

Revenue put options gain popularity in US power markets


Morgan Stanley seen as top dealer in emerging risk management niche



US power prices have slumped in recent years, making fixed-price hedges less attractive



Alexander Osipovich

 @aosipovich 16 October 2015

The past few years have been tough on US power generators. As the shale boom has unleashed plentiful supplies of cheap natural gas, and improvements in energy efficiency have caused electricity demand to flatline, power prices in many parts of the country have been stuck in a multi-year slump.

Against that backdrop, a new type of bespoke hedging tool has grown increasingly popular among those investors willing to take a long view and construct new power plants. Called the revenue put option, it enables the owners of a power plant to place a floor under the revenues that they can expect to get from that facility over a specified period of time, typically around five years in most recent deals, market sources say. The details are complex, but the idea is simple: by purchasing a revenue put, a firm building a new plant can protect the downside risk on its investment, while retaining exposure to upside – an attractive prospect if one believes that US power prices are set to rebound.

"Revenue puts have become much more prevalent in the last three years than they had been previously," says Mitchell Carroll, a Boston-based partner at law firm Morgan Lewis who has advised on several power-plant transactions involving the product. "I do see it as an increasing trend."

Market sources familiar with revenue puts – including dealers, power plant developers, lawyers and risk management consultants – stress that transactions involving the structure are still rare, with perhaps half a dozen executed over the past 12 months. Most of those deals have involved a small number of private equity firms or developers building natural gas-fired plants, although there have also been cases of renewable developers using the structure for wind farms.

Revenue puts have become much more prevalent in the last three years than they had been previously

Moreover, only a small number of dealers are in the business of writing revenue puts. In fact, sources say just one dealer has executed the majority of such transactions in recent years: Morgan Stanley.

While Morgan Stanley declined to comment, a source close to the bank says its commodities unit developed and refined the product in response to the needs of the marketplace and has since enjoyed a brisk business in writing revenue puts for clients. "Many developers and investors have a view that markets will strengthen over time, so a hedge product that leaves no upside was unpalatable to many of them," says the source. "Thus the revenue put. We believe that projects are being developed with the benefit of this product that would otherwise not see the light of day."

Other dealers that have written revenue puts for clients or are actively seeking to get in the business, sources say, include BP Energy Company, the North American gas and power trading arm of the UK oil major; Citi; Macquarie; and Shell Trading Risk Management, the US energy derivatives-trading unit of Royal Dutch Shell. BP, Citi and Shell all confirm their involvement in the marketplace, while Macquarie declined to comment.

Power plant developers that have used the product praise it as a useful solution, but they complain that the cost is too high. Due to the illiquidity of the market and limited number of dealers, the premiums that a developer must pay for a revenue put can be quite steep, they say.

"With revenue puts, the main benefit is, obviously, that they don't lock in the upside," says Sherman Knight, chief commercial officer at Competitive Power Ventures (CPV), a Maryland-based developer that has recently used the product to hedge its revenues for a natural gas-fired power plant in New York state. "They protect the downside to allow for the debt financing to be placed. But you have to weigh that benefit against the cost of the option premium that you're paying."

Cost isn't the only concern when it comes to revenue puts. Investors and developers paying out millions of dollars for the highly customised product should be sure to read the fine print, say risk management consultants specialising in US power deals. Depending on how each contract is designed, the consultants say, the revenue put may not provide the protection that customers are expecting.

