
Renewable Energy Contracts

Issues in Valuation and Risk Measurement

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Renewables Market is Driven by Differing Goals

Major Goals of Participants

Producer

- ✓ Get Financed
- ✓ Monetize Tax Incentives
- ✓ Stabilize Cash Flow

Consumer

- ✓ Demonstrate Green Sourcing
- ✓ Meet Power Needs
- ✓ Stabilize Cash Flows

Conflicting goals between buyers and sellers are nothing new, but the differences can have major implications in the risks that are transferred.

	Producer	Consumer	Marketer
Shape	Sell	Can't Use	Price
Intermittency	Sell	Don't Want	Challenging
Term	Sell	Buy	Price
Basis	Node	Hub	Price
Credit	SPV	Corporate	Price
Operational	Sell	Don't Want	Challenging
Attribution	Sell	Mixed	Neutral

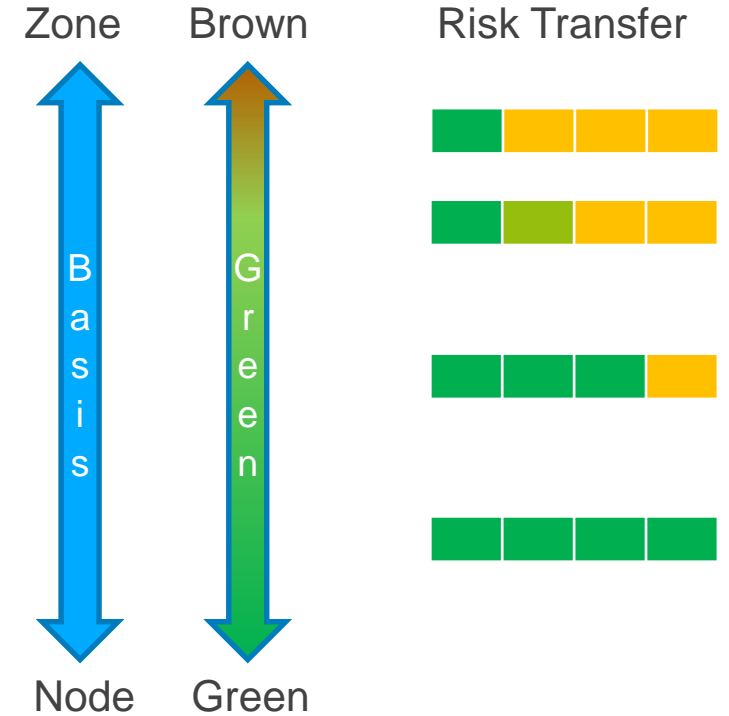
Risk Transfer by Various Products

Fixed Price Block PPA – A standard fixed volume Peak/Offpeak physical or financial hedge similar to what can be traded on an exchange with custom durations and credit provisions.

Fixed Price Shaped Hedge – A physical or financial hedge wherein the delivery volume is fixed, but tailored to certain months, seasons, or hours. The smaller the resolution of volumes, the more shape risk is transferred.

ProxyGen VPPA – A financial hedge that accounts for intermittency. Meteorological equipment is installed at the renewable generation site. The notional volume of the swap is determined hourly based on observed meteorological data and the engineering details of the asset. Shape and intermittency risk is transferred.

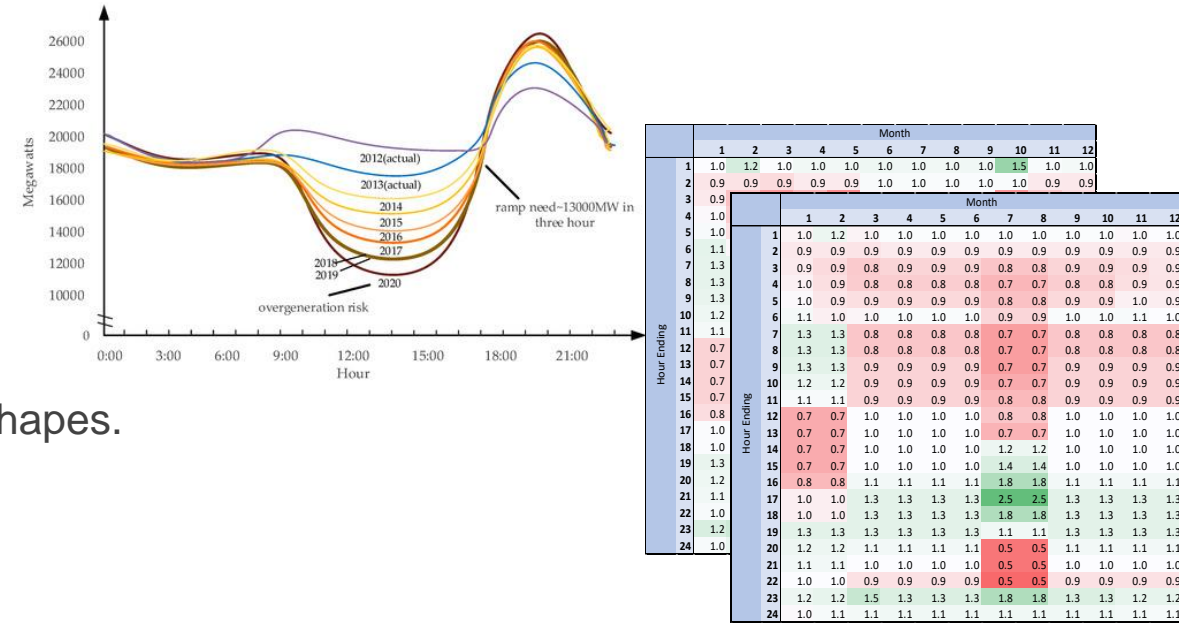
Full Unit Contingent PPA – Renewable power is sold at a fixed price in the amounts generated and delivered by the plant. Full price, shape, intermittency and unit contingent risk is transferred.



