PROXY GENERATION PPAs

The Next Evolution of PPAs for the Corporate & Industrial Buyer

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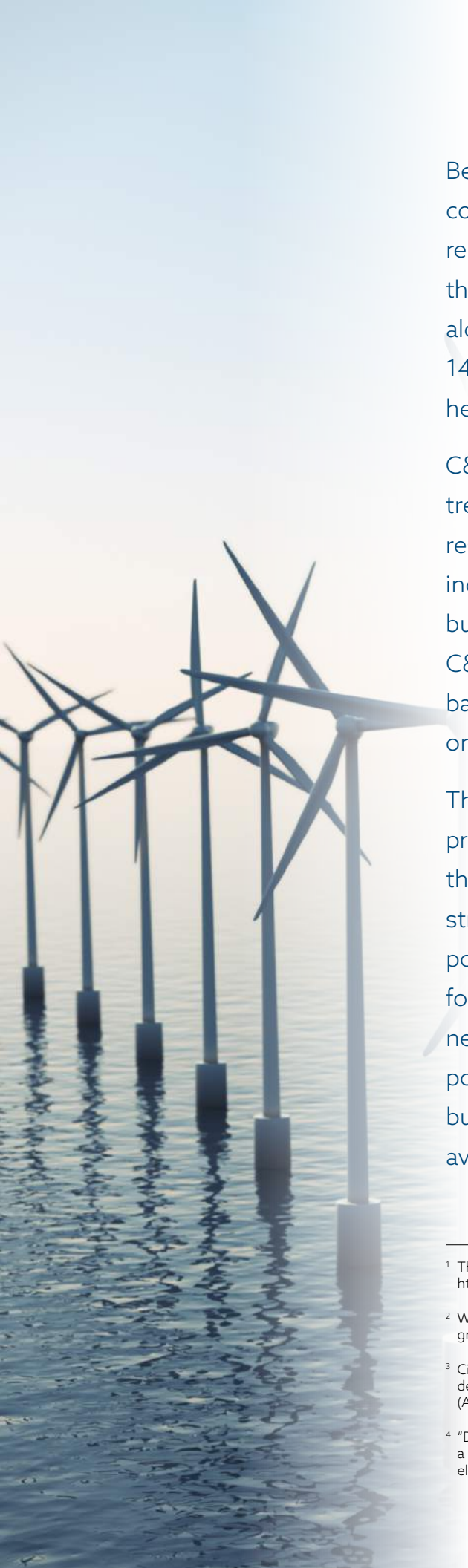
DISCLOSURES

In the interests of transparency, the reader is advised that REsurety may benefit from the adoption of the Proxy Generation PPA as against the traditional vPPA since (1) REsurety is, and may often be, appointed to perform the role of the independent calculation agent under Proxy Generation PPAs, and (2) REsurety's Volume Firming Agreements, which are cited in various portions of this paper, are most efficient at hedging C&I buyers' Fuel Risks when hedging volumes under a Proxy Generation PPA.



Beginning as novelty transactions dominated by socially conscious "tech" companies, corporate & industrial (C&I) renewable energy purchases now exert tremendous pull in the electricity market. Since 2013 and in the United States alone, C&I buyers have contracted for approximately 14,000 MW of renewable energy[1], continuing to make headlines with every purchase.

C&I buyers' appetites for renewable energy have unleashed tremendous creativity in structuring new products. As a result, C&I buyers benefit from state-of-the-art offerings, including: direct purchases of renewable energy by C&I buyers; "green tariffs"[2]; and intermediated deals allowing C&I buyers with smaller purchasing requirements to piggy back onto larger deals originated by financial institutions[3] or by other C&I buyers.

This paper turns a lens onto direct purchases[4], the predominant form of renewable energy transaction. And, this paper further narrows its focus onto the preferred structuring tool for those direct purchases—the long-term power purchase agreement (PPA)—by exploring methods for re-tooling the PPA (1) to simplify the contracting and negotiation process, (2) to better align the interests of green power buyers and power sellers, and (3) to empower C&I buyers to use the latest risk management tools being made available to them from insurance and commodity markets.