From PPAs to revenue puts

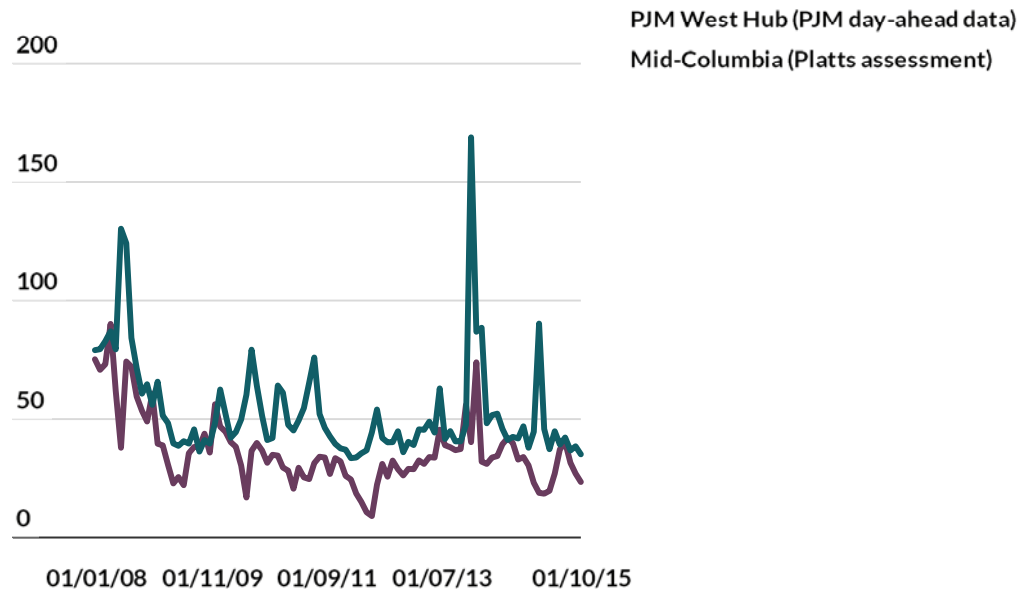
Revenue puts can be seen as the latest step in the evolution of hedging tools used in the electricity industry, building on power purchase agreements (PPAs) and heat rate call options.

Traditionally, the most conservative way for a power plant developer to secure the revenues from their investment has been through a PPA – a simple physical forward transaction in which they commit to sell electricity from their plant to a customer, such as a utility, for a fixed period of time, sometimes as long as 20 years or more.

But PPAs have become less attractive to developers as electricity prices have slumped. According to Platts, the New York-based energy market data provider, the average day-ahead peak price at PJM West Hub – the most liquid trading hub in the eastern US – fell from \$83.29 per megawatt-hour (MWh) in 2008 to \$45.46/MWh in the first 10 months of this year. Prices on the US west coast have collapsed too, with the average peak price for Mid-Columbia, a major trading hub in the northwest US, sinking from \$64.85/MWh to \$26.65/MWh over the same time period (see figure 1).

F1. Monthly average peak power prices

For Mid-Columbia and PJM West Hub



Source: Platts, PJM [Embed](#)

"I am very reluctant to get into a long-term PPA where I have to give up all my potential upside to someone else for as many as 10, 15 or 20 years," says Tom Festle, the Chicago-based chief financial officer of E.on Climate & Renewables North America, a developer largely specialising in wind power. "The discount attached to PPAs right now is just so punitive for us, as a developer, that I don't want to enter into a PPA. I'd much rather enter into a revenue put."

Meanwhile, those developers still interested in PPAs have found it harder to find counterparties willing to buy their electricity. Because of the low prices, utilities that previously might have committed to buy power through PPAs see less urgency in doing so – and that, too, has led developers to turn to other types of hedging instruments, including revenue puts. "Much of this comes out of the fact that PPAs have become more difficult to source from the developers' and

sponsors' standpoint," says Carroll, the lawyer with Morgan Lewis.

More complex than the PPA is the heat rate call option, which is still widely used by owners of gas-fired power plants. Such instruments – a type of financially settled, over-the-counter derivative – let generators manage their exposure to so-called 'spark spreads'. A spark spread is the difference in the price of electricity sold by a generator and the price that the generator must pay for its gas. When power prices at a particular location are high and gas prices are low, spark spreads are wide and power plant owners can make a great deal of money; conversely, when the differentials collapse and spark spreads narrow, power plant owners may find it unprofitable to run their units and their profits are zero.

The conditions under which a power plant is profitable, then, depend on the prevailing market prices for power and gas, as well as on the 'heat rate' of the power plant, a measure of its efficiency at converting gas into electricity. Those plants that are more efficient, with lower heat rates, can more easily reach the point of profitability as spark spreads widen. The least efficient plants, with the highest heat rates, need to wait until spark spreads are at their widest before they are profitable.

