



Q1

PPA Price Index





LEVELTEN ENERGY

PPA Price Index

Q1 2019



Q1 2019 Report Overview

The LevelTen Q1 2019 PPA Price Index is the fourth edition of this report. To bring more transparency to the market, every quarter, LevelTen Energy provides an in-depth look at PPA offer price averages submitted through the LevelTen Marketplace, for both wind and solar projects, in five independent system operator (ISO) regions, including CAISO, ERCOT, MISO, PJM and SPP.

This quarter, in addition to reporting on *how much* prices have changed, we also examined *why* they changed. We conducted a survey of renewable energy project developers to find out which market factors impacted their offer prices the most. We also explored whether or not changes to federal tax credits would affect future renewable energy project development. Read on for the results.

Renewable Energy Market Developments: Q1 2019

We identified six major market developments that could increase or decrease wind and solar PPA offer prices in Q1 2019 (summary below). To find out which of these market factors impacted prices

the most, we conducted a survey of all active wind and solar developers in the U.S. and Canada on LevelTen's Marketplace, and received 40 responses. The results of that survey follow.

Changes in Engineering, Procurement & Construction Costs

The cost of wind turbines is generally declining, although iron and steel tariffs have tempered that decline slightly. Similarly, while the cost of solar panels has declined dramatically over the past five years, the impending Investment Tax Credit phase-down has increased demand for panels, resulting in higher costs for developers who have not yet secured panels.

Increased Competition Among Developers

There was a 17% increase in the number of active projects submitted to the LevelTen Marketplace from Q4 2018 to Q1 2019. More active projects in the Marketplace means that developers are facing more competition from other developers, which could contribute to continuing price declines.

Emerging PPA Structures & Deal Terms

C&I buyers are incorporating more risk-mitigating structures into their PPAs, and these terms, including \$0 price floors and collars, increase risk for developers. In response, developers may add premiums to their PPA price offers. Another dynamic we observed throughout 2018 and into Q1 2019 is the proliferation of attractive financial hedge opportunities for solar projects in markets such as ERCOT and PJM, which put upward pressure on C&I PPA prices.

Increased Demand from Corporations

Corporations are continuing to invest in renewable energy through PPAs. In Q1, we saw PPA announcements from companies spanning multiple industries, including Facebook, General Mills, Microsoft, The Home Depot and the deal that LevelTen facilitated with Bloomberg, Cox Enterprises, Gap Inc., Salesforce and Workday. This increased demand could lead to higher prices.

Increased Demand from Utilities

Many states have passed Renewable Portfolio Standards, with deadlines spanning from 2020 to 2040. To meet these standards, utilities are entering into PPAs with renewable energy projects at increasing rates. The increased demand could lead to increased prices.

Tax Credit Expiration/Reductions

The Production Tax Credit (PTC) will expire in 2020 for wind projects that have not commenced construction by 2019. For solar projects, the Investment Tax Credit (ITC) will be reduced from 30% in 2019 to 26% for projects that commence construction in 2020. While these changes could be expected to raise PPA prices, potentially slowing development altogether, the elimination of tax equity investors from a project's capital stack is anticipated to reduce capital costs and soften the PPA price impact.



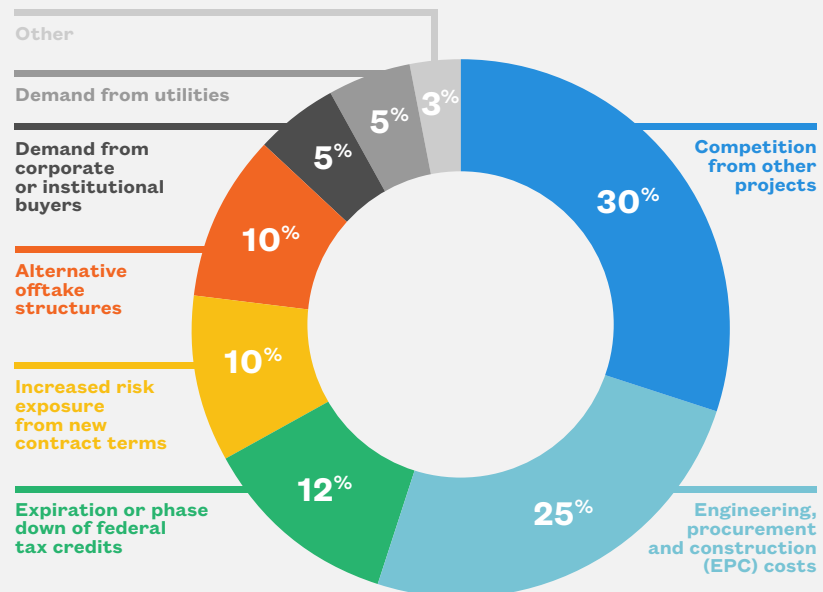
Q1 2019 Developer Survey


To understand a project developer's perspective on why PPA prices have decreased in four out of five ISOs, we sent a survey to all of the active project developers on the LevelTen Marketplace, and received 40 responses. This quarter, we wanted to know two things:

1. What had the largest impact on your PPA offer price(s) in Q1 2019?
2. Do you expect the phase down/expiration of federal tax credits to decrease the number of projects you commence construction on in 2020 and beyond?

Market Forces that Impacted PPA Offer Prices

What had the largest impact on your PPA offer price(s) in Q1 2019?





Based on the survey results, there wasn't a clear market factor that had the largest impact on PPA offer prices, although "competition from other projects" took the lead at 30%. The Investment Tax Credit phase down may play a role in this; many solar developers are scrambling to commence construction in 2019, before the credits are reduced.

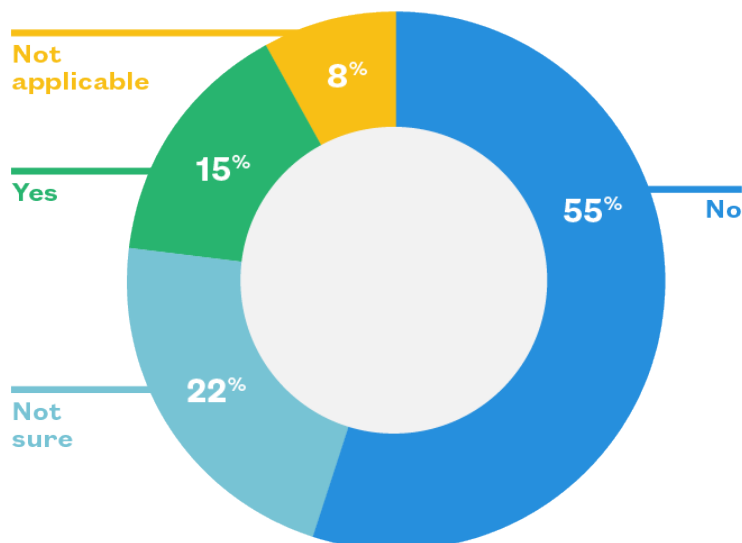
"We are seeing an increasing number of solar projects submitting requests to utilities to connect to the grid, and competition to interconnect and to sell electricity is increasing," said Henry Weitzner, chief executive officer, Walden Renewables. "This is an ideal time for renewable electricity buyers to take advantage of a strong and growing supply of solar projects."