Challenges with Valuing Shaped Products

Pricing information can be hard to validate:

- Specific hours or sub-blocks do not trade very far forward.
- Past realized hourly pricing is not a good indication of future shapes.
- What fundamentals to introduce?



Common Products

RTC & Block: Standard pricing, often marketable but doesn't match output.

12 x 2: Not much different than block, but volumes are customized for each month of the contract.

12x24: Each hour of each month has a specified volume.

8760: Customized to every hour.

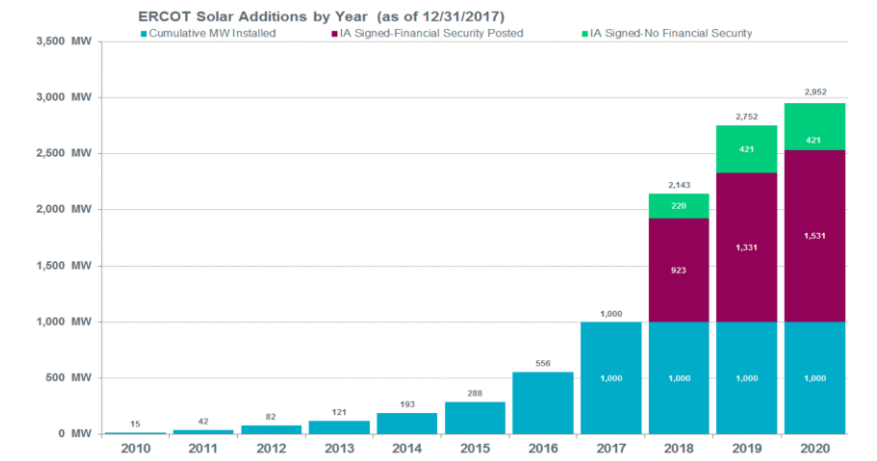
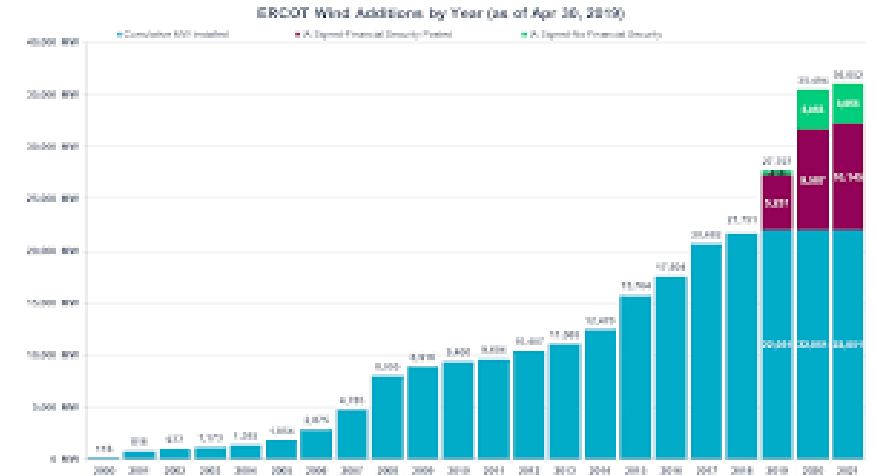
Risk measurement can be even more challenging:

- "Open Delta" represented by the hourly volumetric deviations from 5x16 and 7x8 averages.
- Each hour can have a different volatility.
- What to assume about correlations between hours, and the impacts of peak shifting?
- Can offsetting really be accomplished? Depends on contract structures.

