



# Risk Management Tools for Clean Energy Sellers & Clean Energy Buyers



# Managing financial risks for the clean energy economy

## Table of Contents

<b>Our Experience</b>	1
<b>Tools for Clean Energy Sellers</b>	
Power Purchase Agreement	3
Revenue Swap	4
Balance of Hedge	5
<b>Tools for Clean Energy Buyers</b>	
Settlement Guarantee Agreement	6
Volume Firming Agreement	7
<b>Settlement Index Details</b>	8

# Our Experience

**7GW**

of wind and solar generation protected

**923**

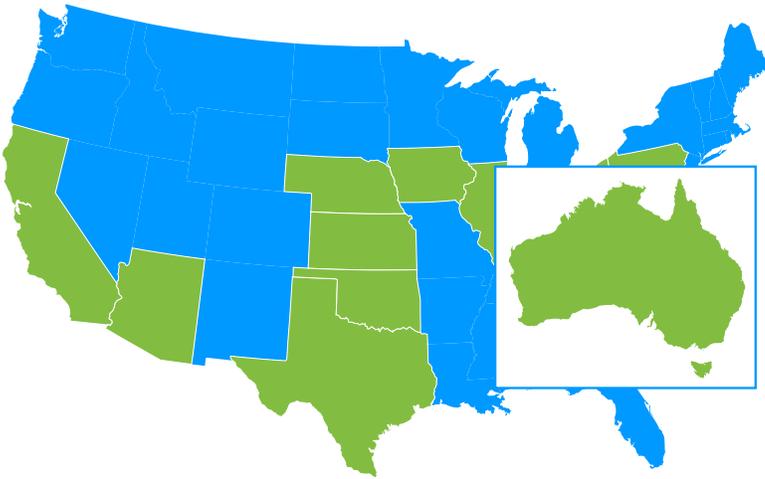
contract-months settled

**25**

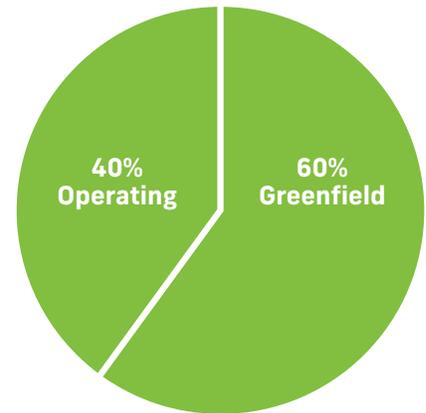
transaction counterparties

# Deployment of REsurety's Renewable Energy Risk Mitigation Products

Widespread Adoption:  
Deployed across 5 RTOs and Australia



Utilization by new build, operational and re-powered projects



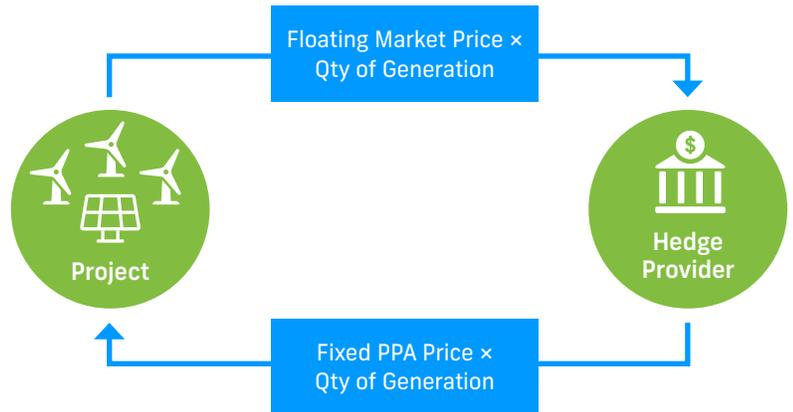
Publicly announced clean energy transaction counterparties include:



**T A A L E R I**

# Power Purchase Agreement

A virtual Power Purchase Agreement (vPPA) is a financially-settled, contract-for-difference hedging structure that provides a clean energy project with increased confidence in the value of power generated by the project (in \$ per MWh).