Here are a few other conclusions from the survey:

- 25% of respondents said that a "change in engineering, construction and procurement (EPC) costs" had the largest impact.
- 10% of respondents said increased risk exposure from new contract terms had the largest impact. Examples of the types of contract terms that increase risk for developers include market (floating) price floors and ceiling (collar) structures, non-settlement thresholds, shorter tenors, proxy generation calculation of production and hub settlement basis risk.
- Another 10% of respondents said alternative offtake structures had the largest impact on prices. These alternative offtake structures provide greater optionality in revenue sources for project developers, thereby increasing their opportunity cost of entering into a PPA with a corporate or institutional buyer. Examples of alternative offtake structures include financial hedges, proxy revenue swaps, revenue puts, and merchant exposure.
- Only 10% of respondents said that demand from utilities or corporate/institutional buyers had the largest impact.
- 12% cited the expiration or phase down of federal tax credits for wind and solar projects as the largest factor. "As we prepare for the step down in ITC at the end of 2019, everything we are quoting at the utility-scale level is seeing an uptick in price because the development cycle for utility scale projects is 2-3 years, so by the time the project is ready to achieve its commercial operation date, we are assuming the step down will take effect, impacting the economics of the deal," said Boris Feldman, managing partner, Base Energy. "The increase in demand doesn't help offset the real cost of the reduction of the tax credit. The decrease in balance of system (BOS) cost is certainly a consideration, but all of the indicators we are seeing today are actually pointing in the opposite direction. Module prices are increasing as a result of the final year of 30% ITC rush, as are engineering, procurement and construction (EPC) and BOS costs."

Changes to Federal Renewable Energy Tax Credits

Do you expect the phase down of federal tax credits to decrease the number of projects you commence construction on in 2020 and beyond?



The PTC and the ITC both expire for large wind projects in 2020. For solar projects, the ITC will be reduced from 30% in 2019 to 26% in 2020. This has left many people wondering what the impact will be on future wind and solar development in the U.S. According to our survey, the tax credit changes may not have a dramatic impact on the rate of project development. 55% of respondents said that the changes would NOT decrease the number of projects they commence construction on in 2020 and beyond.

“We believe the demand for renewable energy projects and the demand for renewable electricity will continue to grow strongly. That demand growth will not be

stopped by the step down in investment tax credits. The market will adjust to a lower tax incentive by reducing financing and construction costs. Also, PPA pricing will move higher,” said Weitzner.

Only 15% said the tax credit phase down would decrease the number of projects they commence in 2020 and beyond, and 22% said they aren’t sure yet. For 8% of respondents, the question wasn’t applicable, because they operate in Canada.

The results have left us hopeful that other market forces – like lower costs and rising demand, will temper the effects of the tax credit changes on renewable energy development.



About the LevelTen Energy PPA Price Index

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Leveling The Playing Field

Power purchase agreement (PPA) prices have historically been shrouded in secrecy—adding yet another hurdle to a complex transaction process. We're creating unprecedented transparency by sharing data on projects featured in the LevelTen Marketplace to help developers make informed pricing decisions and sellers identify the best projects to service their sustainability goals.

Digging Deeper With Data

What's in the LevelTen PPA Price Index? A customized report detailing PPA pricing averages, broken down nationally and across independent system operators (ISOs), and split by wind and solar.

Regional Data

The PPA Price Index includes prices for the following ISOs:

- **CAISO:** California Independent Service Operator
- **ERCOT:** Electric Reliability Council of Texas
- **MISO:** Midcontinent Independent System Operator
- **PJM:** PJM Interconnection
- **SPP:** Southwest Power Pool

Stay In The Know

Up-to-date data is always the most useful—so we've committed to publishing our PPA Price Index on a quarterly basis. However, PPA prices represent only a fraction of the data required to effectively evaluate PPA opportunities. For real-time analysis of project value and risk, cash flow modeling, price curves and more, please request credentials to the LevelTen Marketplace at leveltenenergy.com/marketplace.

Q1 2019 PPA Price Index Overview

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To determine how PPA offer prices have shifted from Q4 2018, we analyzed data on 1,100+ price offers from 340+ renewable energy projects across the country.

The following are a handful of key takeaways from Q1 2019:

- Across markets, an evenly-weighted index of P25 wind and solar prices decreased \$0.39/MWh, or 2.3% quarter-over-quarter.
- Solar prices decreased in all markets except MISO, with the largest decreases coming from CAISO, PJM and ERCOT, and only moderate decreases in SPP.
- Wind prices also decreased, but not as significantly as solar prices. ERCOT and SPP saw material decreases in their prices, while CAISO, MISO and PJM saw slight increases.

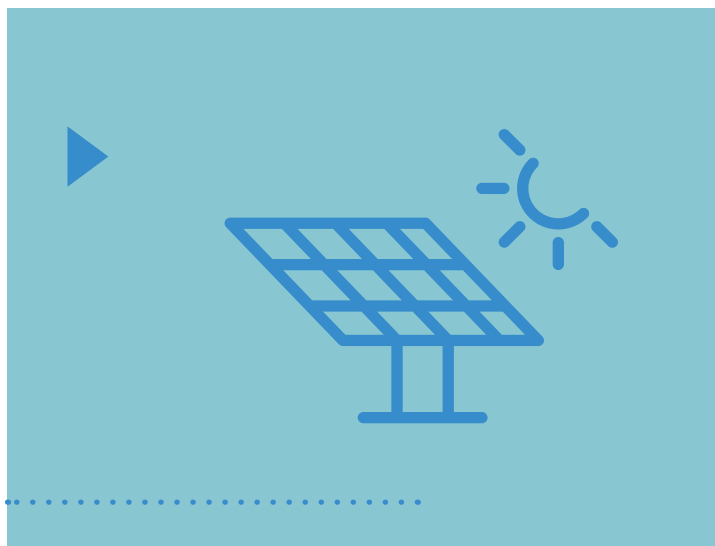
We made a few changes this quarter:

- The number of price offers that we analyzed for this quarter's Index increased from 700 to 1,100 due to a change in the LevelTen Marketplace that made it easier for developers to submit multiple offers (at different contract terms) for the same project.
- We added a few new hubs to the Index: wind prices in NP15 and Palo Verde in CAISO, as well as solar prices at Michigan hub in MISO.

Methodology

For the data presented below, the term "prices" refers to offer prices uploaded to the LevelTen Marketplace that were active as of 4/17/19. Data is based on real-time prices for all ISOs and technologies except for CAISO wind, for which we included real-time and day-ahead prices to expand the data set. We included only as-generated (i.e. unit-contingent) price offers. All prices are hub-settled for a virtual PPA contract structure.

Prices were offered across a range of project commercial operation dates with contract tenors ranging from 10-25 years. Price data is aggregated and reported in percentile buckets (e.g., "P25" refers to the most competitive 25th percentile offer price); national and ISO data is generally reported to the P10 level, while hub-specific data points are reported to the P25 level to maintain project developer confidentiality.



