

# Innovation in **POWER** PURCHASE AGREEMENT STRUCTURES



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# Foreword

This report builds on WBCSD's ***Corporate Renewable Power Purchase Agreements: Scaling up globally*** report (October 2016), which provides background on corporate power purchase agreements (PPAs). The initial report includes the opportunities that PPAs offer, the obstacles corporate buyers and developers face as they plan and negotiate PPAs and potential solutions to challenges.

The objective of this ***Innovation in Power Purchase Agreement (PPA) Structures*** report is to identify further challenges that corporate buyers have come across as the corporate PPA market has grown and evolved in existing and new markets and jurisdictions. It identifies examples of innovations in different markets as a result.

Our hope is that better understanding of these challenges and innovations will accelerate deployment of more corporate PPAs in mature markets and that it will also assist in the development of successful new markets for corporate PPAs. In each case, though, innovations in one market may not be applicable in other markets due to different market dynamics.



## Corporate Renewable Power Purchase Agreements: Scaling up globally

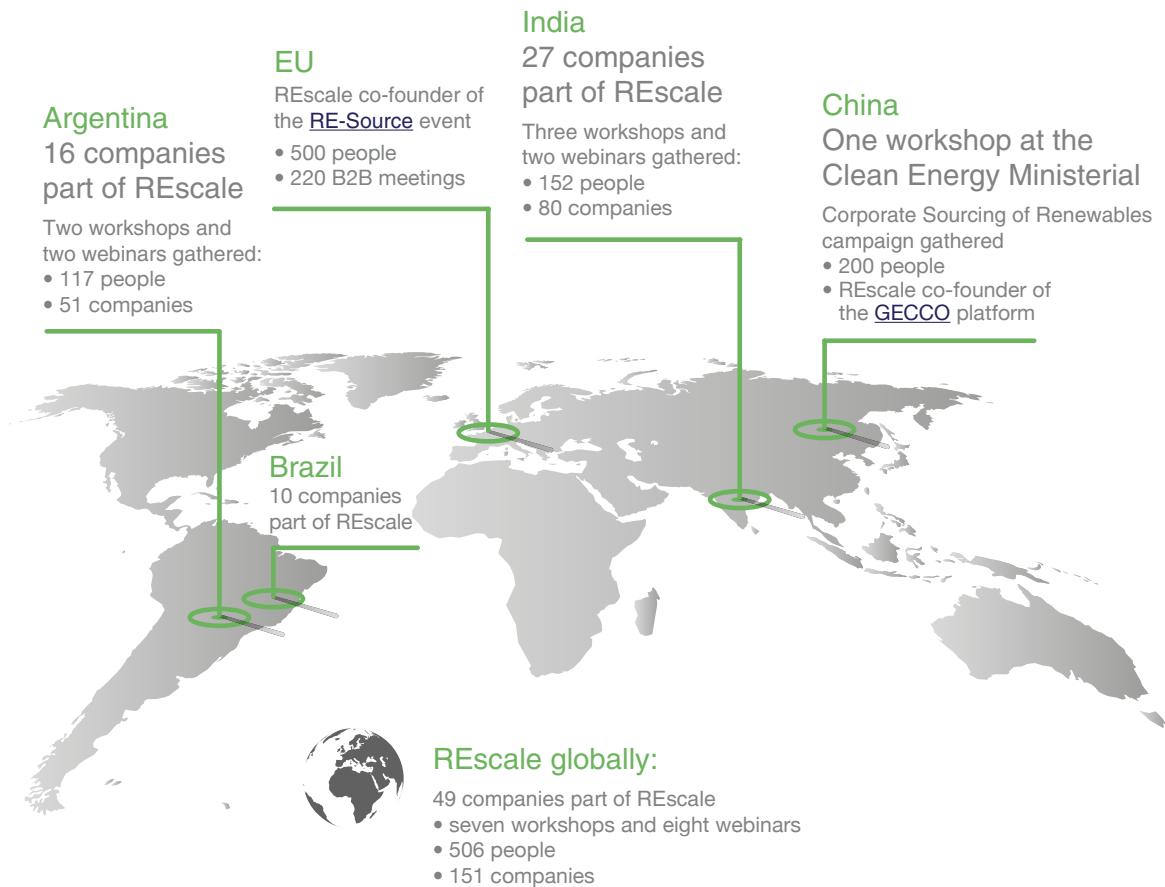
Organizations are increasingly looking to reduce their environmental footprint and energy costs. While reducing energy consumption is often the most obvious way to reduce impact on the climate, companies need to maintain continuous business operations. As a result, many private companies are procuring energy from renewable generation sources as part of their plans to reduce carbon emissions in their sustainability strategy. The role that renewable energy plays in a company's energy strategy is increasingly elevated from an operational and technical exercise to a strategic and commercial priority.