## Contract and Settlement Scenario Illustrations<sup>1</sup>

### Illustrative Contract

Fuel: Solar  
 Scale: 150MW (AC)  
 vPPA Price: \$25  
 Settlement Period: Qtly

### Settlement Scenario A

Generation: 130,000 MWh  
 Gen-Wghtd Price: \$21/MWh  
 Settlement: \$520k to Project  
 Project Net Revenue: \$3.25M (\$25 per MWh)

### Settlement Scenario B

Generation = 50,000 MWh  
 Gen-Wghtd Price = \$31/MWh  
 Settlement: \$300k from Project  
 Project Net Revenue: \$1.25M (\$25 per MWh)

<sup>1</sup> Settlement calculations assume hub pricing only and ignore hub-to-node price basis

See disclaimer on page 8

## Resulting Risk Allocation

<sup>2</sup> Project and Hedge Provider's exposure to Operational Performance depends on what settlement index is used.

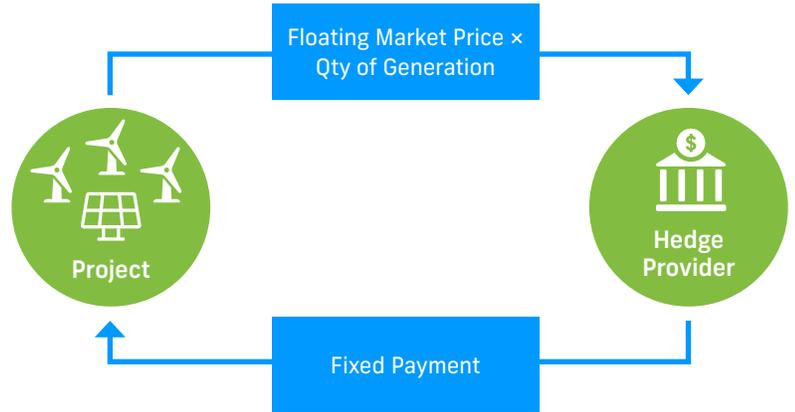
	Operational Performance <sup>2</sup>	Market Price (Hub)	Resource Volume	Resource Shape	Price Basis (Node-Hub)
<b>Project</b>	✓	○	✓	○	✓
<b>Hedge Provider</b>	✓	✓	✓	✓	○

## Additional Details

<b>Availability</b>	vPPA contracts can be provided for operational or greenfield wind and solar projects located in ERCOT, PJM, SPP, MISO, NYISO, or CAISO.
<b>Settlement Point</b>	vPPA contracts typically settle using hub or Zone prices and as such the project retains all exposure to node-to-hub price basis risk.
<b>Environmental Attributes</b>	vPPA contracts typically hedge the value of power only and as such the project retains ownership over all environmental attributes.
<b>Settlement Limits</b>	vPPA contracts may include bilateral settlement limits, but such limits are not typically required.
<b>Settlement Index</b>	vPPA contracts can settle using Proxy Generation or Metered Generation. If Metered Generation is used, Proxy Generation will be used to determine damages from project non-performance (such damages being subject to a materiality threshold and cap). See page 8.

# Revenue Swap

A Revenue Swap is a financially-settled, contract-for-difference hedging structure that provides a clean energy project with increased confidence in the value of revenue earned by the project (in \$ per settlement period).