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[1] The Business Renewables Center maintains an up to the date tracker, available at: http://businessrenewables.org/corporate-transactions/.

[2] World Resources Institute tracks existing green tariffs at: https://www.wri.org/publication/emerging-green-tariffs-us-regulated-electricity-markets.

[3] Citi's 10 year agreement with QTS Realty Trust serves as a recent example of such an intermediated deal. See "Citi to Power QTS Data Center in Irving, TX with Clean, Renewable Energy," BusinessWire (April 2, 2018).

[4] "Direct purchases" here include those transactions in which the C&I buyer and the project are in a direct contractual relationship; and this paper therefore includes both the purchase of physical electricity as well as swaps.

The Evolving PPA

Originally designed to manage the relationship between electric utilities and independent power producers (IPPs) for fossil fuel-powered projects, the PPA was adapted in the early 2000s to manage the relationship between electric utilities and IPPs for renewable energy projects. In the early 2010s, the PPA evolved again. Given the regulatory impediments to direct contracting between C&I buyers and renewable energy projects, this evolution re-purposed the infrequently used PPA financial contracts-for-differences structure into the preferred tool for C&I buyer contracting—now referred to as the Virtual PPA, or "vPPA."

But despite its evolution to date,

the C&I vPPA remains stubbornly entrenched in its utility origins. The C&I vPPA treats a project's fuel, operational and price risks—the core drivers for each project's economics—the same as those risks would be treated under a fossil fuel-powered PPA by allocating most of these risks to the C&I buyer. That treatment, however, ignores the reality that the operation of a renewable energy project is fundamentally different from the operation of a fossil fuel-powered project. Further, this treatment thwarts C&I buyers' ability to use the tools available to manage the risks taken on through the execution of a vPPA.

To correct this misallocation of risks, the traditional C&I vPPA needs to evolve.

Short Summary

This paper introduces that newest evolution to the C&I vPPA—the "Proxy Generation PPA." Recently deployed in a handful of C&I transactions, the Proxy Generation PPA is specifically designed to both (1) re-allocate the risks associated with a project's operations back onto the project and (2) enable the C&I buyer to effectively manage the risks associated with uncertain future vPPA settlement payments by using the available and expanding vPPA risk management tools offered by insurance and commodity markets. The Proxy Generation PPA also has the added benefit of reducing contractual complexity in the C&I vPPA.

And while the Proxy Generation PPA is a new evolution of the C&I vPPA, it builds upon the learned experience of more than 4,000 MW of Proxy Generation-linked contracts that have been signed by (re)insurance firms over the past four years. Combined with recently available Proxy Generation-based Volume Firming and PPA Settlement Guarantee agreements, the Proxy Generation PPA provides a powerful tool for C&I buyers to pursue sustainability goals through the acquisition of renewable energy, while avoiding the risks that they may be unwilling or unable to absorb.

Part I of this paper defines the risks involved in buying power from a renewable energy project, and the allocation of those risks under the traditional C&I vPPA structure. Part II introduces the Proxy Generation calculation as well as the main features of the Proxy Generation PPA. Part III concludes by presenting a case study that explores the first deployment of the Proxy Generation PPA by one of the leading C&I buyers in the market today: Microsoft.