There are a number of ways for companies to adopt a renewable energy strategy, for instance through renewable electricity, heat or transport, all of which have associated benefits. The most accessible solutions in terms of carbon emission reduction for many industries are currently centered around renewable electricity.

Renewable electricity strategies vary from investing directly in a generation asset, or purchasing the power from a third party's project to buying renewable certificates. WBCSD's global report "Corporate Renewable Power Purchase Agreements – Scaling up Globally" focuses on a company purchasing electricity from an off-site renewable electricity project via a PPA. Corporate PPAs are a suitable instrument to address offtake risk for developers and financing parties and therefore can significantly help to increase and accelerate the deployment of renewables – the objective of WBCSD's REscale business solution.

[http://www.wbcsd.org/Clusters/Climate-Energy/Resources/Corporate\\_Renewable\\_PPAs\\_Scaling\\_up\\_globally](http://www.wbcsd.org/Clusters/Climate-Energy/Resources/Corporate_Renewable_PPAs_Scaling_up_globally)

**Figure 1:**  
Regional engagement activities for REscale



# 1. Introduction to the main features and risks that will define a PPA structure



As outlined in the first report – ***Corporate Renewable Power Purchase Agreements: Scaling up globally*** – power purchase agreement (PPA) discussions focus on a company purchasing (whether actually or notionally) electricity from an off-site renewable electricity project via a PPA (a corporate renewable PPA or corporate PPA). This report does not cover the additional issues and solutions associated with approaches such as purchasing from an on-site or near-site project that is behind the meter or investing directly in such a project.

When looking at different contracting approaches globally, it is important to use a consistent approach to understanding corporate PPAs and the market context that informs them. This introduction sets out the main features of corporate PPAs that are common to a variety of contracting approaches. Such features may relate to the corporate PPA – such as the term, volume or pricing – or cover wider aspects that influence the form of a corporate PPA – such as the relevant power market or the design of relevant renewable energy subsidies. It also looks at common risks that need to be addressed, such as the risk of the project not being built on time or performing as expected. In doing so, it briefly discusses the perspectives of different parties involved, such as the corporate buyer, the developer and lenders.

These concepts are then used for the more detailed analysis of different contracting methods and how they approach some of these features and risks found in the following chapter.

**Table 1:**  
Corporate PPA features

Corporate PPA feature	Summary
<b>Parties</b>	<p>In general, the counterparties to the PPA will be the owner of the renewable energy asset, as seller, and the corporate as buyer.</p> <p>However, there are circumstances where other parties may be involved. For instance, due to regulatory or commercial reasons, a corporate buyer may use a utility or other market participant as its agent for all or part of a corporate PPA transaction.</p> <p>It is important to identify and involve all of the relevant parties from the outset – as this will dictate the structure, terms and requirements of the corporate PPA itself, particularly when the corporate PPA becomes a tri-party or multi-party agreement due to the involvement of a sleeving agent, utility or other intermediary.</p>
<b>Pricing</b>	<p>This primarily covers the price to be paid with respect to the electricity generated over the term of the PPA, which will influence what is being paid for. For example, in a synthetic PPA this would be a differential payment between a reference energy price and the price agreed under the PPA. In a physical or sleeved PPA, this would be the price for electricity generated and delivered to the buyer or its agent. (Synthetic PPA and sleeved PPA structures are explained further below.)</p> <p>However, the pricing mechanism in a PPA can also cover a range of other items, such as:</p> <ul style="list-style-type: none"> <li>• Indexation by reference to inflation or other relevant indexes.</li> <li>• The price (if any) to be paid for applicable local certification that the electricity is renewable (such as Renewable Energy Certificates in the United States, Guarantees of Origin in Europe or International Renewable Energy Certificates (<a href="#">I-RECs</a>) in Brazil).</li> <li>• The price to be paid for any benefits that may accrue to the buyer as a corporate buyer of electricity (such as the avoidance of industry charges that may have otherwise been payable).</li> </ul>
<b>Tenor</b>	<p>This is the period over which the corporate buyer is obliged to pay for electricity contracted for under the PPA. It can be a fixed period or one that is subject to extensions triggered by certain conditions or if one or both of the parties to the PPA elects to do so.</p>