Solar

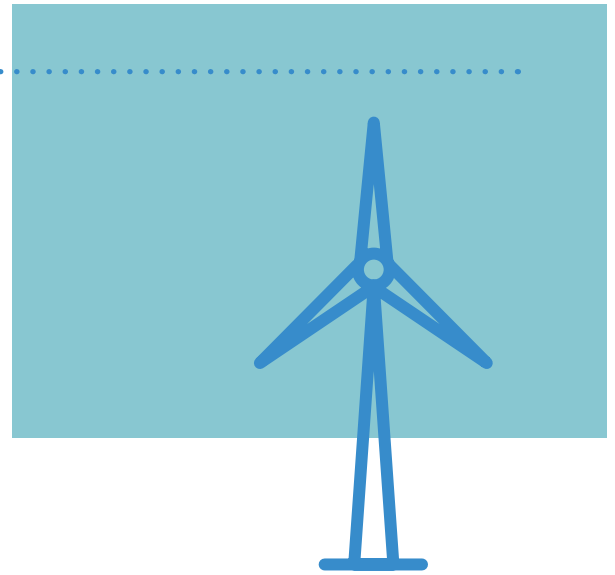
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The P25 Index for solar prices dropped in all markets except MISO, which increased by 4%. CAISO saw the biggest drop, with a 15% decrease in prices from Q4 to Q1.

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Other P25 Index changes of note:

- In MISO, we saw solar projects offering high prices at Illinois, Indiana and Michigan hubs, which drove ISO-wide percentile metrics higher. However, less significant price decreases at Texas, Louisiana and Arkansas hubs tempered those moves.
- In CAISO, Palo Verde, SP15 and NP15 all saw a decrease. Of the three hubs, SP15 contributed most to the ISO wide 15% decrease.
- ERCOT prices dropped by 6%, led by a 9% decrease in the West Zone of ERCOT.
- PJM had a 3% decrease, driven by downward movements in the AEP-Dayton hub, DOM, and Western hub. This was tempered by small upward shifts at the North Illinois hub and Eastern hub.
- SPP had a slight decrease of only 1% overall, following up on last quarter's large decline.



Wind



The P25 Index for wind prices increased moderately in three markets (CAISO, MISO and PJM), but a large decrease of 8% in ERCOT and a moderate decrease of 1% in SPP pushed the overall index down.

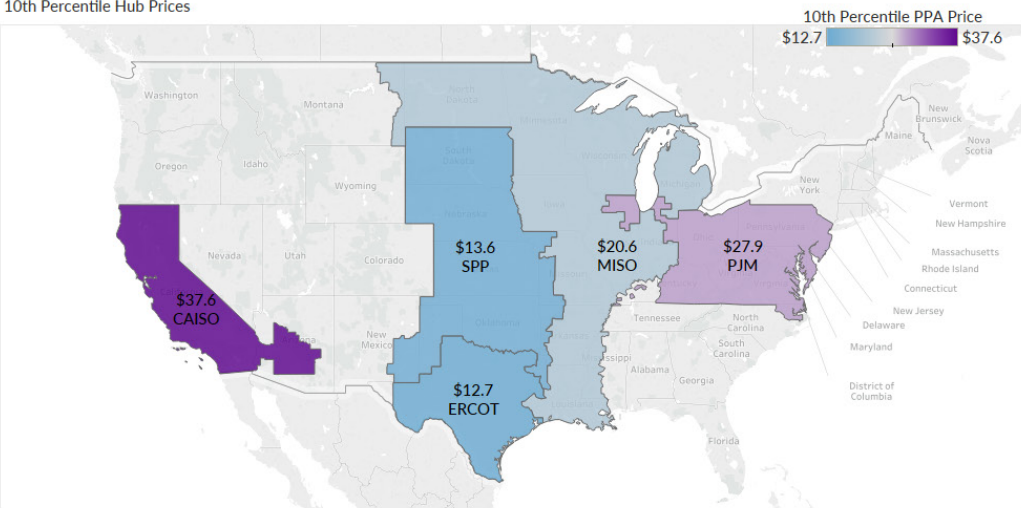


Other P25 Index changes of note:

- CAISO prices saw a 4% increase. We recently added the NP15 and Palo Verde hubs to our report, increasing our price offer depth. We expect the CAISO wind market to remain volatile and illiquid for the foreseeable future.
- In MISO we saw a 5% increase in prices. There was a material increase at the Indiana and Minnesota hubs, but those increases were mitigated by a price decrease at the Illinois hub.
- PJM had a moderate increase of 1% in prices. The North Illinois hub pushed overall prices higher, but decreases at the DOM and Western hub created downward pressure.
- Prices in ERCOT decreased the most, dropping 8% from Q4 to Q1. The West Zone in ERCOT contributed the most to the drop, with an 11% decrease.
- SPP had a moderate decrease of 1%, with minor price drops in both the South and North hubs.

National Market Overview

Wind PPA Price by ISO
10th Percentile Hub Prices



Marketplace Metrics

Total Projects	344.0
Pricing Offers	1,148.0
Total MW Offered	42,721.2
P25 of Levelized PPA Price	\$23.00
P50 of Levelized PPA Price	\$29.50
P75 of Levelized PPA Price	\$35.00

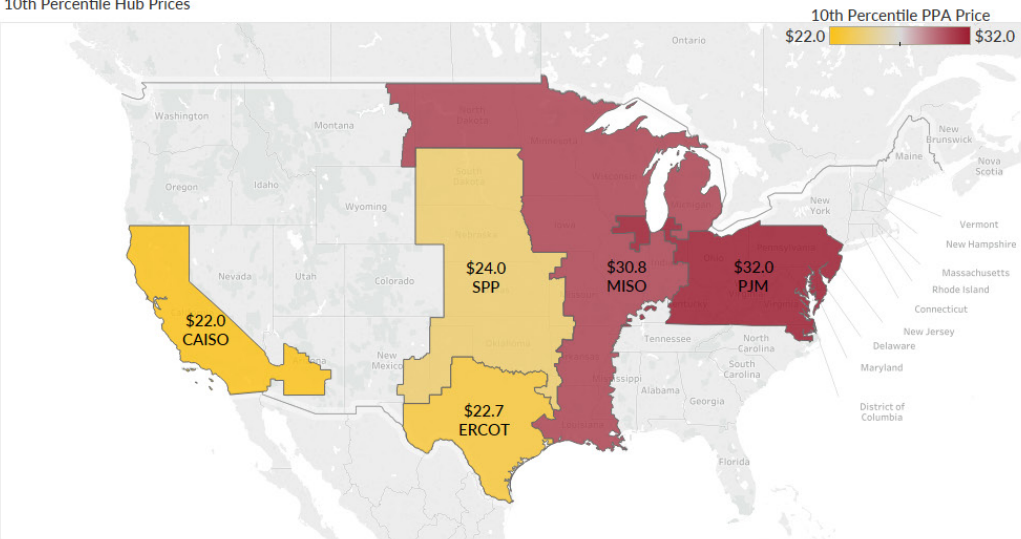
Solar Metrics

Total Projects	252.0
Pricing Offers	798.0
Total MW Offered	26,751.8
P25 of Levelized PPA Price	\$25.50
P50 of Levelized PPA Price	\$31.45
P75 of Levelized PPA Price	\$36.76

Wind Metrics

Total Projects	91.0
Pricing Offers	350.0
Total MW Offered	15,769.4
P25 of Levelized PPA Price	\$15.72
P50 of Levelized PPA Price	\$19.03
P75 of Levelized PPA Price	\$32.85

