Introduction to Virtual Power Purchase Agreements

Agenda

- Overview of Green Power
- What are Power Purchase Agreements
- Virtual PPAs
- Case Study - Iron Mountain
- Question and Answer Session

- Guest Speaker – Kevin Hagen
  Director Corporate Responsibility
  Iron Mountain

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Webinar Objectives

- Provide an overview of how power purchase agreements – and specifically virtual power purchase agreements work
- Provide a case study from a prominent Green Power Partner on their experience with VPPAs

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Green Power Partnership Overview

- Summary
  - The U.S. EPA's Green Power Partnership is a **free, voluntary** program that encourages organizations to use green power as a way to reduce the environmental impacts associated with conventional electricity use.
- Objectives
  - Reduce U.S. greenhouse gas emissions
  - Expand the voluntary green power market
  - Standardize green power procurement as part of best practice environmental management
  - Provide recognition platform for organizations using green power in the hope that others follow their lead
- +1,400 Partners are purchasing >35 B kWh annually

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EPA's +1,400 Partners

What is Green Power

Biogas

Biomass

Wind

Solar

Low-Impact Small Hydro

Geothermal

- Subset of renewable energy - representative of resources and technologies that offer the highest environmental benefit
- Electricity generated from natural resources that replenish themselves over short periods of time, including the sun, wind, moving water, organic plant and waste material (biomass), and the Earth's heat (geothermal)
- Must be from "new" facilities placed into service within last 15 years or those that have been repowered
- Must be of the "voluntary" market
  - Incremental to or Above-and-beyond compliance market requirements (e.g., cannot be used for regulatory requirements)

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Green Power – Product Options

- Renewable Energy Certificates (RECs)
  - The environmental "attributes" of electricity generated from renewable resources (1 REC = 1 MWh)
  - Attributes are based on the generation technology type and age, geographic location, and time of generation
  - Does not include the underlying electrons – "unbundled"

- Green Power Electricity Products
  - Green power offered by utility suppliers that is generated from renewable sources
  - Is a "bundled" product that includes both the RECs and underlying electrons

- Power Purchase Agreement (PPA) for Renewables
  - Usually a long-term contract to procure RECs and underlying electrons from a specific project
  - Can be on- or off-site
- Owned On-site Generation
  - Install a renewable system on-site (e.g. solar panels, wind turbine)
  - Produces both electricity and RECs from the on-site source

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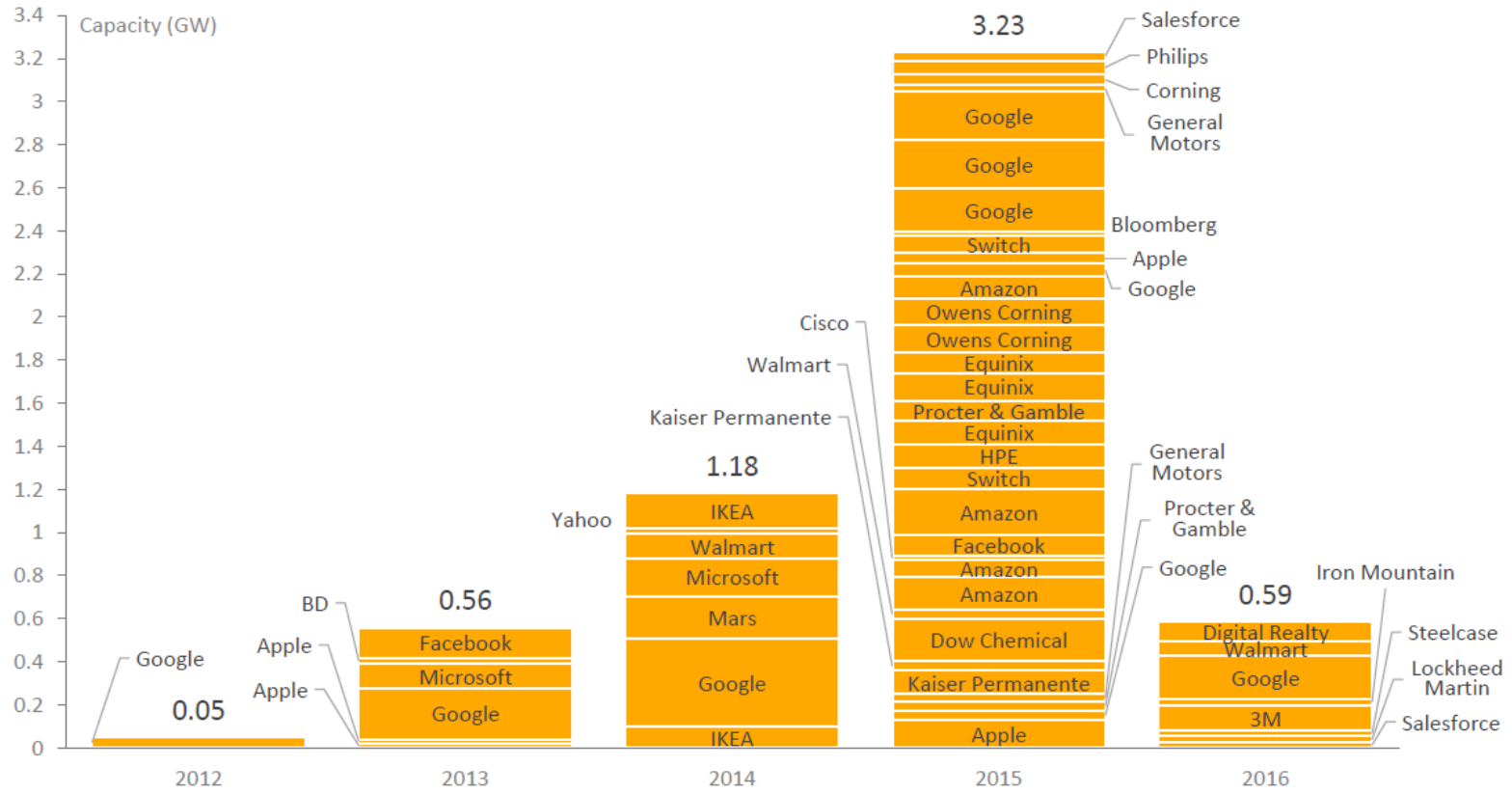
Corporate Renewable Energy Deals



Publicly announced contracted capacity of corporate Power Purchase Agreements, Green Power Purchases, Green Tariffs, and Outright Project Ownership in the United States and Mexico, 2012 – 2016. Excludes on-site generation such as rooftop solar PV. Last updated: July 14, 2016.