## Contract and Settlement Scenario Illustrations<sup>1</sup>

### Illustrative Contract

Fuel: Wind  
 Scale: 200MW  
 Fixed Payment: \$3M  
 Settlement Period: Qtly

### Settlement Scenario A

Generation: 192,000 MWh  
 Gen-Wghtd Price: \$14/MWh  
 Settlement: \$312k to Project  
 Project Net Revenue: \$3.0M (\$16 per MWh)

### Settlement Scenario B

Generation = 118,000 MWh  
 Gen-Wghtd Price = \$28/MWh  
 Settlement: \$304k from Project  
 Project Net Revenue: \$3.0M (\$25 per MWh)

<sup>1</sup> Settlement calculations assume hub pricing only and ignore hub-to-node price basis

See disclaimer on page 8

## Resulting Risk Allocation

<sup>2</sup> Project and Hedge Provider's exposure to Operational Performance depends on what settlement index is used.

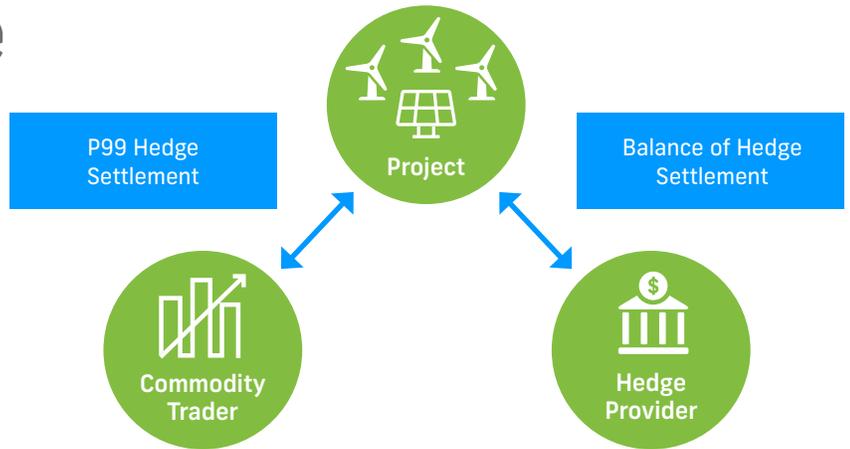
	Operational Performance <sup>2</sup>	Market Price (Hub)	Resource Volume	Resource Shape	Price Basis (Node-Hub)
<b>Project</b>	✓	○	○	○	✓
<b>Hedge Provider</b>	✓	✓	✓	✓	○

## Additional Details

<b>Availability</b>	Revenue Swap contracts can be provided for operational or greenfield wind and solar projects located in ERCOT, PJM, SPP, MISO, NYISO, or CAISO.
<b>Settlement Point</b>	Revenue Swap contracts typically settle using hub or Zone prices and as such the project retains all exposure to node-to-hub price basis risk.
<b>Environmental Attributes</b>	Revenue Swap contracts typically hedge the value of power only and as such the project retains ownership over all environmental attributes.
<b>Settlement Limits</b>	Revenue Swap contracts may include bilateral settlement limits, but such limits are not typically required.
<b>Settlement Index</b>	Revenue Swap contracts can settle using Proxy Generation or Metered Generation. If Metered Generation is used, Proxy Generation will be used to determine damages from project non-performance (such damages being subject to a materiality threshold and cap). See page 8.

# Balance of Hedge

A Balance of Hedge (BoH) contract is a financially-settled hedging structure that reduces or eliminates a clean energy project's exposure to the volume and timing of generation risk that is inherent to a traditional fixed volume swap energy price hedge, also known as a "Bank Hedge" or a "P99 Hedge". See our [white paper](#) on P99 Hedges. (Note: a BoH can be structured to hedge either to fixed \$ per MWh or fixed \$ per settlement period).