Solar PPA Price by ISO
10th Percentile Hub Prices

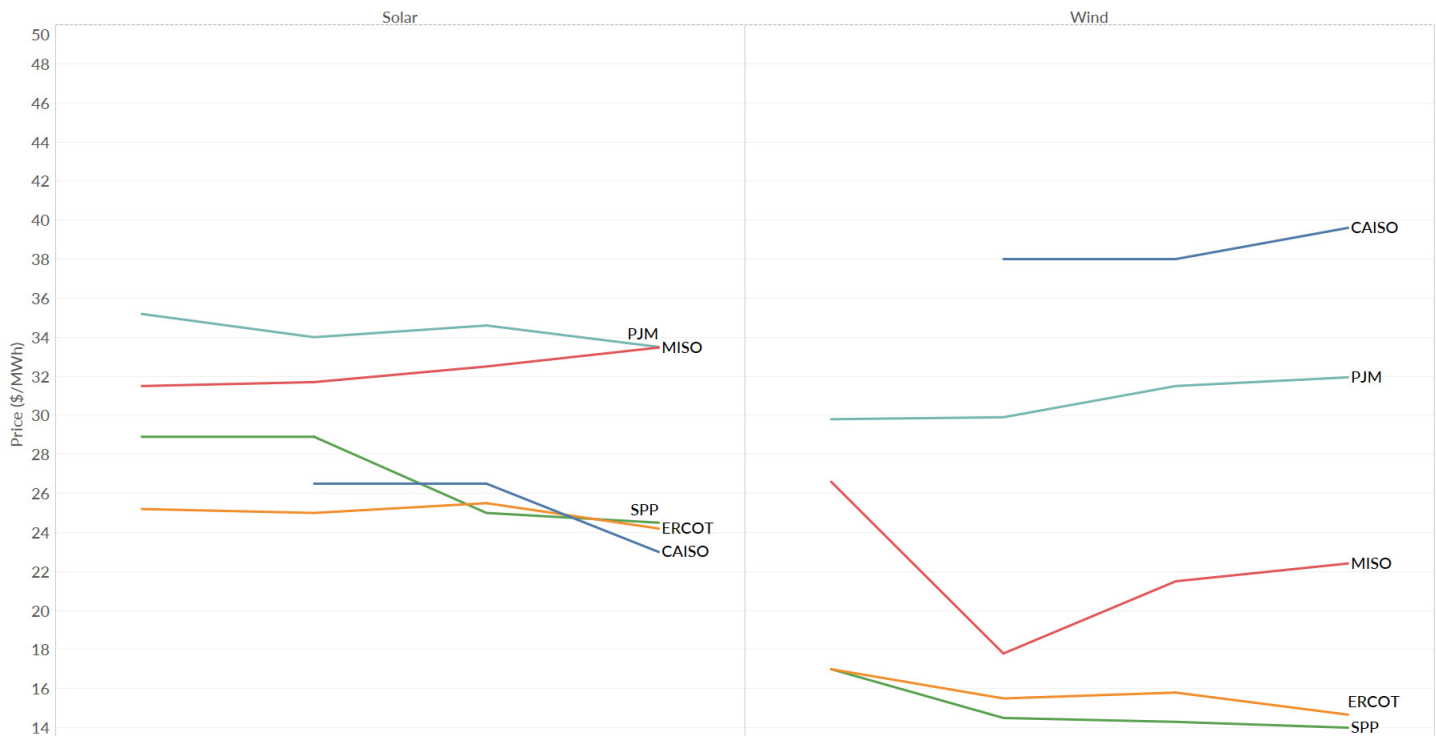


10th Percentile PPA Prices by COD



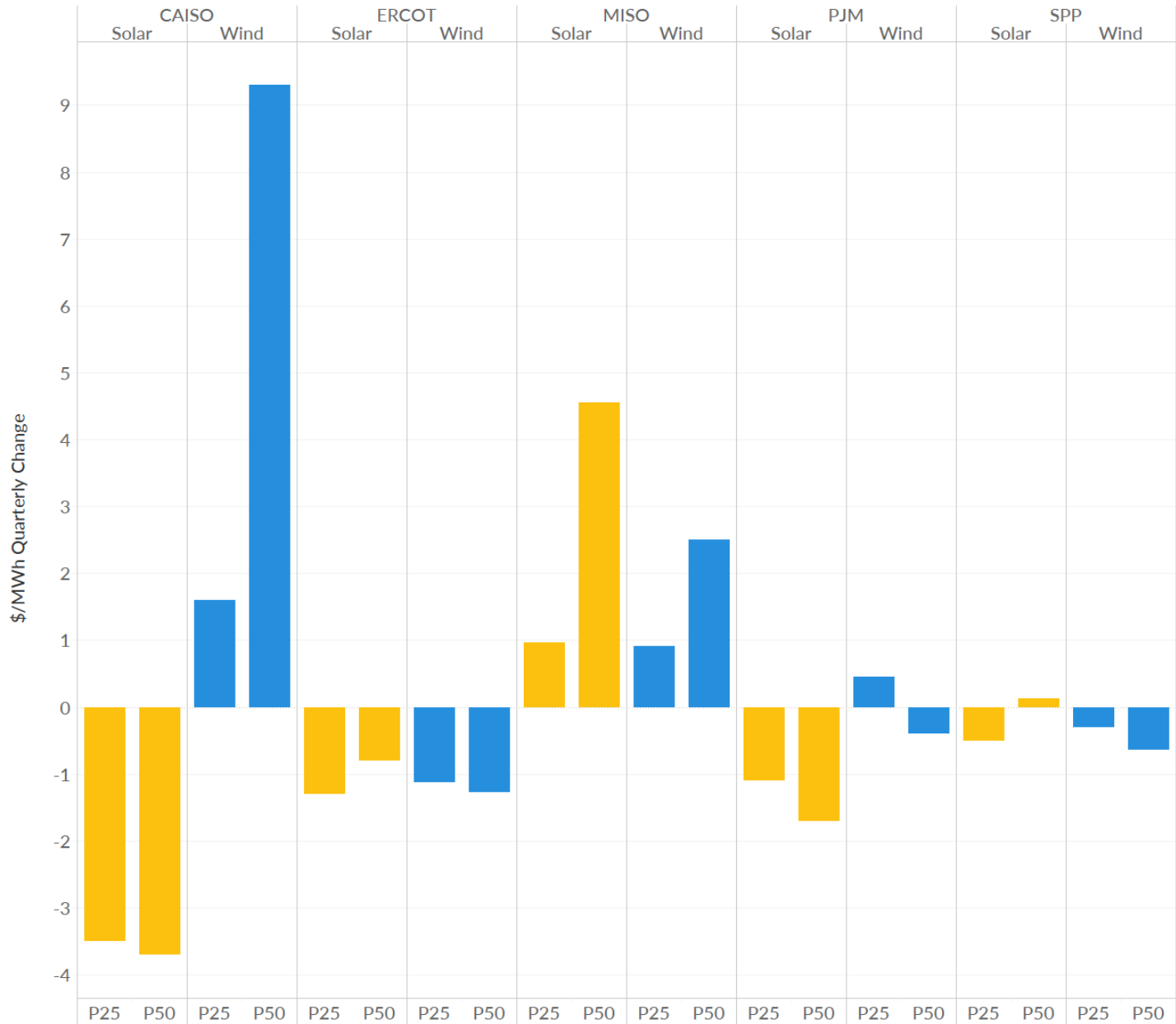
Price Index Comparison

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Quarterly Aggregate Price Changes

