**Background**

As renewable assets reach the end of their Power Purchase Agreements (PPAs), they transition into merchant market exposure where revenues are subject to volatile wholesale prices, congestion, and curtailment risk. Valuing the future output of these assets requires integrating historical performance and market price dynamics, a forward (or forecast) view of prices, and an analysis of the risk/volatility inherent to these elements to best determine a fair price for the asset’s future output. Your challenge is to design a **transparent, data-driven valuation framework** for merchant renewable energy pricing that can inform real-world hedging and risk management decisions.

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**Prompt**

You are part of a renewable developer portfolio team evaluating **three merchant assets** (two wind, one solar) in three different US markets where the PPAs have expired. Using the data provided (real-world data that has been anonymized), develop a methodology and model to determine the company’s willingness to trade merchant risk for a fixed-price offtake structure, and use this model to calculate the risk-adjusted price at which the company would be willing to recontract these assets for a 5-year period.

Please ignore things such as Capex, O&M costs, taxes, the value of capacity or Renewable Energy Credit (RECs), etc., for this exercise. The value of the future energy output is the only thing under consideration.

Your solution should be **quantitative, reproducible, and decision-oriented**.

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**Deliverables**

1. **Valuation Model that shows over the specified 5-year term (2026-2030):**
   * Expected generation (by month, peak and off-peak periods).
   * For each asset, four fixed prices for the term in $/MWh: real-time (RT) and day-ahead (DA) prices for both busbar and hub-settled products.
   * Prices should include a breakdown of their components (hub price, basis, and any other considerations) including:
   * Any risk adjustments that should factor into the final prices
   * Assume that the company’s risk appetite is P75, i.e., it wants to have a 75% probability that the fixed-price hedge will be better than merchant. Be prepared to evaluate other P-levels.
2. **Documentation & Assumptions**
   * Clearly state all assumptions.
   * Explain methodology for price forecasting and risk analysis.
3. **Code or Analytical Tool (if applicable)**
   * Submit via **GitHub repository** with:
     + README.md explaining methodology, setup, and execution steps
     + Organized scripts or notebooks for reproducibility
     + Environment file (requirements.txt or environment.yml)
4. **Presentation (ppt slide deck)**
   * Summarize approach/methodology, key assumptions, valuation results, and recommendations
   * Highlight risk drivers and actionable insights (e.g., key risks, potential mitigation measures, etc.)

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**Considerations**

* How do you handle volume and price risk?
* How do negative price events impact your analysis?
* How would your answers be impacted if the PPA customer will not take generation when prices are negative?
* Are some markets more amenable to hedging than others? Is there a market where staying merchant might be preferable to locking in a price for 5 years?
* Are there any other data that would have been useful?

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**Data Provided**

* Three years of historical hourly wind and solar generation data from three assets (2 wind and 1 solar) in 3 different markets - ERCOT, MISO, CAISO
* Corresponding historical hourly prices ($/MWh), RT and DA, at the assets’ busbars and reference hubs
* Monthly forward price curves, peak and off-peak periods, for the reference hub of each asset. Note that these forward curves represent the price for a fixed/flat 25 MW block of power.

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**Preparation Materials *(distributed 1–2 weeks prior)***

[What is a corporate renewable Power Purchase Agreement? | WBCSD](https://www.wbcsd.org/corporate-renewable-power-purchase-agreements-ppas/what-is-a-corporate-renewable-power-purchase-agreement/)

[Pricing-structures-for-corporate-renewable-PPAs.pdf](https://www.wbcsd.org/wp-content/uploads/2023/10/Pricing-structures-for-corporate-renewable-PPAs.pdf)

[What is a fair price for a PPA?](https://www.dnv.com/article/what-is-a-fair-price-for-a-ppa--186034/)

[Flexible assets & renewable energy risk management | McKinsey](https://www.mckinsey.com/industries/electric-power-and-natural-gas/our-insights/managing-risk-in-renewable-energy-portfolios-the-role-of-flexible-assets)

[2025 Renewable Energy Industry Outlook | Deloitte Insights](https://www.deloitte.com/us/en/insights/industry/renewable-energy/renewable-energy-industry-outlook.html)

[Valuation trends of renewable energy assets - WTW](https://www.wtwco.com/en-us/insights/2025/06/valuation-trends-of-renewable-energy-assets)

[Hedging Strategies to Optimize Merchant Energy Porfolio Performance](https://www.ascendanalytics.com/blog/hedging-to-mitigate-power-market-forecast-risk)

[Solar PPA market remains stable in Q1 2025 – pv magazine USA](https://pv-magazine-usa.com/2025/04/24/solar-ppa-market-remains-stable-in-q1-2025/)