Intermittency

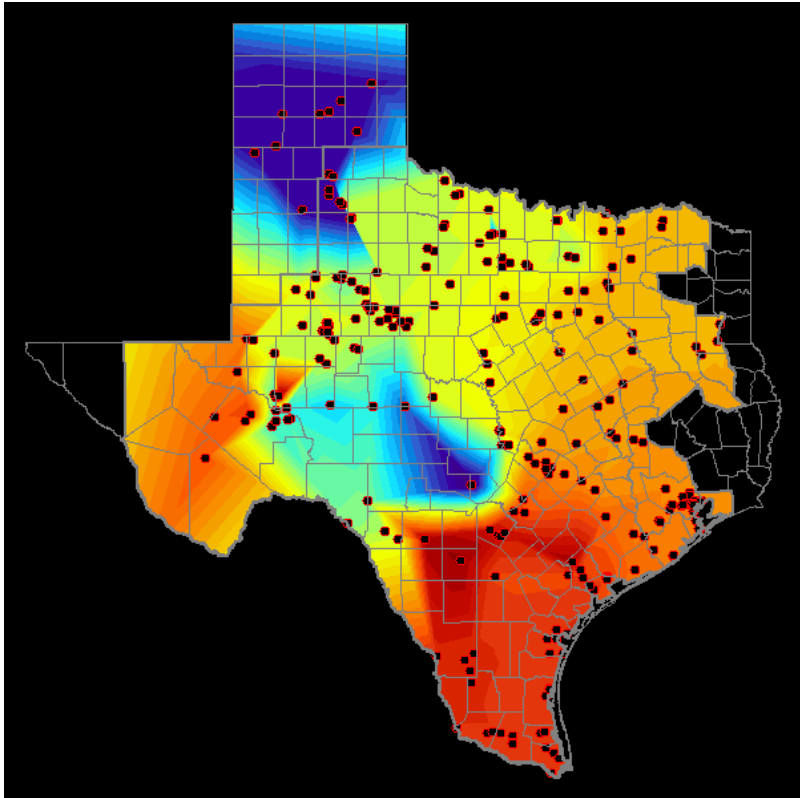
Intermittency is one of the more challenging aspects of renewable valuation and risk measurement.

- Intermittency is isolated from unit contingency as not all arrangements pass on unit contingency risk. Rather, intermittency refers to the inherent variability of renewable asset production caused by meteorological and physical factors.
- Intermittency results in a very difficult risk to manage - negative gamma. As renewable production fluctuates hour by hour, system prices vary in an inverse manner.
- This negative gamma will likely increase with greater renewables penetration.
- As a result, hedging decisions, pricing and risk measurement are very difficult.
- Alternatives include the use of options, use of dispatch models to determine the value of replacement energy, and conservative hedging.



Notes:
 - The data presented here is based upon the latest information provided to ERCOT by resource owners and developers and can change without notice.
 - Installed capacities for the current year account for changes reported by the facility owners during the reporting month, and will be reflected in subsequent years' totals.
 - Installed capacities include only solar facilities that have registered with ERCOT (Those larger than one megawatt and supply power to the ERCOT system.)
 - This chart reports annual planned units with projected Commercial Operations Dates throughout the calendar year. In contrast, ERCOT's Capacity, Demand and Reserves (CDR) report shows planned capacity projected to be commercially available on or before the start of the Summer and Winter Peak Load seasons.

Basis



Node vs. Hub?

- As transmission constraints emerge, the price of energy produced at remote nodes can differ significantly from hub prices.
- Contract structures will determine which counterparty bears this risk.
- Node-to-hub risk can be managed in the short term through CRRs and FTRs
- In the longer term, to assess and price risk, assumptions must be made about future grid conditions, plant additions, transmission projects, and load growth.
- Some participants will seek to transact in zones other than that in which the asset is located. This will introduce additional hub-hub basis risk.

Attribution


- A buyer's desired level of "Greenness" can impact contract structures and thus have implications on credit and risk.
- Buyers desired level of greenness can be set by any number of factors including stated environmental goals and marketing campaigns. Various rules for public companies may have an impact contract structure. Consider the following statements:

"We will reduce our effective carbon emissions by 80% within 5 years"

"We source 50% of our energy from a wind farm in Hattiesville, MD"

The first statement can be satisfied with RECs. The second requires a contract with a wind farm, and possibly balancing and other services.

Potential Structures

- 
- Brown/financial fixed price/fixed volume hedge
 - Brown w/RECs
 - Index green w/RECs, brown financial hedge.
 - Green fixed shape with rec's
 - Additionality – full unit contingent purchase with RECs and marketing rights.