**Table 1: (continued)****Corporate PPA features**

Corporate PPA feature	Summary
<b>Volume</b>	This is the amount of electricity to be paid for by a corporate buyer under a PPA. In general, for intermittent technologies such as wind or solar, the volume will be the total output of the generation facility (or a percentage of that total output). <a href="#">Chapter 2</a> discusses different approaches to this.
<b>Subsidies</b>	Payments by the corporate buyer with respect to the electricity generated may not be the only revenue source available to the owner of the generation facility. Where other renewable energy support regimes are applicable, these may need to be dealt with in the PPA. For example, this may be as simple as clarifying that the seller retains all rights to such benefits. Alternatively, in some markets, the benefits arising from such a renewable support regime may be transferred to the corporate buyer along with the electricity.
<b>Power market</b>	A PPA will reflect the design of the power market in which the generation facility is located and (potentially) where the corporate buyer's demand is located. This is not limited to whether a corporate buyer could, for example, be the corporate buyer of physical deliveries of electricity. It is also relevant to other features, such as pricing. For example, the design of a market will influence what sources of market pricing are available as a reference tool within a PPA.  How different products within a power market are treated from a regulatory and accounting perspective is also an influence. For example, a financial hedge product with respect to electricity price exposure may be treated differently under financial services regulations in a market than under a physical purchase of electricity. For more detail on this we refer to the WBCSD's latest <a href="#">IFRS Accounting Outline for Power Purchase Agreements</a> report (January 2018).
<b>Renewable power certification</b>	The transfer of certificates demonstrating the renewable nature of the electricity purchased is an important feature of PPAs for corporate buyers. In mature markets such as the United States or Europe, this aligns with robust regulatory regimes that enable confidence in the tracking and retirement of such certificates to support renewable claims under standards such as <a href="#">RE100</a> (a collaborative, global initiative uniting more than 100 influential businesses committed to 100% renewable electricity). In less mature markets, this may require more bespoke arrangements.

Other PPA features can be considered in terms of how they manage risks that are common to most PPA transactions. [Table 2](#) outlines some of these risks and common approaches of different stakeholders. It highlights the perspective of lenders as the purpose of many corporate PPAs is to provide the core revenue stream that enables the relevant renewable energy facility to be built. Where debt financing is sought, it often comes in the form of limited recourse financing where the lenders will focus on the corporate PPA as a crucial revenue contract.