What that means is that a power plant can be modelled as a call option: its value is zero as long as the spark spread stays below a certain threshold; then, as the spark spread grows past that threshold, the value of the plant grows linearly along with it.

That's the reason why power plant owners can hedge their profits by selling heat rate call options. By selling a heat rate call option to a counterparty, the power plant owner collects a premium. In return, the power plant owner must pay their counterparty if the spark spread widens beyond the strike agreed in the options contract. However, under such conditions, they can also expect their gas-fired plant to be running profitably, so the cashflows from the plant should cover the cost of those payouts. If the terms of the heat rate call option contract are perfectly matched to the economics of the power plant, then the contract serves as a perfect hedge, allowing the plant's owner to collect a stable cashflow regardless of what happens to spark spreads.

Having a stable cashflow, though, is unappealing to investors and developers that want to retain exposure to upside. Like PPAs, heat rate call options are a way to lock in profits, not to put a floor underneath them and ride the market upwards if it

risers. That's why revenue puts have emerged as an attractive alternative to heat rate call options, dealers say.

"In every conversation we have nowadays with project developers building new plants, the discussion centres around two types of instruments: the heat rate call option and the revenue put," says Ken Fleming, Connecticut-based senior vice-president of northeast origination at BP. "Sometimes these are used jointly. A project might be partly hedged with a heat rate call option and partly with a revenue put."

I am very reluctant to get into a long-term PPA where I have to give up all my potential upside to someone else for as many as 10, 15 or 20 years

The simplest way to understand a revenue put is to view it as an options contract in which the underlying of the contract is the revenue of the power plant in question. If the plant's revenue drops below a certain strike – \$50 million per year, for example – then the seller of the put must pay the buyer the difference between the strike and the realised revenues. For instance, if the owner of a power plant buys a four-year revenue put from a bank, running from 2015 to 2018 and with a strike of \$50 million per year, and the plant's revenues in 2016 actually come in at \$40 million, the bank would need to pay the power plant owner \$10 million that year to make up the difference.

That explanation, however, omits an important real-world detail. Dealers never actually sell revenue puts in which the underlying of the options contract is the actual, real-world revenue of the physical power plant that their clients are building. Instead, the underlying is the revenue of a hypothetical plant modelled off of the real-life facility. In other words, the contract will specify all the parameters of such a 'synthetic unit', including the location at which it buys gas and the location at which it sells power, as well as its heat rate and other physical characteristics. Taken together, all that can be used to calculate how much revenue the plant should be earning under various market conditions.

So when the time comes for the dealer to make payouts under the revenue put – often once a quarter or once a year for the duration of the contract – the dealer runs the model and calculates how much the synthetic unit should have earned in the preceding time period. If the revenues of the synthetic unit are less than the strike, the dealer makes the necessary payout.

As long as the performance of the synthetic unit mirrors the performance of the real-world power plant, the owner of the plant can count on having a reliable hedge. "To provide an effective hedge, the revenue put is structured to represent the operating characteristics of the plant as closely as possible," explains Carla Vincitore, Houston-based president of Shell Trading Risk Management.

Meanwhile, dealers gain an important advantage by selling revenue puts based on the hypothetical revenues of synthetic units rather than the real revenues of real plants: they can more easily manage their risk. For instance, they can manage their exposure to gas and power prices based on the indexes and locations used in their model, rather than the prices actually seen by the plant operator, which might be tied to illiquid gas hubs or unusual, out-of-the-way power pricing points.

Importantly, the use of the synthetic unit also means that dealers are not exposed to the operational risk of running a power plant. For example, a dealer does not need to worry about the risk that a plant's operators will make a mistake and lose out on potential profits by failing to run the plant on a day when market conditions are favourable. Such an operator mistake would impact the revenues of the real-life power plant but not the idealised revenues of the synthetic unit.

