

Proposed Market Rules May Increase Wind Curtailments

Changes in market rules could potentially complicate the financing of wind projects in certain jurisdictions.

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Historically, wind resources have often been characterized as must-take resources, meaning that they would deliver power to their off-taker regardless of market prices. In some control areas, new market rules have been developed or are being developed to provide strong economic incentives for wind projects to curtail generation during times of low market prices. In many cases, these rules would also impose new market risks on wind resources by removing protections that currently shield these projects from risks faced by other generators. If these risks are passed from the off-taker to the generator, these changes will, at minimum, complicate the estimation of project revenues and could, at worst, erode a project's profitability.



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Recent power purchase agreements (PPAs) for wind projects in California and elsewhere have typically been structured as must-take agreements with a fixed price per megawatt-hour. In a market such as California, the off-taker accepts power from the plant owner, pays the plant owner a fixed price for the power and then sells the power into the market at the market price. As such, the off-taker (or the

off-taker's customers) bears the market price risk while the project owner assumes the production risk.

Wind conditions and turbine performance characteristics are the key factors in determining production risk. It is possible to develop reasonable estimates of plant generation using site-specific, historical meteorological data and technology-specific performance data. Production risk, therefore, does not generally impede project financing as long as the plant is sited in a suitable location and built with high-quality components.

In California, potential changes in market rules may provide economic incentives for wind and other intermittent generation sources to more fully participate in the power markets in order to facilitate the curtailment of deliveries when market conditions are unfavorable. At the same time, regulators are encouraging off-takers to shift some of the market price risk from ratepayers to project owners by not fully compensating suppliers for lost revenue in the event of an economic curtailment. Similar shifts are occurring in other jurisdictions nationwide.

Economic curtailments can cause a significant loss of revenue even when

limited to a certain number of hours per year, because they often occur when a project's output is high. The risk to project revenues can be bounded only through an understanding of the rules governing economic curtailment, current and future market conditions that may contribute to curtailments, the off-taker's incentives with regard to curtailment, the ability of project owners to receive production tax credits (PTCs) and renewable energy credits (RECs) for curtailed deliveries, and contract provisions for compensation in the event of a curtailment.

Changing market rules

Curtailment incentives for wind project owners and off-takers can diverge when market prices fall. Because wind projects generally have low marginal costs of production, it is in the interest of project owners with fixed-price contracts to keep their plants operating regardless of the market price.

This incentive is particularly strong for projects that are eligible for tax credits or RECs that are tied to production. Off-takers have different incentives when the market price falls below the contract's fixed price. Under such conditions, the off-taker has a negative contribution to margin for each unit of energy purchased under

Figure 1: Changing Market Rules for Wind Projects

Jurisdiction	Current or Recent Situation	Emerging Situation
Mid-Atlantic (PJM)	Wind projects are treated like other resources. They may bid a price indicating their willingness to be curtailed and are otherwise assumed to have a minimum price of zero.	No change
New York (New York ISO)	Wind projects are treated like other resources. They are required to bid price curves indicating their willingness to be curtailed.	No change
Texas (ERCOT)	Prior to December 2010, wind projects were paid at least in part for emergency curtailments, which were frequently required to maintain system stability in West Texas areas with large wind resources. They were typically shielded from curtailments.	Under the new nodal market, wind generators are treated the same as all other generators and may bid prices indicating willingness to be curtailed. They are subject to the same market risks as other generators, except that they are allowed a 10% deviation above instructed energy and are not fined for deviations below instructed energy.
Midwest (Midwest ISO)	Wind scheduling and curtailing is done outside of the market. There are no provisions for economic curtailment.	New FERC rules will bring wind resources into the market over the next two years, allowing for economic dispatch and curtailment and subjecting projects to possible payments for uninstructed energy deliveries.
California (California ISO)	Wind projects typically self-schedule and are price takers. There are no provisions for economic curtailment and very high penalties for emergency curtailments.	Proposed rules would encourage wind generators to fully participate in the market and to bid prices for economic curtailment. They would also subject wind generators to 10-minute settlements (instead of monthly settlements), increasing the likelihood of payments for deviations from instructed energy deliveries.
Pacific Northwest (BPA)	During periods of oversupply, all other generators are curtailed first, including reducing nuclear output to 25% of capacity and reducing the amount of hydropower to the maximum allowable limit. There are no provisions for economic curtailment and no payments for emergency curtailments.	BPA's draft "environmental redispatch" proposal calls for curtailing wind projects during oversupply emergencies after all other options have been utilized. Off-takers would receive surplus hydropower in place of the wind power, but BPA would not reimburse plant owners for lost tax credits and RECs. Wind resources not receiving production tax credits would be curtailed first. There would still be no provisions for economic curtailment.

Source: MRW & Associates

the fixed-price PPA, meaning that it is generally in the interest of the off-taker to curtail the project.

As more wind resources are being developed in areas with insufficient transmission or load support, oversupply and congestion conditions are arising with increasing frequency, resulting in prices in certain locations that are significantly lower than PPA prices. In fact, it is not uncommon for market prices to be negative.