**Table 2:**  
Risks and positions

Risk	Summary	Corporate buyer position	Developer position	Lender position
<b>Development risk</b>	This is the risk that the generation facility is not constructed and commissioned on a timely basis or at all.	Corporate buyers will not want to be locked into purchasing electricity from a project that has not been commissioned within a reasonable period.	Developers will focus on ensuring that any hard date to complete the construction and commissioning of a project includes an appropriate buffer and will extend for forces beyond the developer's control.	Lenders to a project will want to ensure that there is limited risk of the corporate PPA falling away before a project is completed.
<b>Performance risk</b>	This risk looks at whether the project performs as expected. For example, that it achieves a minimum level of mechanical availability, meets its warranted power curve (wind) or performance ratio (solar PV).	Corporate buyers often make economic assumptions based on the expected performance of a technology or the specific project. Reflecting this in the corporate PPA can provide comfort as well as a potential exit route for a poorly performing asset.	Developers may consider performance guarantees unnecessary in light of the economic incentive on a generator to maximize output. Where agreed, the focus will be on ensuring any requirements are achievable and aggregated over time (as, for intermittent sources, time aggregation diminishes risk).	Lenders will be aligned with developers on ensuring that such requirements in the PPA are sensible and include appropriate remedy rights.
<b>Volume risk</b>	For intermittent technologies in particular, this risk captures the likely output of the facility over a period of time.	Depending on the market, some corporate buyers will look to the developer to commit to a minimum volume over a reasonable period of time, such as a year.	Developers work with such proposals so long as requirements are achievable and aggregated over time. <a href="#">Chapter 3</a> discusses other hedging solutions that have been applied, such as weather derivatives.	Lenders will be aligned with developers on ensuring that such requirements do not shift too much risk to the project.
<b>Shape or profile risk</b>	This captures the fact that the hour-to-hour output will be variable depending on relevant conditions such as wind or irradiation, even if the overall volume of an intermittent technology over a sufficient period of time can be forecast. Against this, the demand profile of a corporate buyer is likely to be baseload.	Corporate buyers will often work with their overall electricity supplier to manage the impact of an intermittent output profile interfacing with the corporate buyer's demand profile. Fees are associated with doing so.	There is a relatively limited number of public examples of parties to a corporate PPA agreeing that a developer will manage risk for a corporate buyer (for example, by offering a firm output profile). This report discusses how this may change.	Lenders prefer that a borrower have the least risk exposure feasible. Where a borrower manages such risks for a corporate buyer, this will be closely scrutinized.

**Table 2: (continued)**  
Risks and positions

Risk	Summary	Corporate buyer position	Developer position	Lender position
<b>Basis risk</b>	This risk is usually most relevant to synthetic PPAs but can be relevant to physical PPAs (for example, in a market with zonal pricing). It concerns the risk where the reference price for payments under the PPA (e.g., wholesale electricity price) does not correlate with the price the corporate buyer is generally exposed to under its wider electricity supply arrangements.	This is a risk that informs a corporate buyer's analysis of the commercial structure of a corporate PPA and whether it is satisfied it will likely work over its term.	As basis risk impacts the corporate buyer directly, a developer would see this as a matter for the corporate buyer to assess and get comfortable with.	The lender will be aligned with the developer on this.
<b>Balancing risk</b>	This concerns the risk of being exposed to system costs arising from a facility's forecast generation being different from its actual output.	Whether a corporate buyer takes this risk will depend on the form of corporate PPA used and the particular market dynamics. It would not be relevant to a synthetic PPA. In some markets, the corporate buyer's agent for receipt of physical volumes under a sleeved PPA is well placed to manage this risk for a fee.	Whether a developer takes this risk will depend on whether it is usual or economically efficient for the developer to do so. The developer may also engage an agent or intermediary between the corporate buyer and developer, who will take or share this risk.	This is usually a matter of ensuring that the risk is properly modeled and accounted for.
<b>Credit risk</b>	This risk covers the likelihood that a party will be unable to pay amounts owed under a PPA. As the PPA is a crucial revenue contract, this risk is most often considered primarily in terms of the ability of the corporate buyer to pay.	Corporate buyers will often resist the requirement to provide credit support. Letters of credit are relatively expensive. Even parent company guarantees can attach an internal cost to a group and can require internal approvals to be granted that would not otherwise be needed.	The attractiveness of long-term offtake agreements depends almost entirely on the creditworthiness of the corporate buyer. Even where a corporate buyer has a significant positive reputation as a global brand, the creditworthiness of the particular contracting entity will be closely considered.	Creditworthiness and credit support requirements are heavily scrutinized by lenders, particularly where the long-term viability of the project is based on the credit strength of the corporate buyer over that period.