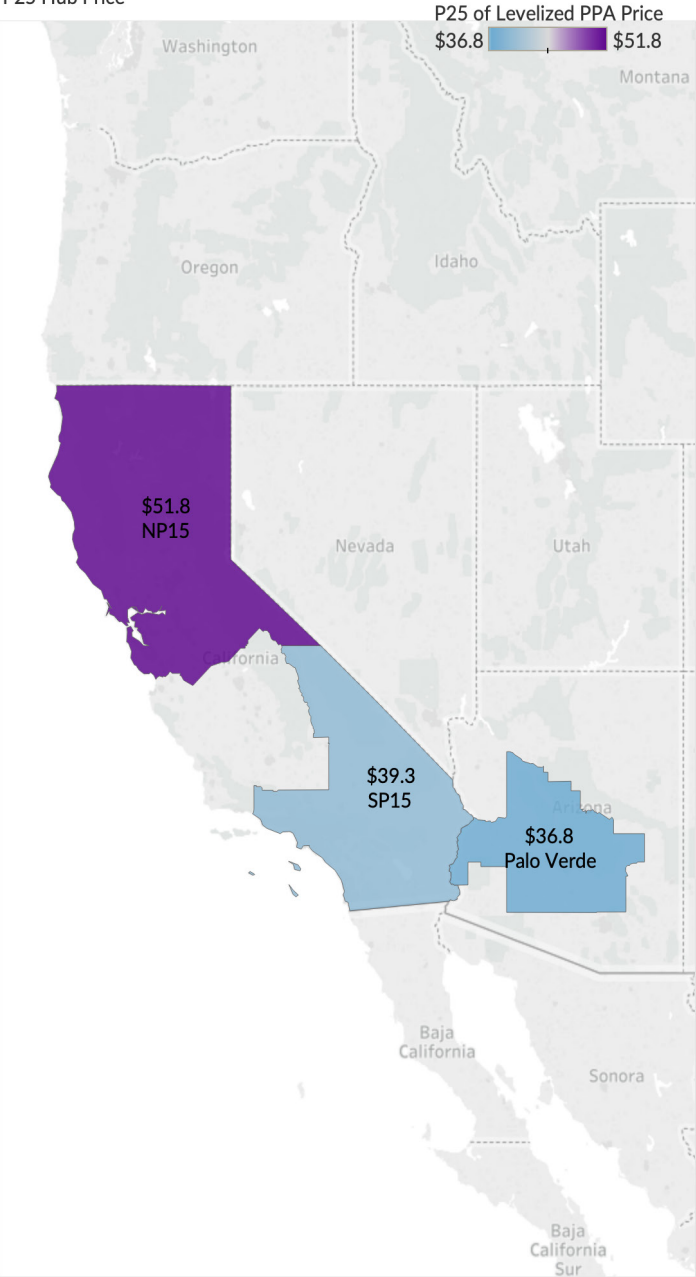
Quarterly Aggregate Price Changes



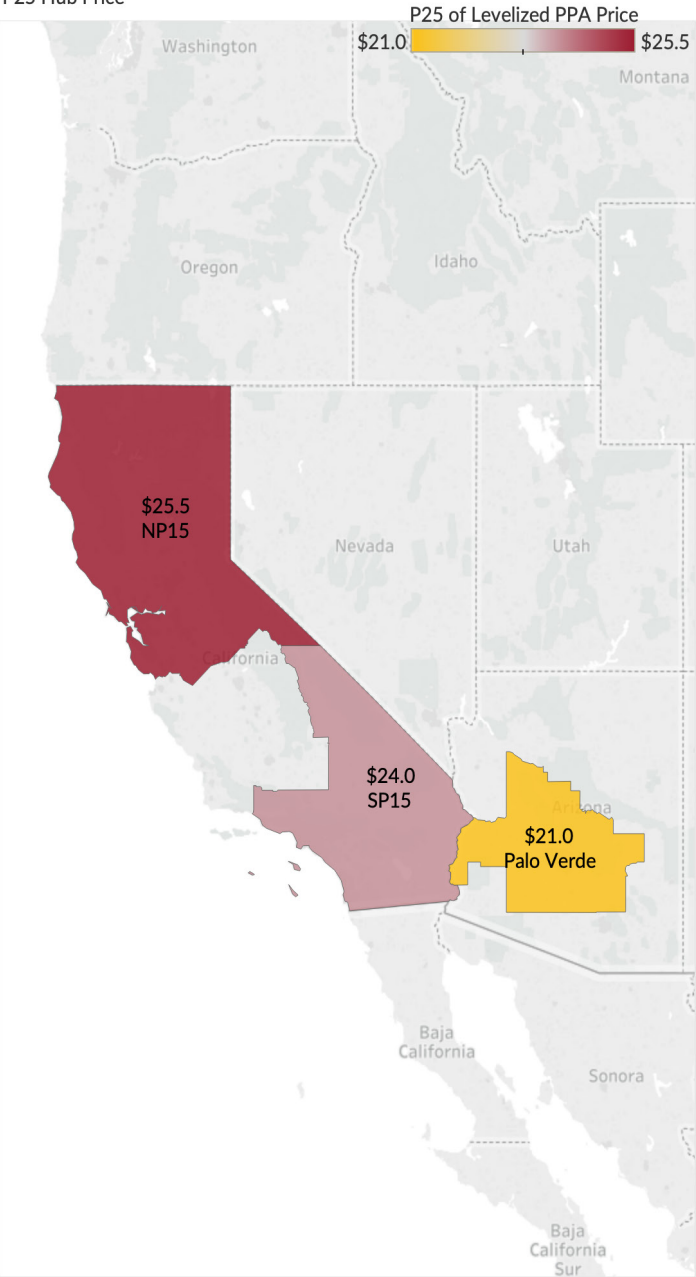
CAISO Market Overview

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Wind PPA Price by Hub
P25 Hub Price