CORE RISKS

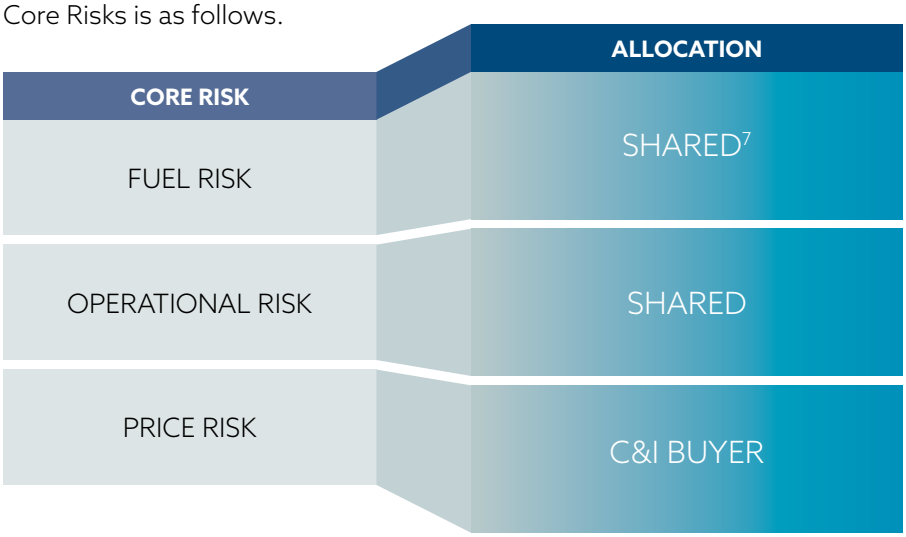
Defining the Core Risks

The economics of purchasing energy from a renewable energy project is subject to three main drivers of risk: fuel, operations and price (collectively, the "Core Risks"). The Core Risks are[5]:

- **Fuel Risk:** The availability and price of fuel to power the project. For fossil fuel projects, Fuel Risk comprises the price of obtaining the commodity that will be burned (e.g., natural gas, coal, diesel or fuel oil). Wind and sunlight have no cost; so Fuel Risk in the renewable energy context is solely dependent upon supply—i.e., how much of the free fuel shows up at any given time and in total.
- **Operational Risk:** The project's operational performance, meaning the efficiency with which a generation facility converts fuel into energy. Components of Operational Risk generally include equipment performance (power curve for wind, I-V for solar), equipment and grid availability (maintenance, curtailment, etc.) and collection system losses.
- **Price Risk:** The price for the project's electricity. Under the C&I vPPA, that price has two components—the price that the project receives from the electricity grid and the fixed price agreed to under the C&I vPPA. Whether or not the C&I buyer makes a payment to the project or receives a payment from the project is dependent upon the relationship between these two price components.[6]

Allocation of Core Risks Under PPAs

In both fossil fuel PPAs and C&I vPPAs, the default allocation of Core Risks is as follows.



In the fossil fuel PPA, Core Risks are allocated consistent with operational reality. In the fossil fuel PPA, dispatch is controlled by the energy buyer, enabling mitigation of the Core Risks. Simplistically, the buyer decides to dispatch the project (Operational Risk) when the cost of fossil fuel to power the project (Fuel Risk) is less than the prevailing market price for electricity generated by the project (Price Risk).

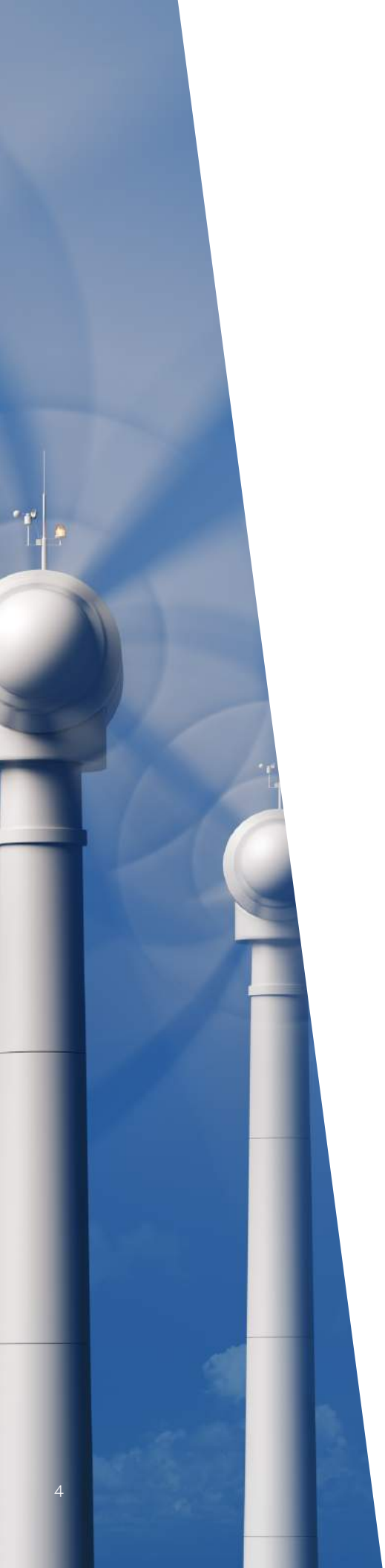
By contrast, in the wind and solar energy context with a C&I buyer, dispatch is controlled by the project.[8] As such, the C&I buyer does not have a mechanism to mitigate the Core Risks. Even if the C&I buyer attempts to use hedging products available in the commodity and insurance markets to hedge a subset of the Core Risks (namely Price Risk and Fuel Risk, respectively), its hedging strategies can be frustrated or negated because it does not actually operate the project. This interjects Operational Risk outside of the C&I buyer's control, which hampers the C&I buyer's ability to "cleanly" hedge the other Core Risks.