Credit: Rocky Mountain Institute.

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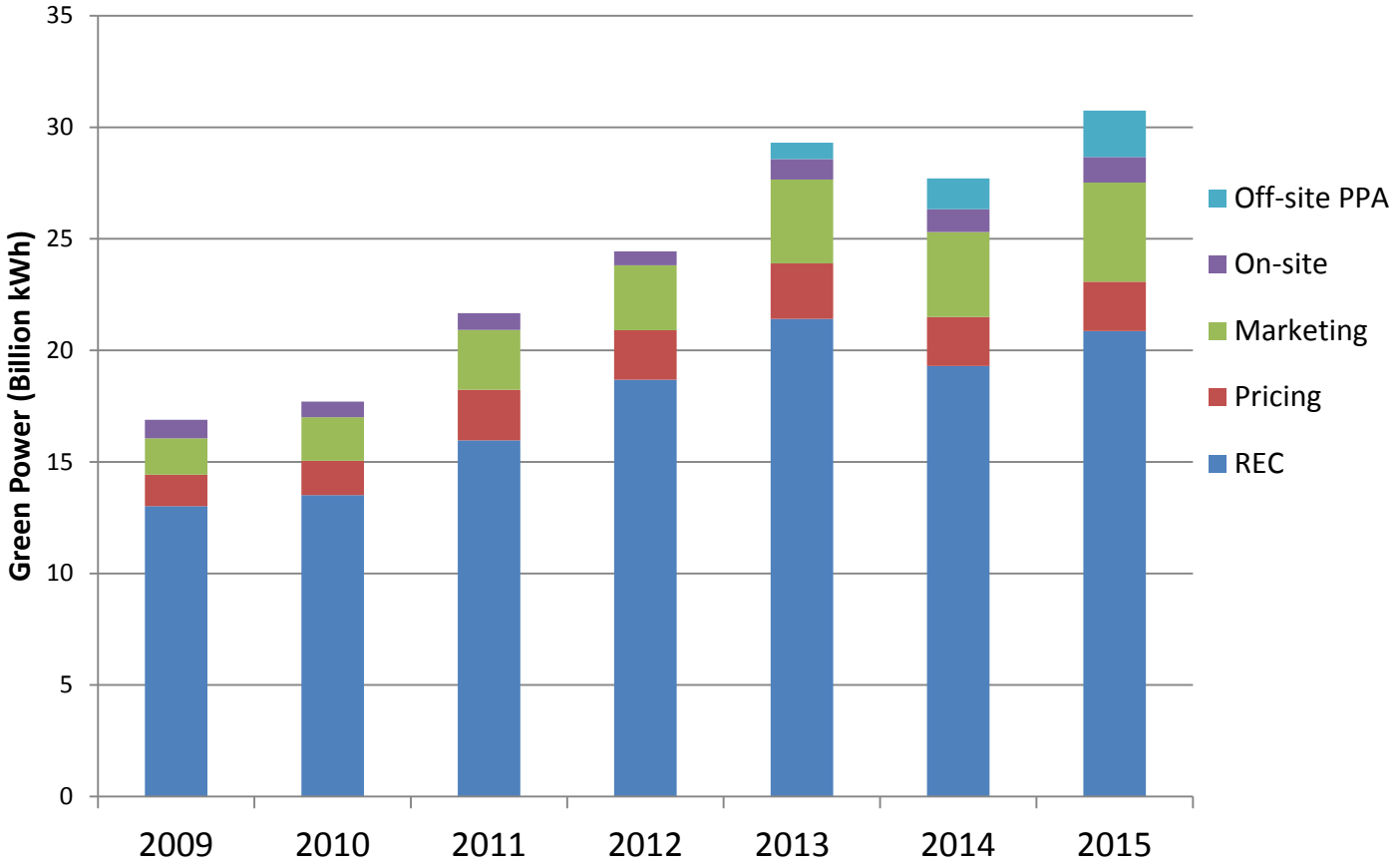
Partners' Green Power Use By Product Type



