self-reported and should be interpreted as a representative sample. Data represent PPAs both with and without offtaker ownership of RECs.

**National Renewable Energy Laboratory**
15013 Denver West Parkway
Golden, CO 80401
303-275-3000 • www.nrel.gov
NREL prints on paper that contains recycled content.

NREL is a national laboratory of the U.S. Department of Energy
Office of Energy Efficiency and Renewable Energy
Operated by the Alliance for Sustainable Energy, LLC
NREL/BR-6A20-65567 • January 2016