[5] One risk that is often discussed in the context of C&I vPPAs is "shape risk." Shape risk is the covariance of Price Risk and one of the other two Core Risks (Fuel Risk or Operational Risk) and is therefore covered as part of the Core Risks.

[6] We note here the distinction between price risk at both the interconnection point and at liquid settlement points. We note the pre-dominance of "hub-settled" C&I vPPAs, in which the parties settle on the basis of the price at a liquid hub as compared to the price at the project's bus bar. In that case, while the Buyer is allocated Price Risk at the liquid hub, it is actually the project that bears the Price Risk between the bus bar price and the liquid hub price (i.e., the project's "basis risk"). However, for purposes of this paper, we focus solely on Price Risk that results when the hub is used as the settlement point price.

[7] Fuel Risk and Operational Risk are shared between the project and the buyer. In a PPA, energy is sold on a price per unit volume ($/MWh) basis. As such, should a lack of fuel or an operational issue cause a project to generate fewer MWh, the project's revenue will be reduced accordingly. Whereas a buyer does not pay for energy not produced, the under or over-generation will lead to the buyer paying for fewer or more renewable energy credits and energy than it anticipated. The uncertainty of the energy volumes can be particularly challenging for a buyer as it can lead to the buyer unexpectedly being long or short the energy market.

[8] The contracts-for-differences structure available to C&I buyers is a purely financial instrument that is not generally concerned with dispatch. Instead, it assumes the swap of fixed and floating revenues.



Operational Risk: The Clear Case for Re-Allocation

While being allocated Operational Risk, C&I buyers have attempted to push some of this risk back onto the project. This has inevitably resulted in a tit-for-tat between projects and C&I buyers—from the perspective of the projects, to allow operational flexibility and from the prospective of the C&I buyers, to both maximize generation during periods of high electricity prices and increase certainty in the amount of power they are expecting to buy. In order to manage the various covenants, exceptions and exclusions necessary to govern this competing dynamic between the project and the C&I buyer, operations-related clauses have become exceedingly complex, bordering on the labyrinthine.

Two examples illustrate the point. First, C&I wind vPPAs have robust provisions measuring the actual mechanical availability of the project as compared to a pre-agreed required availability. These provisions are designed to ensure that the project is able to produce electricity during productive weather conditions. However, the availability guaranty is replete with negotiated exceptions including, for example: curtailments by the transmission provider or electric grid operator; periods when locational marginal prices drop below a pre-set floor; substation failure; serial defect of equipment; and curtailments required to protect environmentally endangered or threatened species. As a result, the availability guarantee language in vPPA contracts is often highly bespoke, limited in the protection it offers C&I buyers and difficult to enforce.

No example illustrates the race to the bottom between projects and C&I buyers better than the frequency and timing of maintenance outages. The project and the C&I buyer typically have competing concerns—the project desires to conduct maintenance at any time the fuel resource (the wind speed) is low, when power prices tend to be high, while the C&I buyer desires that maintenance occur when power prices are low, when wind speeds tend to be high.

In the opening salvo of negotiations, C&I buyers restrict the performance of any maintenance during summer months. Pushing back, projects require exceptions to allow for maintenance during periods of lower wind speeds. C&I buyers push back again, requiring not-to-exceed thresholds in those same months. Projects then retaliate with exceptions to preserve equipment warranties, to which C&I buyers restrict maintenance events that cannot be performed during non-summer months. It is easy enough to see how a one paragraph covenant easily becomes a multi-page tome.