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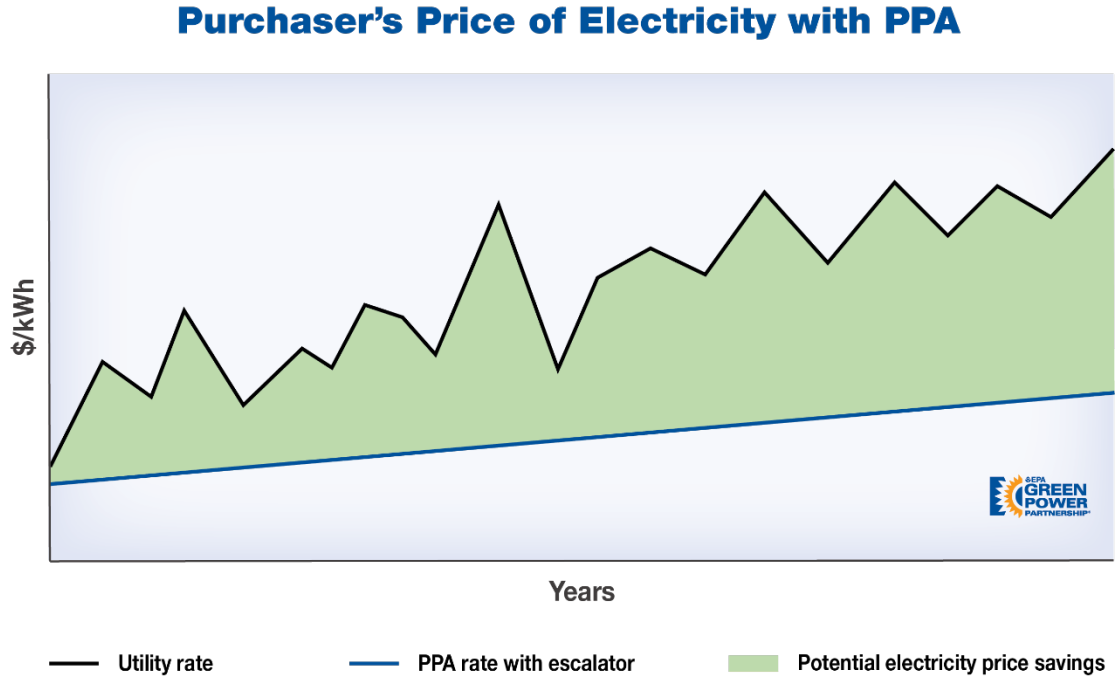
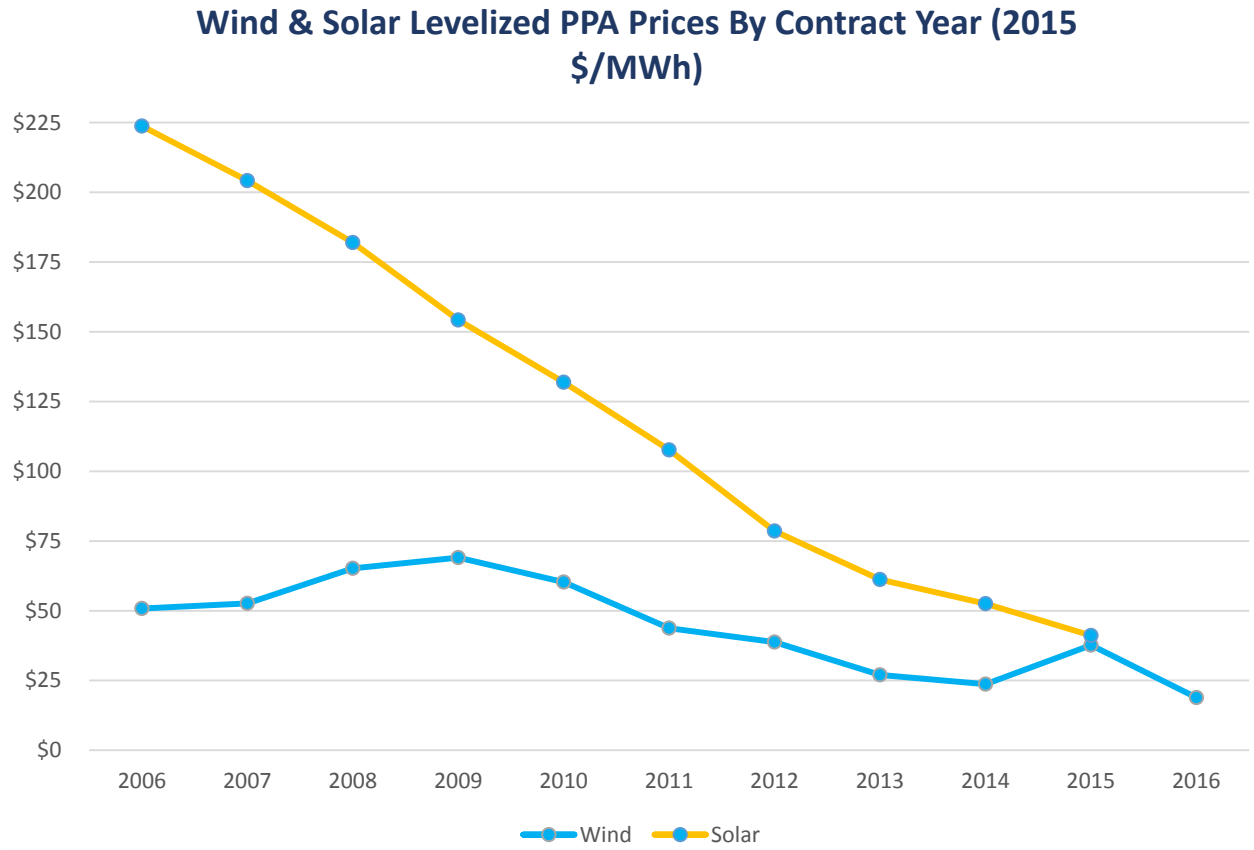
What are Power Purchase Agreements

- A type of contract that allows consumers, typically large commercial entities, to form an agreement with a specific energy generating unit.

- These types of contracts, typically secure a long term stream of revenue for an energy project by providing the energy off-taker a steady cost of electricity.



Wind & Solar PPA Prices



Credit: LBNL, “Utility Scale Solar 2015” and “2015 Wind Technologies Market Report”

Why are Institutions Turning to PPAs?

- Economics – cost savings and price hedge
- Potential to reduce carbon footprint (with REC ownership)
- Naming rights/branding opportunities with renewable energy facility
- Offer tangible, clear association with specific renewable energy facility
- Direct impact on new renewable energy supply (for PPAs with yet-to-be-built projects)

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Typical Characteristics of PPA Offtakers

- Large electricity user with dense load center (college campus or tech data center)
- Financial stability/credit-worthiness
- Focus on longer timeframes
- Willing to be “first mover”
- Looking to reduce carbon footprint
- Desire to directly create new renewable supply

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Types of PPAs

Physical PPA

- Power is “physically” delivered to buyer.
- Renewable energy project and buyer **must** be located in same grid region.
- Limited to states that permit direct retail access.