## Contract and Settlement Scenario Illustrations<sup>1</sup>

### Illustrative Contract

Fuel: Wind  
 Scale: 175MW  
 P99 Hedge Price \$25  
 BoH Fixed Payment: \$3.2M  
 Settlement Period: Qtly

### Settlement Scenario A

Generation: 170,000 MWh  
 P99 Hedged Volume: 136,000 MWh  
 Gen-Wghtd Price: \$17/MWh  
 P99-Wghtd Price: \$20/MWh  
 P99 Hedge Settlement: \$680k to Project  
 BoH Settlement: \$370k from Project  
 Project Net Revenue: \$3.2M

### Settlement Scenario B

Generation = 90,000 MWh  
 P99 Hedged Volume: 80,000 MWh  
 Gen-Wghtd Price: \$45/MWh  
 P99-Wghtd Price: \$57/MWh  
 P99 Hedge Settlement: \$2.56M from Project  
 BoH Settlement: \$1.71M to Project  
 Project Net Revenue: \$3.2M

<sup>1</sup> Settlement calculations assume hub pricing only and ignore hub-to-node price basis

See disclaimer on page 8

## Resulting Risk Allocation

<sup>2</sup> Project and Hedge Provider's exposure to Operational Performance depends on what settlement index is used.

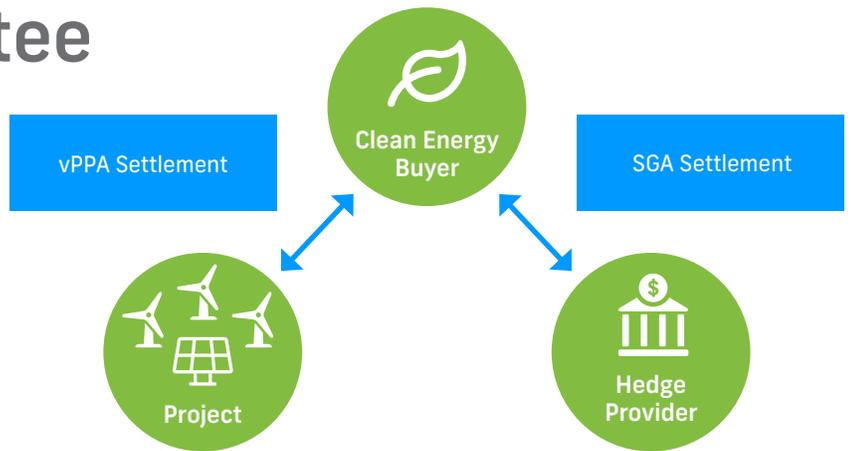
	Operational Performance <sup>2</sup>	Market Price (Hub)	Resource Volume	Resource Shape	Price Basis (Node-Hub)
Commodity Trader	○	✓	○	○	○
Project	✓	○	○	○	✓
Hedge Provider	✓	✓	✓	✓	○

## Additional Details

Availability	BoH contracts can be provided for operational or greenfield wind and solar projects located in ERCOT, PJM, SPP, MISO, NYISO, or CAISO.
Settlement Point	BoH contracts typically settle using hub or Zone prices and as such the project retains all exposure to node-to-hub price basis risk.
Environmental Attributes	BoH contracts typically hedge the value of power only and as such the project retains ownership over all environmental attributes.
Settlement Limits	BoH typically require bilateral settlement limits.
Settlement Index	BoH contracts can settle using Proxy Generation or Metered Generation. If Metered Generation is used, Proxy Generation will be used to determine damages from project non-performance (such damages being subject to a materiality threshold and cap). See page 8.

# Settlement Guarantee Agreement

A Settlement Guarantee Agreement (SGA) is a financially-settled, contract-for-difference hedging structure that provides a clean energy buyer (Buyer) with increased confidence in the future value of its vPPA settlements (can be structured to hedge either to fixed \$ per MWh or fixed \$ per settlement period).