As a result, most modern C&I vPPAs still allocate much of a project's Operational Risk onto the C&I buyer, despite pages of terms and conditions intended to accomplish the opposite. That is a mis-allocated risk. The C&I buyer has little to no control over what turbines are purchased, how they are maintained or upgraded, or what terms and conditions are negotiated into warranties and services agreements, yet the C&I buyer generally bears the financial impacts and risks of those decisions. The Proxy Generation PPA correctly re-allocates the Operational Risk of a project away from the C&I buyer and back onto the project.

Reallocating the Other Core Risks

The Operational Risk is simply misallocated to the C&I buyer. We now also consider the others.

Fuel Risk

In the context of wind and solar energy, neither the project nor the C&I buyer can control Fuel Risk—i.e., the weather. So, Fuel Risk should be allocated to the party that is best positioned to hold or hedge this risk. That decision can, in turn, be influenced by the risk tolerance of the party exposed to the Fuel Risk, and the cost of hedging or transferring that risk.

It is also important here to consider the fact that C&I buyers may in fact be highly attracted to Fuel Risk for accounting reasons. The intermittency of wind and solar fuel resources result in an inability to know how much power will be produced and when—invoking the "no known notional quantity" exemption that avoids having to account for a C&I vPPA as a derivative.[9]

Price Risk

Together with the desire to achieve sustainability goals, Price Risk is the sine qua non as to why many C&I buyers enter into C&I vPPAs—as the C&I vPPA creates a hedge on the cost of their electricity consumption costs. And as such, Price Risk is properly allocated to the C&I buyer.[10] In the ideal (but often not realized) scenario, the purchase price of renewable energy at the liquid trading point specified under the C&I vPPA will be fixed and below the forward price curve for comparable electricity purchases, enabling such C&I buyer to lock in energy prices at a discount to the expected future market cost.

However, while it is true that many C&I buyers enter into C&I vPPAs in order to hedge the cost of their electricity consumption, many others still do not actually have a market-based energy consumption cost risk to offset. This can occur for many reasons—but as one example, let us assume a C&I buyer enters into a 15 year vPPA but has already agreed to buy power at a fixed price from its utility for the next 5 years. As such—for the first 5 years of the 15 year vPPA, the C&I buyer has no energy cost risk to offset and as such the vPPA becomes a speculative 5-year bet on the value of power generated by the relevant wind farm. In cases like this, the C&I buyer may look to hedge or sell their exposure to Price Risk to a Commodity Market Counterparty—such as a bank, commodity trading firm or energy retailer.

The reallocated Core Risks then re-balance as follows:

CORE RISK	TRADITIONAL vPPA ALLOCATION	PROXY GENERATION PPA ALLOCATION	PROXY GENERATION PPA (or after optional hedging)
FUEL RISK	PROJECT & C&I BUYER	PROJECT & C&I BUYER	PROJECT & C&I BUYER (OR INSURER)
OPERATIONAL RISK	PROJECT & C&I BUYER	PROJECT	PROJECT
PRICE RISK	C&I BUYER	C&I BUYER	C&I BUYER (OR COMMODITY MARKET COUNTERPARTY)

How then to come to a solution that will implement this re-allocation? Again, we introduce the Proxy Generation PPA.

[9] See FASB 133 ¶ 6(a).

[10] We take note of the creative solutions in the market to further shift Price Risk to the seller through the form of price collars.

PROXY GENERATION PPA

The Proxy Generation PPA is, in many ways, a fundamental rethinking of what constitutes a PPA. The PPA is, and has been, a construct that is calculated based on the actual generation of a project, as measured by the project's electrical meter. The Proxy Generation PPA, by contrast, re-orients the PPA towards settlement measuring the expected generation of the project given a specific volume of fuel (e.g. the wind speed at each turbine) as measured by the project's operational and meteorological measurement equipment.

For a wind farm, Proxy Generation calculates this expected generation quantity profile as a function of: (1) measured weather conditions at each individual turbine; (2) the turbines' expected fuel-to-power conversion efficiency (also known as the "power curve") and (3) the project's expected operational efficiency ("EOE").