Virtual / Synthetic / Structured PPA

- Financially-settled arrangement between renewable energy project and buyer, with buyer owning RECs.
- Renewable energy project and buyer do not need to be in same grid region.
- Appealing to organizations in states that do not permit direct retail access.
- Appealing to buyers that have multiple load centers.

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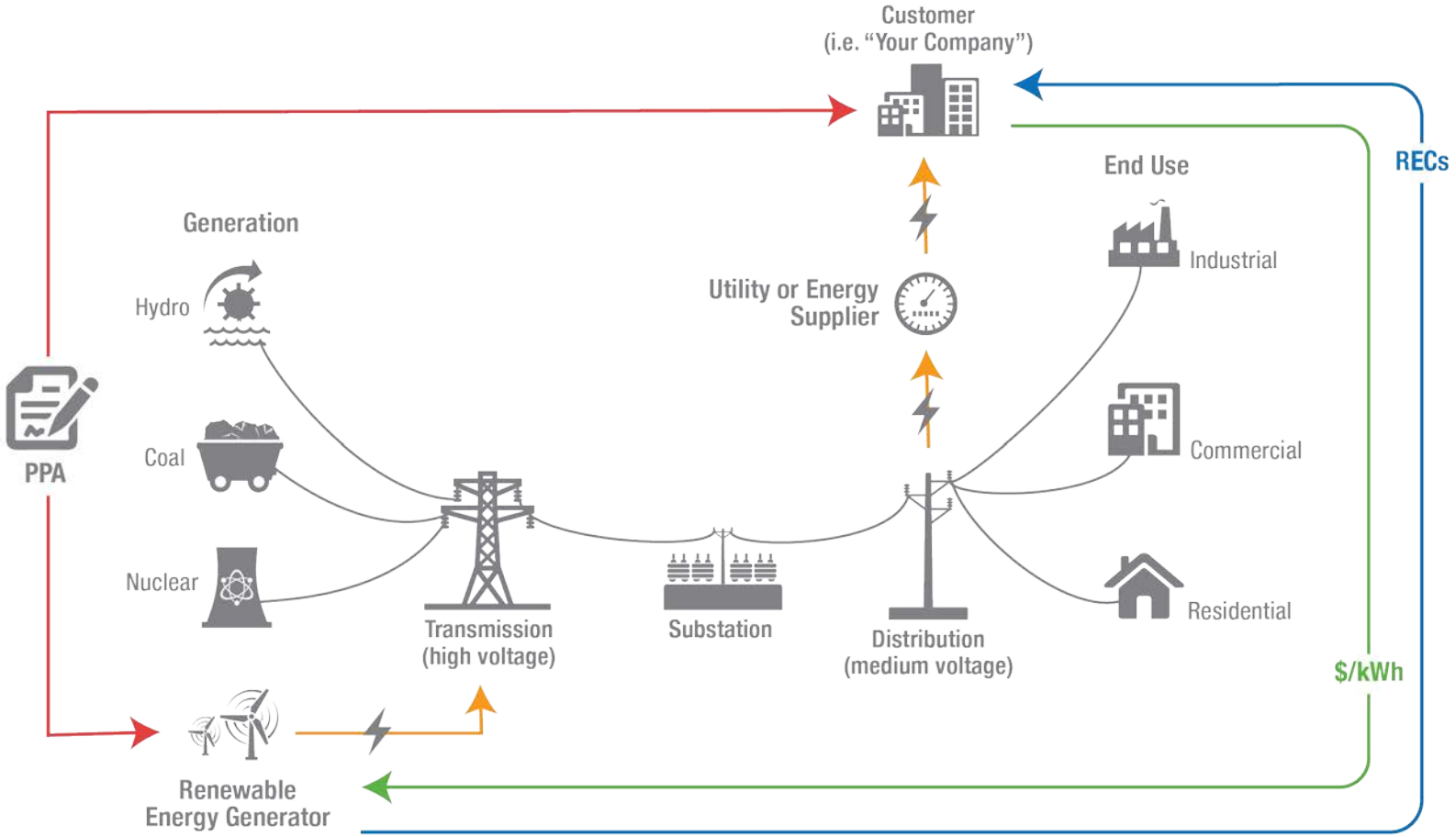
Physical PPA