## Contract and Settlement Scenario Illustrations<sup>1</sup>

### Illustrative Contract

Fuel: Wind  
 Scale: 75MW  
 vPPA Price: \$27  
 SGA Price: \$25  
 Settlement Period: Qly

### Settlement Scenario A

Generation: 90,000 MWh  
 Gen-Wgtd Price: \$15/MWh  
 vPPA Settlement: \$1.08 from Buyer  
 SGA Settlement: \$900k to Buyer  
 Net Settlement: \$2 per MWh from Buyer

### Settlement Scenario B

Generation = 60,000 MWh  
 Gen-Wgtd Price = \$35/MWh  
 vPPA Settlement: \$480k to Buyer  
 SGA Settlement: \$600k from Buyer  
 Net Settlement: \$2 per MWh from Buyer

<sup>1</sup> Settlement calculations assume hub pricing only and ignore hub-to-node price basis

See disclaimer on page 8

## Resulting Risk Allocation

<sup>2</sup> Project, Clean Energy Buyer and Hedge Provider's exposure to Operational Performance depends on what settlement index is used.

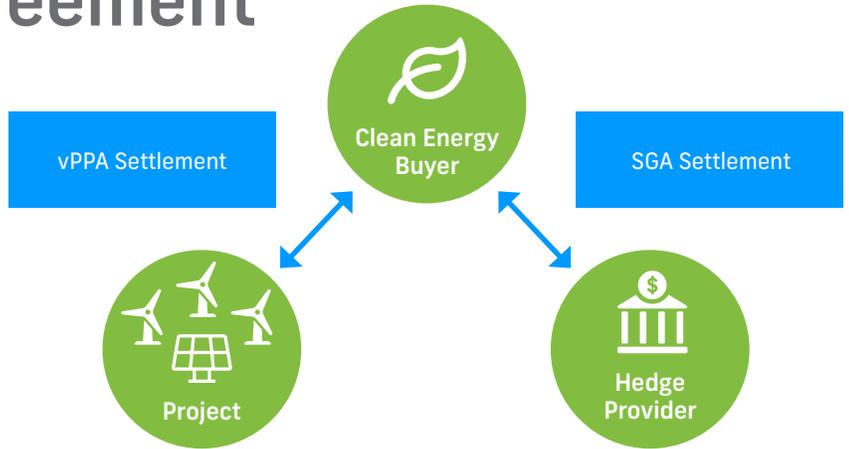
	Operational Performance <sup>2</sup>	Market Price (Hub)	Resource Volume	Resource Shape	Price Basis (Node-Hub)
Project	✓	○	✓	○	✓
Clean Energy Buyer	✓	○	✓	○	○
Hedge Provider	✓	✓	✓	✓	○

## Additional Details

Availability	SGA contracts can be provided for operational or greenfield wind and solar projects located in ERCOT, PJM, SPP, MISO, NYISO, or CAISO.
Settlement Point	SGA contracts typically settle using hub or Zone prices. This is expected to match the settlement point of the Clean Energy Buyer's original vPPA.
Environmental Attributes	SGA contracts typically hedge the value of power only and as such the Clean Energy Buyer retains ownership over all environmental attributes procured via the original vPPA.
Settlement Limits	SGA contracts may include bilateral settlement limits, but such limits are not typically required.
Settlement Index	SGA contracts can settle using Proxy Generation or Metered Generation. If Metered Generation is used, the contract term is expected to be more limited (3-5 year max vs. 10 year max for Proxy Generation settlement).

# Volume Firming Agreement

A Volume Firming Agreement (VFA) is a financially-settled hedging structure that provides a clean energy buyer (Buyer) with increased confidence in the future efficacy of its vPPA as a hedge on energy consumption costs by hedging the hourly mismatch between the volume of your company's energy consumption profile and the volume of energy generated by an intermittent clean energy project.