**Table 2: (continued)**  
Risks and positions

Risk	Summary	Corporate buyer position	Developer position	Lender position
<b>Price risk</b>	This risk covers the extent to which the pricing under a PPA works for a relevant party over time. For example, whether pricing is fixed or floating will create different price risks.	Corporate buyers remain focused on the need for a renewable electricity transaction to make economic sense. A number of corporate PPAs reflect pricing that is attractive to the developer while remaining below what the corporate buyer will expect to pay over the longer term. However, the fixed nature of such pricing can enhance the pricing risk if comparable market prices fall significantly over time. Certain models are emerging in various markets to manage this concern. These are discussed in more detail later in this report.	For most renewable electricity projects, a great deal of the attractiveness of entering into a PPA lies in the ability to secure a long-term and predictable price. More flexible pricing to mitigate long-term pricing risks for a corporate buyer can undermine this predictability.	Lenders will model the corporate PPA pricing extensively to ensure that the project's revenues will be sufficient for repayment of debt. Any mechanism to re-open pricing will be tested for downside risk.
<b>Tenor risk</b>	The scope of this risk is tied to the pricing approach. For example, for a fixed price, a long tenor creates the possibility of significant savings but also the risk of being locked into an expensive price.	This will be informed by wider factors such as to what extent the specific PPA fits within a corporate energy strategy and the sensitivity of the corporate buyer's business to energy price exposure.	Developers' electricity market price forecasts will influence the term of the PPA that they will want to secure. If the project is being financed by debt, then developers will be guided by lender requirements on the minimum term required.	Lenders will usually expect a long-term PPA as it is important to their assessment of the project that it last for at least the term of the debt. <a href="#">Chapter 3</a> discusses this further.
<b>Change in law risk</b>	Laws and regulations change over time. This can upset the balance of risks and rewards under a PPA. A PPA will need to provide a mechanism to allocate or share such risks if they arise.	Corporate buyers are likely to resist bearing change in law risk. Where a PPA is on a long-term fixed price basis, a corporate buyer may consider that the benefit it provides the developer by offering such pricing is enough to justify the project bearing such risks.	Developers will want change in law risk to be well defined and dealt with fairly with regard to the balance of risk and reward under the agreement. Having a fair and workable change in law mechanism is accentuated where a corporate PPA is the primary revenue source for a project.	Lenders will want to ensure the long-term sufficiency of project revenues. They will want to ensure that change in law provisions cannot be used to materially undermine forecast revenues.

**Table 2: (continued)**  
Risks and positions

Risk	Summary	Corporate buyer position	Developer position	Lender position
<b>Force majeure risk</b>	During construction or operation of the project, extraneous events may occur over which neither the developer nor the corporate buyer has control. The effect of such events can delay completion of the project or impact upon generation. A PPA will need to provide a mechanism to allocate or share the responsibility for such risks should they occur.	The corporate buyer will want to know that the developer is doing everything it can to minimize the delay or the impact on generation. It may wish to have the ability to purchase renewable energy from an alternative source during such a period. If the force majeure event is prolonged, the corporate buyer will also want the ability to terminate the PPA.	Developers will focus on ensuring that the scope of force majeure protection is wide and can be applied in circumstances such as construction delay or facility underperformance. Where there are termination rights in favor of a corporate buyer for a prolonged force majeure event, a developer will want to ensure that it is given a reasonable period before these are invoked.	Lenders will want to ensure that the responsibility and the risk of extraneous events are fairly allocated or shared between the corporate buyer and the developer. Lenders' interests are aligned with the developer with respect to this risk. Lenders will also have step-in rights that could be used prior to termination for force majeure.