Sophisticated players

All that complexity means revenue puts are not for the faint-hearted. That's why most deals employing this structure have involved projects backed by private equity firms, says Morgan Lewis's Carroll. "Energy projects that are sponsored by the private equity firms are really pushing these forward," he says. "It's the financial savviness of the private equity firms that gets them comfortable, because they can truly understand the instrument that they're entering into."

Besides CPV, firms said to have used revenue puts include New York-based Energy Investors Fund (EIF), a power-focused private equity group; I Squared Capital, a New York-based infrastructure investment firm; LS Power, a New York-based power developer; and Panda Power Funds, a Dallas-based private equity fund manager specialising in generation.

EIF, which was acquired last year by Los Angeles-based alternative asset manager Ares Management, confirmed in an email to *Risk.net* that it had used revenue puts for recent projects in New Jersey and Ohio. I Squared Capital and LS Power did not respond to repeated requests for comment. Panda declined to comment, but it has previously disclosed using revenue puts for a pair of natural gas-fired power plant projects in Texas.

Energy projects that are sponsored by the private equity firms are really pushing these forward. It's the financial savviness of the private equity firms that gets them comfortable, because they can truly understand the instrument that they're entering into

Industry sources say most revenue put deals have taken place in the northeast US – in the deregulated electricity markets of New York, New England and PJM, which covers many of the mid-Atlantic states – as well as in Texas. That is largely because those areas have the most liquid spot markets for electricity, a necessary precondition for the structure to work.

Another factor that may be driving such deals in the northeast US is the proximity of the gas-rich Marcellus Shale. "There is a big push right now to build natural gas-fired power plants in the parts of the US that have a lot of shale gas, but also a need to replace retiring coal-fired plants as well," says Mike Curry, Citi's Houston-based head of structured products and power sales for North America. "That's a big area of development right now, and it's where a lot of interest in revenue puts is coming from."

Dealers characterise the revenue put as a best-of-both-worlds solution, combining the security of a PPA with the potential upside of a pure merchant project – that is, a power plant that just sells electricity into the spot market. In the context of project finance, that means both debt and equity investors in a new-build power plant can find something to like.

"Revenue puts cater to the needs of both the debt and equity holders," says Anubhav Aggarwal, a Houston-based commodities originator at Citi. "Debt holders get the predictability of a floor on revenues, and the equity holders can participate in the upside based on their investment thesis of increased spark spreads."

Dealers also note that revenue puts are attractive to developers because they are relatively simple from a credit standpoint, compared to heat rate call options. If a developer chooses to hedge its new power plant investment by selling a heat rate option to its hedge provider, the hedge provider gains credit exposure to the developer – infinite credit exposure, in fact, because there is theoretically no upper limit on how much the developer might have to pay out. As a result, the developer typically needs to post collateral to mitigate the credit risk faced by the hedge provider. That often leads to complex negotiations in which the hedge provider ends up taking out a lien on the power plant, alongside the banks that are lending money to the developer, dealers say.

"The challenge with the heat rate call option is credit," says Shell's Vincitore. "Selling the heat rate call option can be problematic since buyers of the heat rate call option will have exposure to the generator when the time comes to call on the option and deliver on its obligations. With no credit history, typically a large letter of credit is required or a first lien."

But if the power plant developer hedges with a revenue put, the situation is "just the opposite", says Vincitore. Once the developer pays the put premium – a one-time payment – the hedge provider no longer faces credit risk from the developer. "The credit exposure in this case is reversed, leaving the generator with credit exposure to its counterparty," Vincitore says. That relieves the developer of the need to post collateral.

Hidden risks

Like any complex product, revenue puts can contain hidden risks for customers that don't fully know what they are getting into.

Risk management consultants who have studied the product say the main danger lies in mismatches between the synthetic unit used in the revenue put and the real-life power plant it is seeking to model. Such mismatches can lead to hedge malfunctions, in which the product will not pay out as much as the power plant owner expects.

Such mismatches can arise because the needs of the dealer and the power plant owner are different, says Greg Sticka, founding partner of Scoville Risk Partners, a New York-based advisory group. While the dealer wants a model that makes it easy to lay off risk in the marketplace, the power plant owner wants a model that hews as closely as possible to the unique characteristics of their plant.