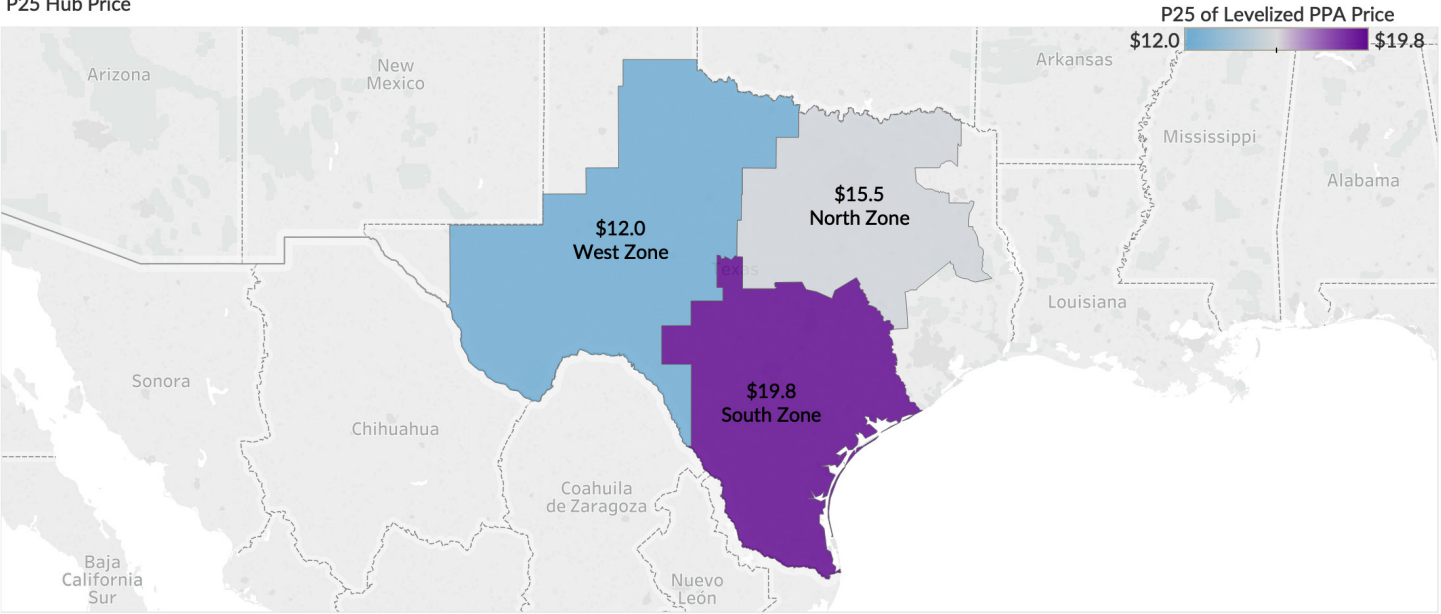


Solar PPA Price by Hub
P25 Hub Price

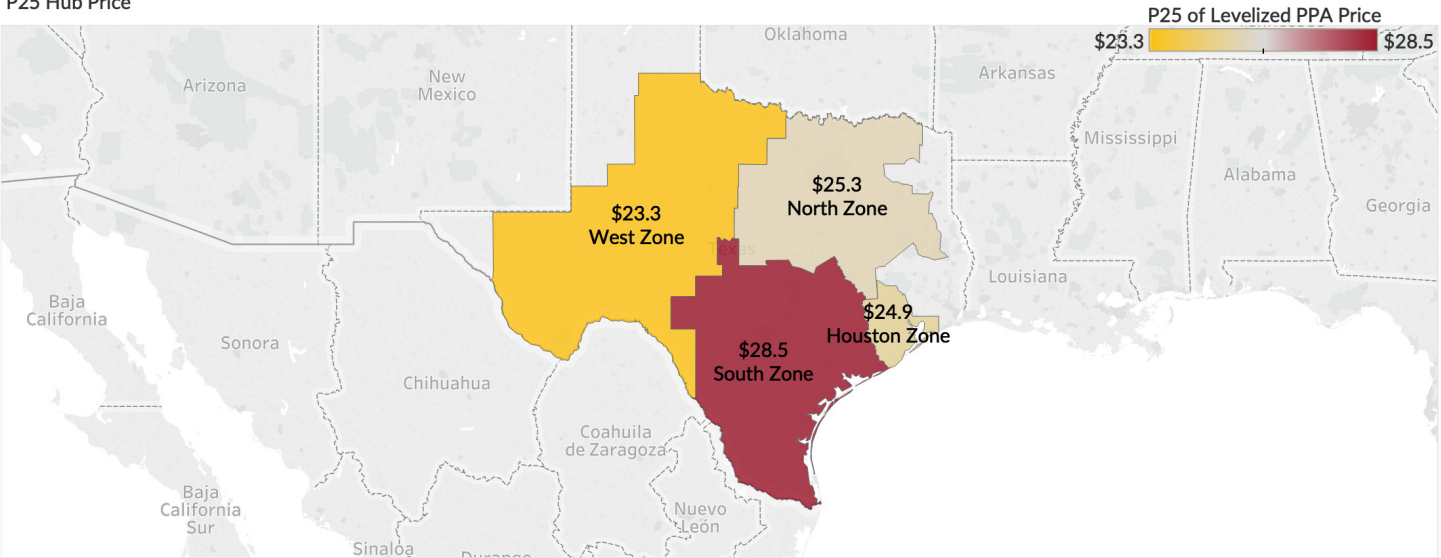


ERCOT Market Overview

Wind PPA Price by Hub
P25 Hub Price

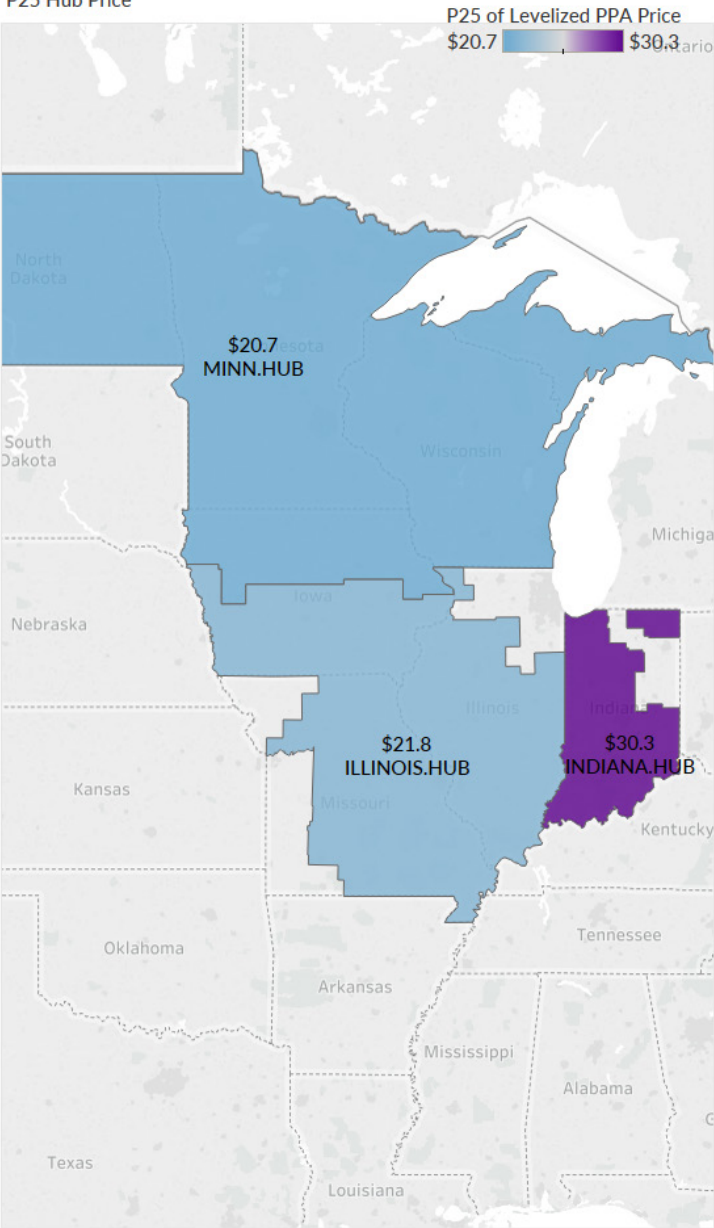


Solar PPA Price by Hub
P25 Hub Price