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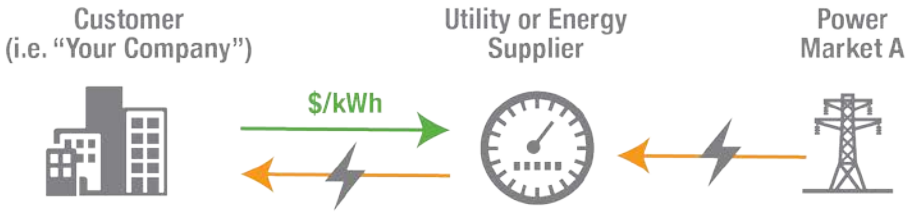
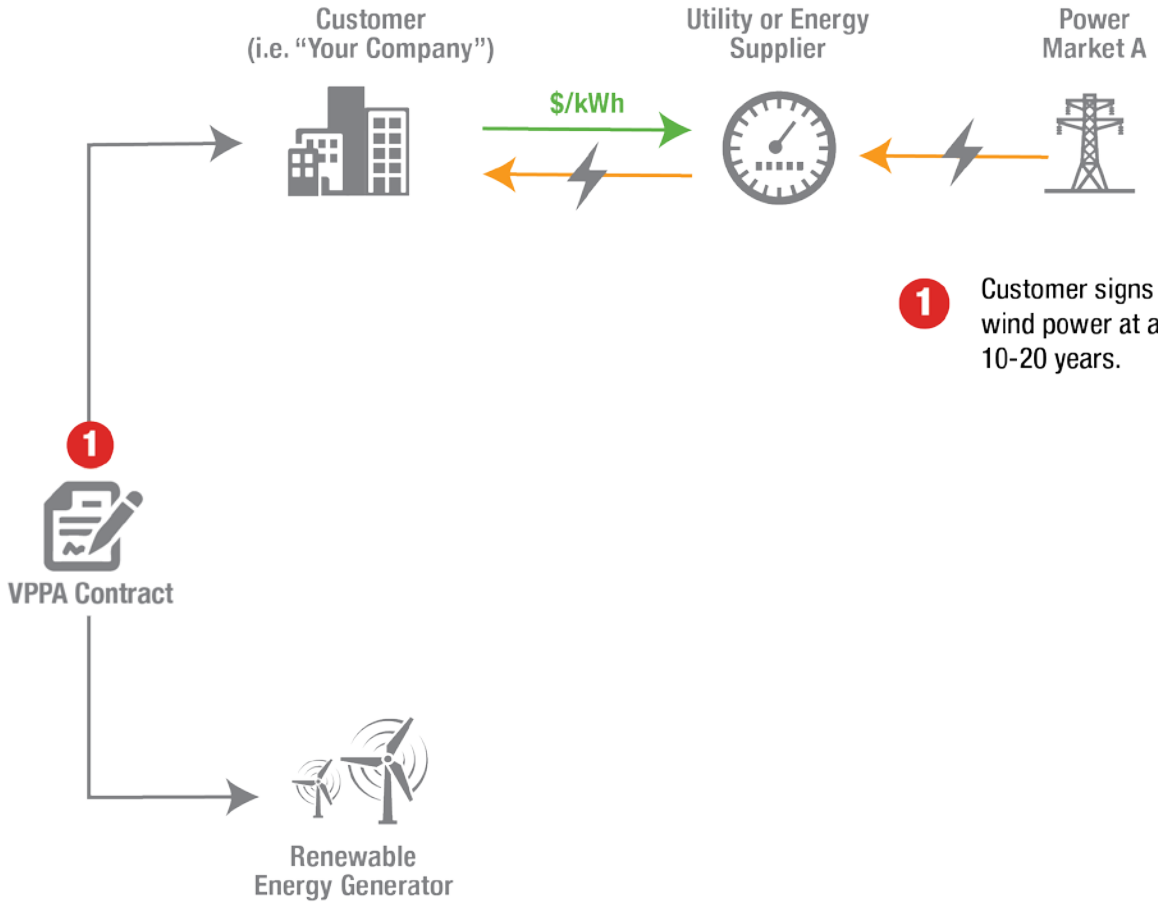
Virtual PPA

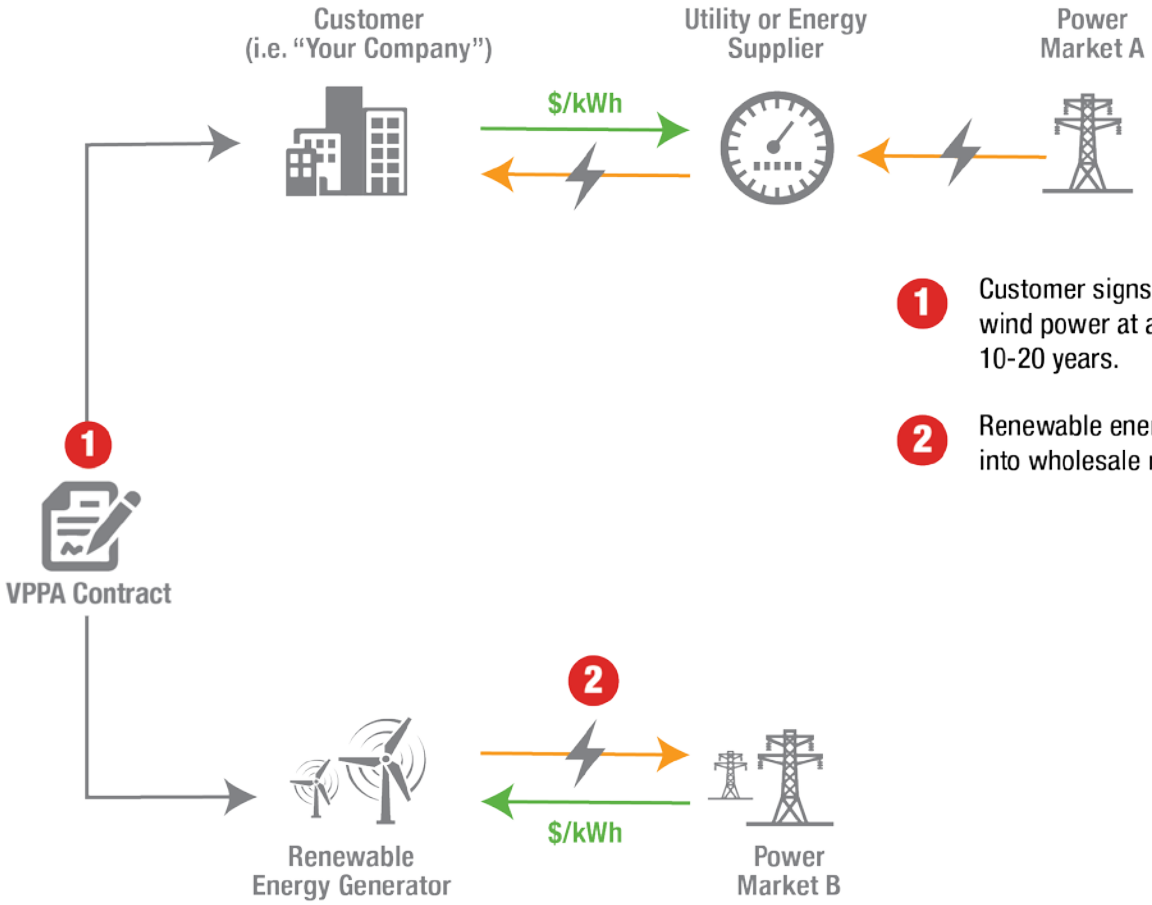

Customer
(i.e. "Your Company")
$/kWh
Utility or Energy
Supplier
Power
Market A

Virtual PPA



1 Customer signs VPPA with renewable energy generator for wind power at a fixed rate (i.e. strike price). Term is typically 10-20 years.