"What's good for the dealer – in terms of a gas delivery point, for example – might not be great from the perspective of the plant owner," says Sticka, whose firm has advised clients on hedging with revenue puts. "In bad times it might cause pain and agony."

What's good for the dealer – in terms of a gas delivery point, for example – might not be great from the perspective of the plant owner. In bad times it might cause pain and agony

For example, consider a natural gas-fired power plant that purchases its fuel at prices tied to the Transco Zone 6 index, which reflects prices for gas deals taking place across an area running from Maryland to New York. The plant's owner may have hedged with a revenue put whose synthetic unit uses gas prices at Tetco M3, a trading hub in Pennsylvania, plus a fixed differential in order to model the exposure of the real-life plant. That may function much of the time, but if there is an unexpected blow-out between Tetco M3 and Transco Zone 6 prices, the plant's owner might discover that the hedge does

not work as expected, says Glen Swindle, managing partner of Scoville Risk Partners.

"In extreme cold, your gas prices might be really high, so your unit would hardly be running and you wouldn't be making any money, but the synthetic M3 unit would be happily boogieing along, generating lots of power," Swindle says. "So you wouldn't get compensated by the revenue put. You might have thought that your revenues were covered at \$50 million a year, but they're not. If the synthetic unit is minting money and your actual unit is not, that \$50 million floor doesn't hold."

Swindle also warns that customers should be on the lookout for 'gaming' in the structure of the revenue put – that is, features that enable the synthetic unit to perform in a idealised, highly optimal way that the power plant operator could never hope to achieve in real life.

"Many of these structures allow the dealer to look back every month or every quarter and say, in the rear-view mirror, how they would have liked to run the synthetic unit; that can be benign, but if you have the wrong features in the structure, the result can be quite delightful for the dealer," Swindle says.

"In real life, if you're dispatching a unit, you need to make a decision today about how you'd like to bid the unit in for tomorrow," he explains. "You're faced with noisy and polluted information; you don't know exactly what will transpire with prices tomorrow. The way the derivative structure works, usually, is that at the end of the month, in the settlement period, the dealer can look back at actual, realised gas and power prices and say exactly how they would have liked to run the unit. If you have a bad structure, the dealer can exercise the option in a way that's unrealistically optimal, if you like, compared to what you can do with your actual asset."

Dealer challenges

Dealers also face challenges when crafting revenue put options for their clients. For one thing, revenue puts are considered 'swaps' under the US Dodd-Frank Act, meaning they are subject to reporting and record-keeping rules and other regulations pertaining to OTC derivatives.

More significantly, though, it is tricky for dealers to lay off the risk of revenue puts in the marketplace. With simpler products, dealers can find clients to take the opposite side of the trade. For instance, a bank that buys a crude oil swap from an oil producer can lay off its risk by turning around and selling a crude oil swap to an airline. But with highly bespoke structures such as revenue puts, it is not easy to find offsets, and dealers must resort to more clever approaches to managing the risk.

"It's a dynamic product that needs to be carefully managed," says BP's Fleming. "It's nonlinear, so you're dealing with delta positions that are changing with time and market prices, just like any other option that you're carrying on your book. To manage that, you need to have the appropriate systems in place to track your positions, and you need to have a trading desk that's robust enough to either hold those positions or find ways to offset the risk."

Morgan Stanley, the leading dealer of revenue puts, relies on diversification and its wide array of relationships with various counterparties to help lay off the risk, says the source close to the bank. "As hedge fund and dealer participation has waned, we have found that originating out of risk with other clients is the better approach," he says. "When we have good offsets for risk, we tend to be more competitive. When we don't, then we seem to lose deals to competitors that do."

Such difficulties help explain why only a handful of dealers are active in the space and why the number of revenue puts executed is so few. Festle, of E.ON Climate & Renewables North America, says power plant developers such as himself would benefit if there were more dealers offering the product.

"I wish there were a better market for it," he says. "The market is thin, in terms of people willing to provide revenue puts, and a thin market means we have to pay disproportionately high and unattractive premiums. The more people in this market, the better for us."