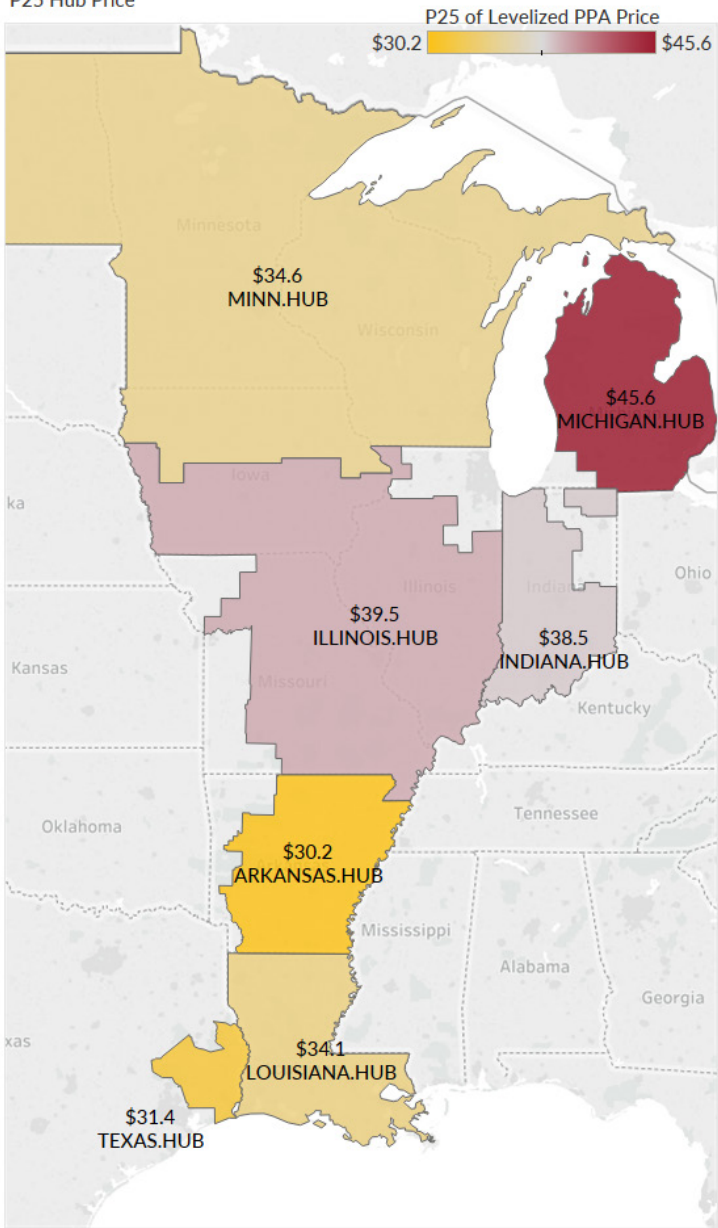


MISO Market Overview

Wind PPA Price by Hub
P25 Hub Price

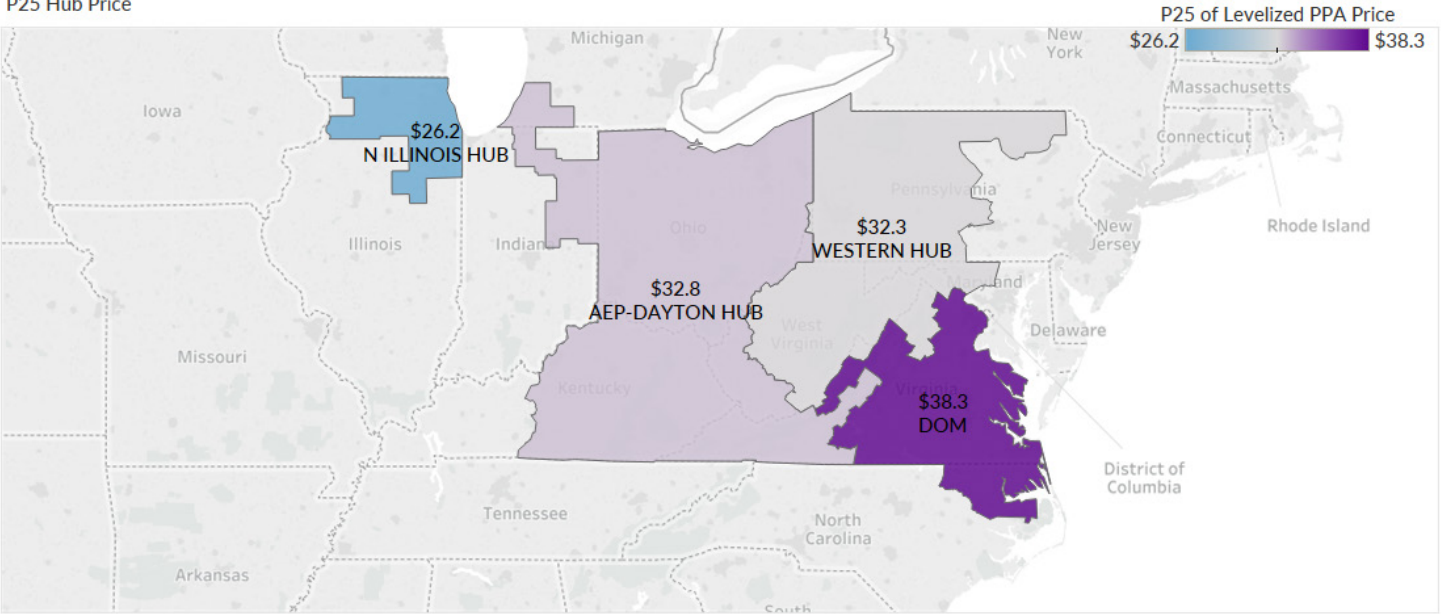


Solar PPA Price by Hub
P25 Hub Price

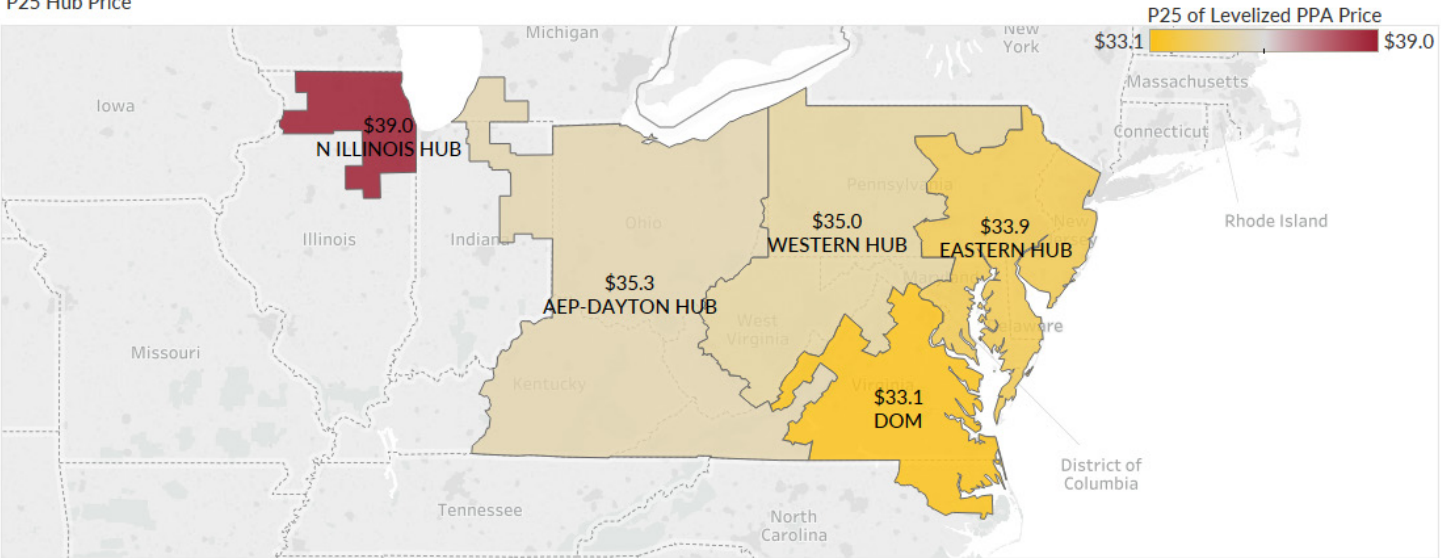


PJM Market Overview

Wind PPA Price by Hub
P25 Hub Price