In short—by calculating the settlement of a Proxy Generation PPA based on the measured input (fuel) as opposed to the measured output (energy) the Proxy Generation PPA buyer avoids taking on exposure to the project's Operational Risk.

Value Proposition

In reorienting the PPA away from the actual metered generation, the Proxy Generation PPA re-allocates Operational Risk squarely to the project. Operational Risk is captured by the EOE which, as a single number, replaces the labyrinth of operational covenants and their exceptions that have become standard in traditional C&I vPPAs. Prior to signing the Proxy Generation PPA, a project determines and commits to the EOE. Once operational, if the project out-performs its EOE, that outcome is to the project's benefit. If the project under-performs its EOE, that outcome is to its detriment. The C&I buyer has no risk—neither upside nor downside—to the project's operational performance, as intended.

In re-allocating Operational Risk in this way, the Proxy Generation PPA achieves three ends. First, it simplifies the contracting process, allowing the Proxy Generation PPA to be stripped of complex and difficult-to-enforce contractual provisions around mechanical availability, turbine selection or limitations on maintenance outages. Second, by re-allocating the Operational Risk to the project, the Proxy Generation PPA aligns interests between the project and the C&I buyer. Third, the re-allocation of Operational Risk to the project empowers the C&I buyer to pursue hedging strategies—if and as it deems necessary—to mitigate Fuel Risk and Price Risk, each of which can separately be hedged through contracts with insurance and commodity market participants, respectively.

Calculation Basics

At its core, Proxy Generation is a straight forward calculation. Every ten minutes, the average wind speed at each turbine is measured and adjusted for air density and blade interference. That wind speed is applied to the turbine's power curve to yield an amount of implied energy. Finally, that quantity of energy is then multiplied by the EOE (a percentage always less than 100% and typically greater than 85%). The resulting volume of energy (in MWh per turbine) is then summed across all turbines comprising the project, and all time intervals within each hour, yielding a project-level, hourly Proxy Generation value that can be applied to the settlement point price.

Additional complexity comes into play in order to handle abnormal conditions. For example: what happens if the project's anemometers break, or if a hurricane knocks the whole project ever and so it no longer reports any wind speeds? Standard provisions exist to handle these conditions, and data quality tracking and – if necessary – data replacement, is a large part of the service performed by the independent calculation agent to a Proxy Generation PPA.

Independent Calculation Agent

Given that Proxy Generation is a calculation of idealized production rather than actual generation, prior to entering into a Proxy Generation PPA, the C&I buyer and the project will need to agree upon a third party with the requisite expertise to provide the Proxy Generation calculation service. The independent calculation agent, then, becomes a crucial third party to the Proxy Generation PPA. The downside to adding a third party to the traditional C&I vPPA process in order to settle on Proxy Generation is cost. Calculation of Proxy Generation as a service typically costs 0.5% of contract value[11], and requires a new contract—a Calculation Services Agreement—to be entered into between the project, the C&I buyer, and the designated calculation agent. The independent calculation agent makes the Proxy Generation calculations on a standard schedule—typically quarterly, with interim reports issued monthly.

Covenants

Since the Proxy Generation PPA is predicated upon a calculated quantity of energy, rather than an observed quantity, the Proxy Generation PPA renders obsolete the complex operational covenants in a traditional C&I vPPA. In their place are covenants covering data reporting and quality. As to data reporting, under a Proxy Generation PPA the project will be required to deliver to the independent calculation agent detailed operational data on the project, including meteorological observations as well as operational conditions. As to data quality, the project will be required to submit to covenants that ensure the data measurement equipment are regularly maintained and operational.

[11] As an example: if a $20 per MWh Proxy Generation PPA is executed with a 100 MW Project with a P50 generation of 350,000 MWh, the expected value of that agreement would be 350,000MWh * $20.00/MWh = $7,000,000. The cost of Proxy Generation calculation services would be $7MM * 0.05% = $35,000.

CASE STUDY: MICROSOFT

As Microsoft's business shifts from being primarily software-based to being primarily cloud-based, the energy consumption of our operations has increased significantly, and is expected to continue increasing with the success of our energy-intensive, cloud-based products. With our current global operations consuming more electricity than some small U.S. states, we face two challenges: (1) the environmental footprint of our operations is expanding and (2) Microsoft's financial performance is increasingly sensitive to a volatile commodity—electricity price.