## Contract and Settlement Scenario Illustrations<sup>1</sup>

### Illustrative Contract

Fuel: Solar  
 Scale: 100MW  
 vPPA Price: \$20/MWh  
 VFA Price: \$22/MWh  
 Settlement Period: Qtly  
 Qtly Buyer Load (ATC): 60,000

### Settlement Scenario A

Generation: 75,000 MWh  
 Gen-Wghtd Price: \$30/MWh  
 ATC Price: \$27/MWh  
 vPPA Settlement to Buyer: \$750k  
 VFA Settlement from Buyer: \$450k  
 Net Cost of ATC Power: \$1.32M (\$22/MWh)

### Settlement Scenario B

Generation = 45,000 MWh  
 Gen-Wghtd Price: \$15/MWh  
 ATC Price: \$23  
 vPPA Settlement from Buyer: \$225k  
 VFA Settlement to Buyer: \$285k  
 Net Cost of ATC Power: \$1.32M (\$22/MWh)

<sup>1</sup> Settlement calculations assume hub pricing only and ignore hub-to-node price basis

See disclaimer on page 8

## Resulting Risk Allocation

<sup>2</sup> Project, Clean Energy Buyer and Hedge Provider's exposure to Operational Performance depends on what settlement index is used.

	Operational Performance <sup>2</sup>	Market Price (Hub)	Resource Volume	Resource Shape	Price Basis (Node-Hub)
Project	✓	○	✓	○	✓
Clean Energy Buyer	✓	✓	○	○	○
Hedge Provider	✓	○	✓	✓	○

## Additional Details

Availability	VFA contracts can be provided for operational or greenfield wind and solar projects located in ERCOT, PJM, SPP, MISO, NYISO, or CAISO.
Settlement Point	VFA contracts typically settle using hub or Zone prices. This is expected to match the settlement point of the Clean Energy Buyer's original vPPA.
Environmental Attributes	VFA contracts typically hedge the value of power only and as such the Clean Energy Buyer retains ownership over all environmental attributes procured via the original vPPA.
Settlement Limits	VFA contracts may include bilateral settlement limits, but such limits are not typically required.
Settlement Index	VFA contracts can settle using Proxy Generation or Metered Generation. If Metered Generation is used, the contract term is expected to be more limited (3-5 year max vs. 10 year max for Proxy Generation settlement).

# Settlement Index Options

## Method 1: Proxy Generation

Proxy Generation is a modeled value representing the volume of energy (in MWh) that a project should have produced each hour of a contract's term based on 1) the fuel measured or modeled at that location during that hour (e.g. wind speed, solar irradiance, etc.), and 2) the fuel-to-power conversion assumptions contracted at the time of execution of the relevant contract (e.g. power curve and turbine layout for wind, PVsyst model for solar, etc.). Proxy Generation is the settlement index preferred by hedge providers, especially when contracting directly with clean energy projects, due to the alignment of interests between parties and the resulting incentives for grid resiliency. Settlement on Proxy Generation minimizes the hedge provider's exposure to the financial risks caused by the project's operational decisions and performance.

## Method 2: Metered Generation

Metered Generation is a measured value representing the volume of energy (in MWh) that a project did produce during each hour of a contract's term, as measured by the revenue-grade meter relied upon by the relevant Independent System Operator. Metered Generation is the settlement index preferred by clean energy sellers as it

is considered simpler to track and audit and limits the project's financial exposure to non-performance of the project during periods of high prices.

## Method 3: Metered Generation w/ Proxy Generation-derived damages

Under this "hybrid" method, settlement calculations are based on Metered Generation but Proxy Generation is tracked in parallel in order to quantify the financial losses incurred as a result of a project's operational decisions and performance. In the event those operationally-driven losses surpass an agreed-upon materiality threshold, damages are charged by the hedge provider for losses above the threshold. However, such damages are subject to an agreed-upon cap such that the project's maximum exposure to damages is known and fixed. This settlement method achieves the hedge provider's goals of aligning interests and incentivizing resiliency while reducing the settlement calculation and audit complexity for the project (as the materiality threshold for damages are rarely exceeded) and eliminating the project's exposure to untenable risk from performance-driven losses (as damages are capped).

Contact us  
to learn more

If you have questions or would like to request the following:

- vPPA indicative quote
- Revenue Swap indicative quote
- Balance of Hedge indicative quote
- SGA indicative quote
- VFA indicative quote

Contact Us

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