Virtual PPA



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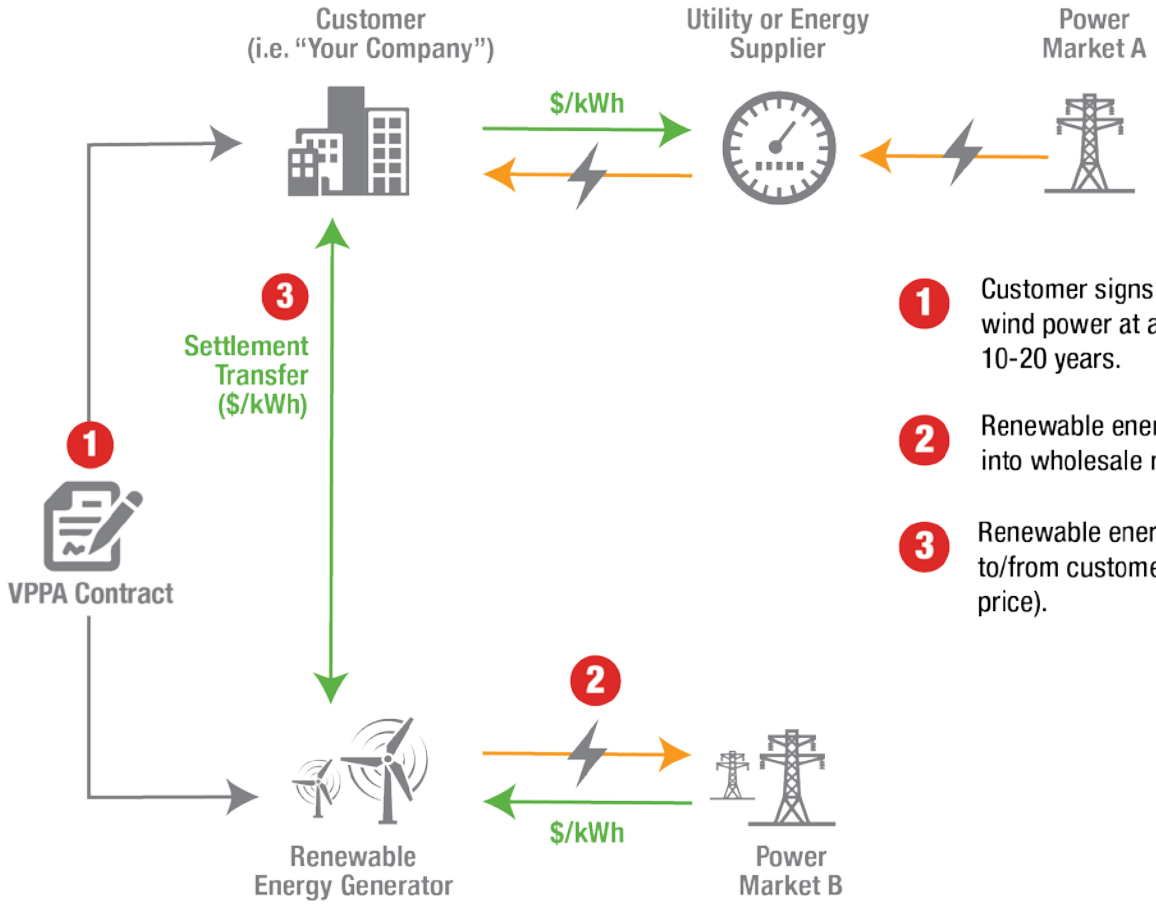
2. Renewable energy generator sells customer's null power into wholesale market and receives market price.