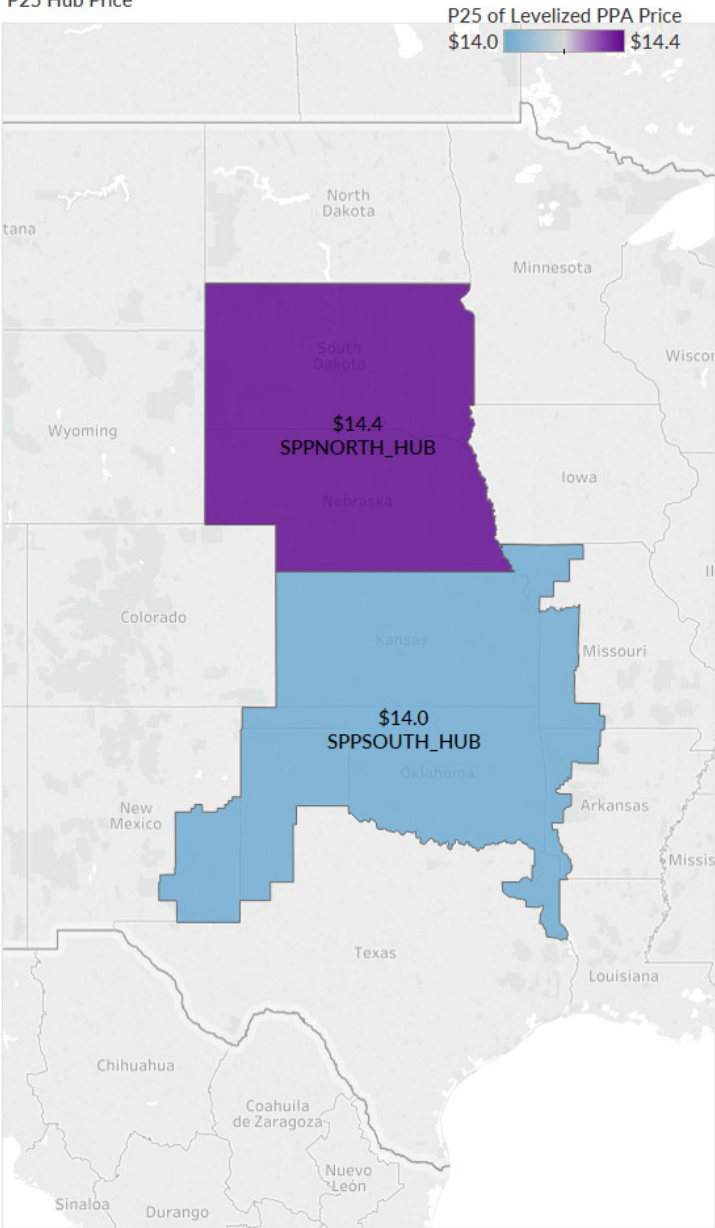


Solar PPA Price by Hub
P25 Hub Price

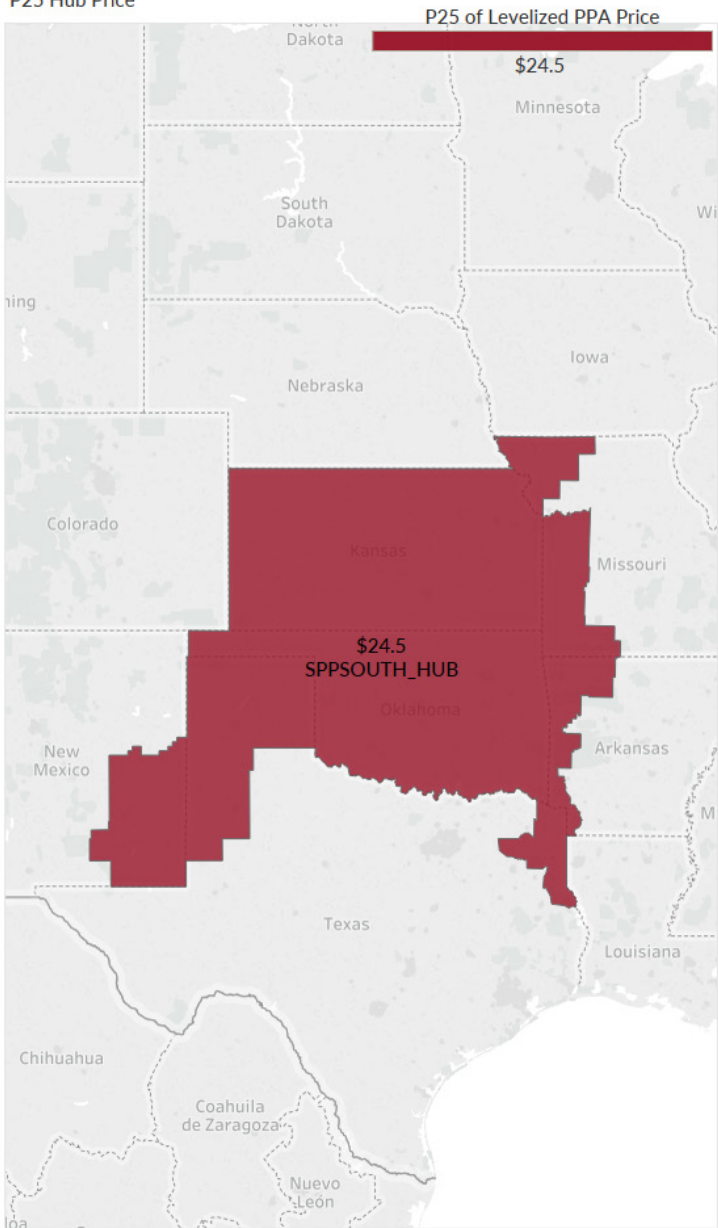


SPP Market Overview

Wind PPA Price by Hub
P25 Hub Price



Solar PPA Price by Hub
P25 Hub Price





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