Current market rules administered by the California Independent System Operator (California ISO) and the Midwest ISO encourage or require must-take wind power transactions to be self-scheduled outside of the market.

These transactions come with high penalty prices for curtailment, effectively eliminating the opportunity for curtailment except if needed to preserve system stability or otherwise avoid an emergency situation. This provides a benefit to wind owners because they are guaranteed the PPA price plus relevant tax credits and RECs for nearly all of the wind

power they can produce. It conflicts with the interests of off-takers, which would prefer to curtail the projects when market prices become too low.

The California ISO and Midwest ISO are now modifying their rules to treat wind resources more like other resources and to encourage owners and operators of renewable resources to participate in the market and specify a price at which they are willing to have their projects curtailed.

The Electric Reliability Council of Texas (ERCOT) has recently completed such a transition in market rules, and wind projects have been fully integrated into the markets of PJM Interconnection and the New York ISO for several years. The Bonneville Power Administration (BPA) is taking a non-market approach to instituting wind curtailments during Pacific Northwest oversupply conditions. These approaches, as summarized in Figure 1, increase curtailment risk and can result in new production risks for project owners.

For example, the California ISO has proposed market rule revisions

that would encourage wind generators to participate in the market to allow curtailment in the event of low prices. The revisions would reduce the market floor price from \$-30/MWh to \$-300/MWh in an attempt to encourage more projects to bid a price point for economic curtailment. In addition, they would remove the benefit that wind projects currently obtain from a monthly netting of deviations from instructed energy and would subject them to settlements in each 10-minute interval. For wind projects, these proposed changes are likely to increase the amount of curtailments and the amount of uninstructed energy penalties.

Curtailment risk sharing

Economic curtailment can be used to shift some of the market price risk from project off-takers to project owners. The amount of risk that is shifted and how the risk sharing is structured can vary significantly depending on the terms of the PPA.

For example, the California Public Utilities Commission (CPUC) re-

cently approved different risk-sharing structures for this year's pro forma renewable procurement contracts to be issued by the state's two largest utilities. For the Pacific Gas & Electric pro forma contract, the CPUC approved a provision allowing 5% of expected annual generation to be curtailed for economic reasons, with generators receiving their full contract price but no reimbursement for lost PTCs.

For the Southern California Edison (SCE) pro forma contract, the commission approved a provision allowing curtailment without compensation or reimbursement for lost tax credits up to an agreed-upon cap level between 50 hours and 200 hours per year, with compensation and a discounted buyback option for any excess curtailment.

This decision is likely to be challenged by wind developers and/or renewable power advocates and may be revisited. Even if implemented as adopted, these pro forma contract provisions may not be binding on project owners, which may attempt to negotiate more favorable terms.

As part of the negotiation process – in California and elsewhere – generators should insist on contractual clarity and specificity with regard to the process and rules regarding curtailment. Without such clarity, projects can face significant impacts to net income.

For example, wind farms that were formerly owned by FPL Energy, now NextEra Energy Resources, were forced to pay \$29 million in deficiency payments in 2010 because their contracts with utility TXU omitted a common contract provision that would have allowed curtailed energy to be counted as if it were generated

for the purpose of evaluating compliance with output guarantees. As curtailments become more frequent, more of these types of contract disputes are likely.

Potential disputes are already brewing in California, where SCE claimed that its existing renewable energy contracts give it an expansive right to curtail without compensation to the generator. In addition, given that there are often differences between scheduled output and delivered energy from variable renewable resources, disputes regarding the amount of energy that has been curtailed are likely to arise if contracts are not clear on how the amount of curtailed energy should be determined.

Implications for project owners

The implications of economic curtailment for an individual project will depend critically on the relevant market rules and the contract provisions for curtailment procedures and payments. Generally, however, in areas with large amounts of wind and insufficient transmission access or load, project owners and their lenders should anticipate curtailments for new (and possibly for existing) projects.

The amount of curtailment will depend on factors such as the location of the project and the current and planned load, generation capacity and transmission capacity in the project's vicinity. Market rules will determine the level of curtailment, whether intermittent generators risk imbalance charges when they deviate from instructed energy and other market risks.

Contract terms are equally important, because they will determine how

parties share these risks. As evidenced by the NextEra and SCE disputes, specificity and clarity of curtailment terms in PPAs can prevent large financial surprises.

Unless all curtailment risk is borne by the off-taker, curtailment and market risks inject additional uncertainty into the projection of project revenue, which may make it more difficult to finance wind projects. Project owners and lenders will need to carefully examine the economic curtailment provisions in the PPAs as well as the correlation between wind patterns and market prices. Low market prices during periods of high wind availability could significantly reduce project revenues if the off-taker is not obligated to provide some sort of make-whole payment for curtailed generation.

Understanding these conditions will allow developers and lenders to incorporate curtailment and market risks into revenue projections and price them into power-supply bids. Properly incorporating market risks into the PPA price increases the probability of meeting financial targets and allows projects to be financed with lower risk premiums. **ENR**

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