Virtual PPA



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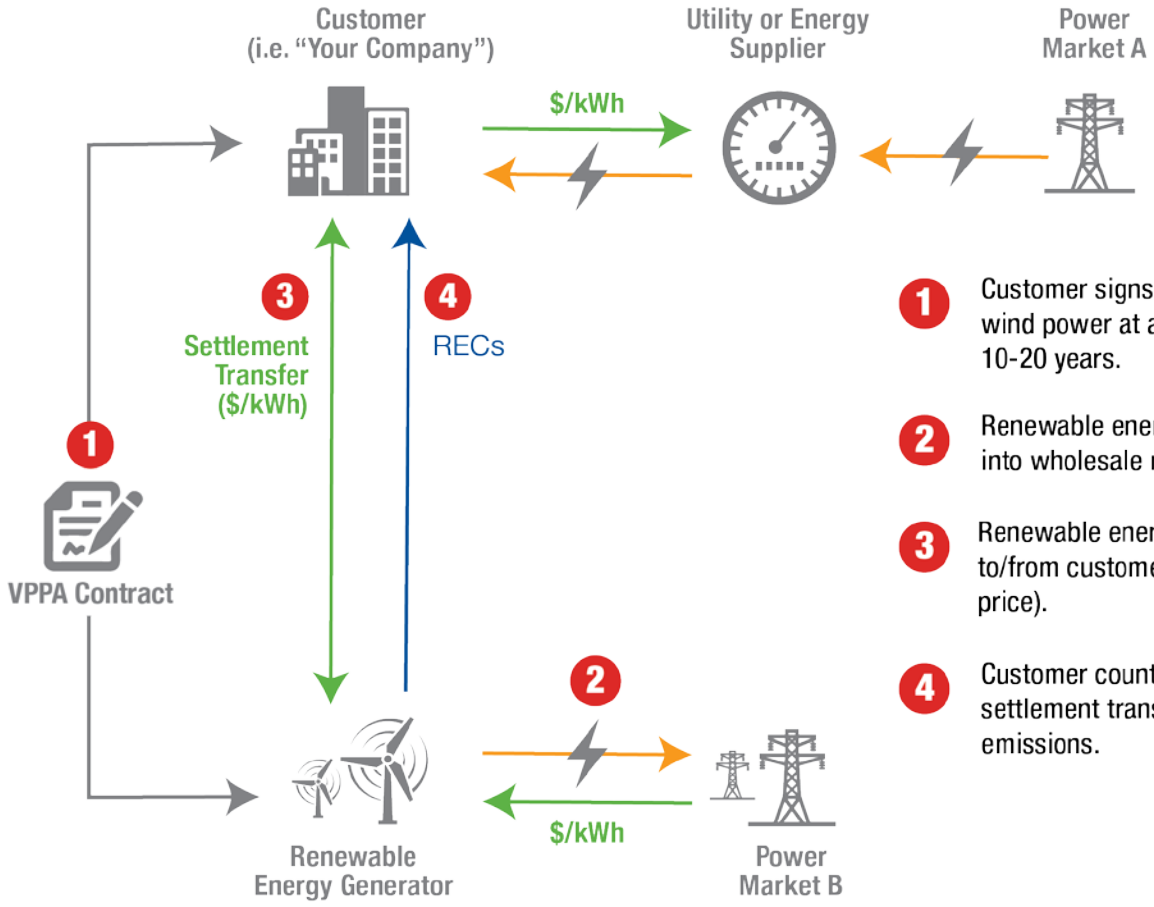
Virtual PPA



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4. Customer counterbalances utility payment for power with settlement transfer, and uses RECs to reduce scope 2 emissions.

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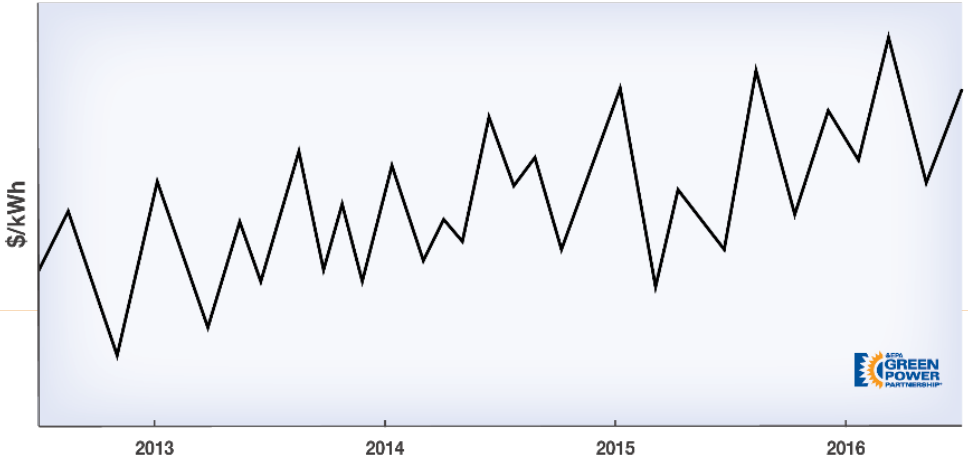
Company's Electricity Rate for Delivered Power



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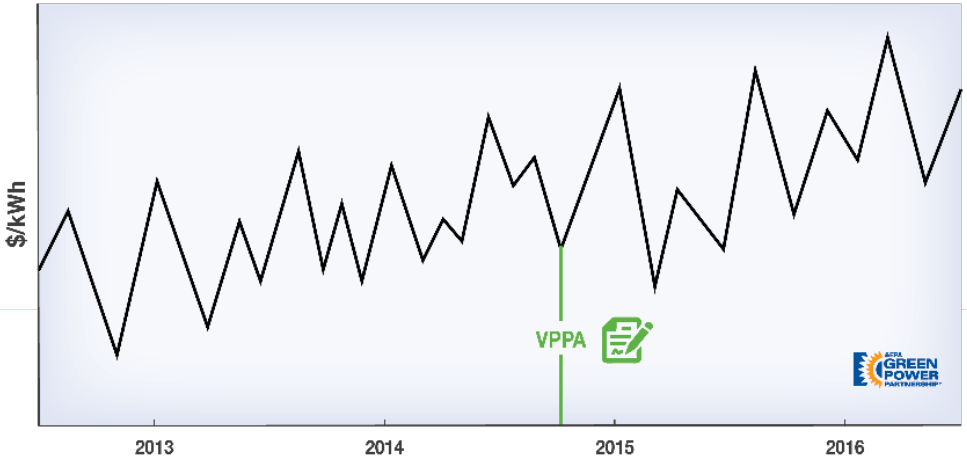