Microsoft was an early pioneer of the traditional C&I vPPA, viewing it as an excellent tool in addressing our first challenge: environmental sustainability. Through the direct purchase of energy from wind and solar projects, we are on a path to eliminate the carbon footprint of our data centers' energy consumption. With respect to our second goal of energy price certainty, however, the traditional vPPA has proven a partial but incomplete tool. This is because our data centers consume power 24 hours a day, regardless of whether the wind is blowing, the sun is shining, or the project with which we have signed a vPPA is available to produce energy. It is through our pursuit of this second goal—certainty in energy consumption costs—that we have embraced the Proxy Generation PPA.

As background, Microsoft's first traditional vPPAs began producing clean energy in the summer of 2015. Watching those first transactions begin to perform, we were delighted by the contribution they made to our sustainability goals but were frustrated by the financial volatility of the settlement payments and the limited ability we had to predict or manage that volatility. Project generation changed dramatically month-to-month and quarter-to-quarter; and we often found ourselves buying an excess of power when we did not need it (when energy prices were relatively low) and receiving a shortfall of power when we did need it (when energy prices were relatively high). For an organization like Microsoft that values predictable financial performance, having the efficacy of our vPPAs as tools to manage energy costs be dependent on the weather was not ideal, so we began to work with commodity markets and insurance firms to craft a solution.

What became clear was that Microsoft had good options to manage all of the risks associated with our traditional vPPAs except for one-- the Operational Risk. Banks and commodity trading firms were eager to work with us to manage the Price Risk on any expected excess or shortfalls in generation as compared to our load and (re) insurance firms were eager to work with us to manage Fuel Risk; but nobody wanted to take on the Operational Risk.

The reason given was fairly simple: Microsoft's partners on the traditional vPPAs, the projects themselves, directly or indirectly controlled the Operational Risk; and holding risk exposure to a third party's decisions is expensive, at best, and impossible, at worst. In response to that market feedback, Microsoft changed the way we purchase clean energy, exclusively buying power via Proxy Generation PPAs with the goal of leaving the Operational Risks with the party that controls them—the project. Having identified a solution, we changed our contracting strategy quickly, and as of today Microsoft has signed agreements to buy clean power from over 1,300 MW of wind and solar projects across the U.S., with nearly 1,000 MW of those agreements using the Proxy Generation PPA structure.

These Proxy Generation PPA structures, coupled with the Volume Firming Agreements we recently announced (https://blogs.microsoft.com/on-the-issues/?p=61905), enable Microsoft to succeed in its win-win strategy of renewable energy procurement, achieving both our sustainability and financial goals in parallel. We hope that the model Microsoft has pioneered provides a useful template for other C&I buyers who are similarly aiming to achieve aggressive sustainability targets without having to sacrifice financial performance or flexibility.

CONCLUSION

While retaining much of the vPPA architecture that has been successfully utilized to contract for approximately 14,000 MW of C&I renewable energy transactions since 2013, the Proxy Generation PPA represents a conscious evolution of the vPPA.

That evolution is first towards simplicity. By replacing the C&I vPPA's couplet of an as-generated energy construct and operational covenants with a single Proxy Generation calculation based on weather conditions and the EOE, the Proxy Generation PPA removes the back and forth negotiation over operational covenants and the need to police those covenants.

That evolution is also towards the complementary goals of aligning green power buyers and sellers' interests in the operation of projects and empowering C&I buyers to fully utilize the latest risk management tools available in the insurance and commodity markets. The Proxy Generation reverses the traditional utility PPA assumption of bluntly pushing Core Risks onto the buyer. Instead, the Proxy Generation recognizes that (1) the C&I buyer has different objectives and capacities from its utility counterpart and (2) the C&I buyer simply cannot bear the same risks as effectively as its utility counterpart, By re-allocating the Core Risks between the project and the C&I buyer in relation to which party can best bear or hedge these risks, the Proxy Generation PPA disaggregates unhedgeable Operational Risk from hedgeable Fuel Risk and Price Risk.

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