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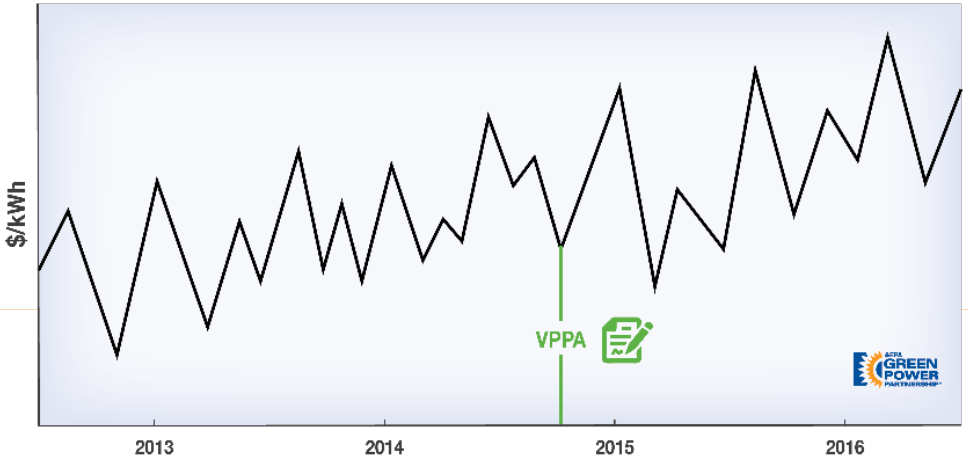
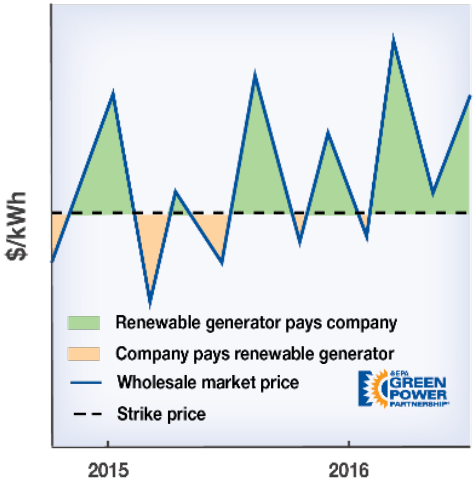


VPPA Transfer Settlement



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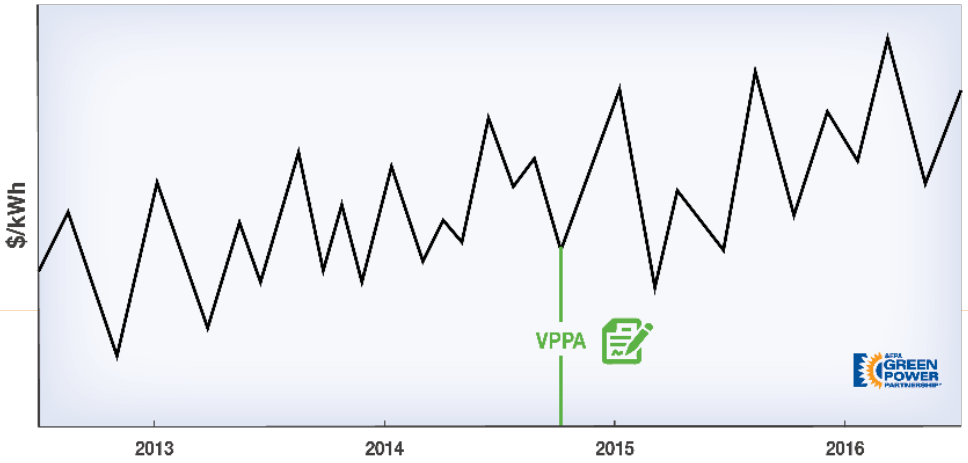

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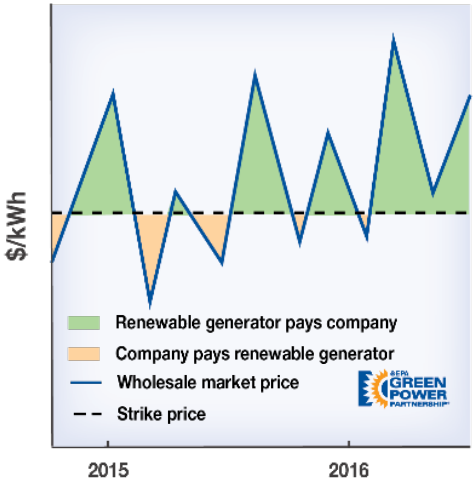
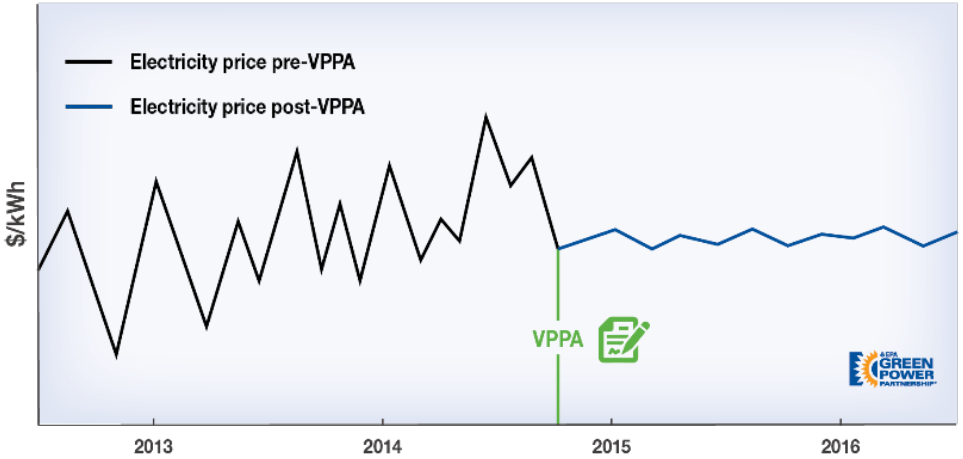


Company's Net Electricity Price with VPPA Hedge



Challenges and Risks of VPPAs

- Lack of in-house skills to negotiate VPPA
- Power price risk
- Effectiveness of hedge is contingent on correlation between power markets
- Counterparty credit risk
- Regulatory risk
- More difficult story to tell to stakeholders

Q&A Session

- An overview of Green Power Partnership is available on EPA's Web site www.epa.gov/greenpower

- More Questions?
  - Christopher Kent, 202-343-9046, kent.christopher@epa.gov

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