## 2. Overview of the main PPA structures used today



## Introduction

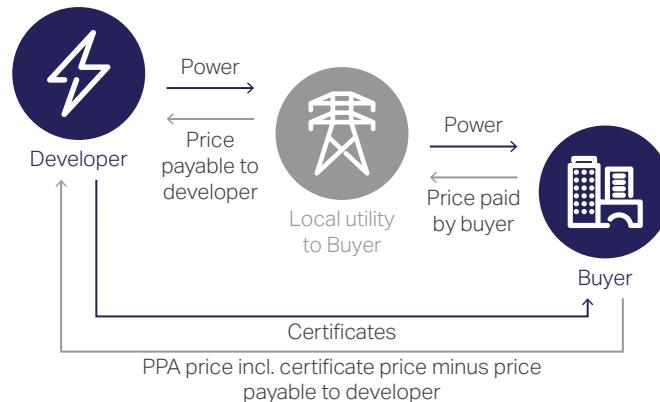
This chapter recaps some of the discussion from the previous ***Corporate Renewable Power Purchase Agreements: Scaling up globally*** report regarding common structures used for corporate PPAs. It then goes into greater detail on some of the main features and approaches to risk allocation, with a view to identifying some common issues or challenges across different structures and markets. These are the basis for investigating innovation in [Chapter 3](#).

## Common structures

### Synthetic, virtual or financial structure

A virtual approach replaces the physical PPA model with a financial structure that creates a similar economic effect as a physical PPA for both parties, without sleeving or transmission fees. Virtual PPAs are more flexible in their structure – developers and the offtaker do not have to be connected to the same network provider. Virtual PPAs are most common in a range of liberalized power markets such as the United States. This structure is also adopted in many other new corporate PPA markets around the world. It is used to build plants where the renewable resource is strongest but where the corporate buyer is unable to procure power wholesale or wants to avoid a sleeving fee.

**Figure 3:**  
Synthetic PPA structure  
(example with renewable certificates)



### Sleeved or physical structure

Where a direct connection to the generation asset is not available, but the asset is on the same grid network as the company's offtake point, the corporate buyer can enter into the PPA and appoint a licensed utility or electricity supplier to physically deliver power on its behalf. The action of transferring the electricity through the utility is known as sleeving in many markets because the electricity is sleeved by the utility or electricity supplier from the generation asset to the buyer. In North America, the delivery of power is more commonly referred to as transmission or distribution service.

**Figure 4:**  
Sleeved PPA structure  
(example with renewable certificates)



The choice of contracting structure will influence many but not all of the features and risks of a corporate PPA. For example, [Table 3](#) highlights some differences and commonalities in features and risks between synthetic PPAs and sleeved PPAs.

**Table 3:**  
Synthetic vs sleeved PPAs

Feature/risk	Common approach?	Notes
Parties	No	Physical PPA more likely to involve sleeving agent, intermediary or electricity supplier that manages physical offtake and redelivery of power. Not relevant for a synthetic PPA.
Pricing	No	Synthetic PPA by its nature will involve financial payments determined on basis of selected market reference price. Physical PPAs can be structured this way or as simple payment for electricity. Although structured differently, the economic effect of a synthetic PPA versus a physical PPA can be the same. That said, the accounting and financial services regulation of derivatives also need to be considered for a synthetic PPA.
Tenor	Yes	Both usually driven by lenders seeking revenue certainty on a long-term basis.
Volume risk	No	A synthetic PPA has more flexibility to define volumes to be subject to the price hedge provided (which may not be the actual generation of the underlying project). To date, physical PPAs have tended to follow actual generation. <a href="#">Chapter 3</a> further discusses approaches to this.
Basis risk	Yes	Basis risk is usually relevant to both synthetic PPAs and physical PPAs but can be less significant where both the developer and the corporate buyer operate and trade in the same energy market and thus have the same wholesale energy cost basis.
Renewable power certification	Yes	In general, whether a corporate buyer is using a synthetic PPA or a physical PPA, it will want to acquire renewable power certificates or other relevant environmental attributes (if available).
Development risk	Yes	A corporate buyer's interest in seeing that the underlying project is built on time is the same whether a synthetic PPA or a physical PPA is used.
Performance risk	Yes	A corporate buyer's interest in seeing that the underlying project performs as expected is the same whether a synthetic PPA or a physical PPA is used.
Shape risk	Yes	To the extent that a synthetic PPA mirrors the actual generation profile, the shape risk is similar. However, as a synthetic PPA is a derivative product, it is perhaps more flexible to include additional derivative products to mitigate shape risk. <a href="#">Chapter 3</a> discusses this further.
Balancing risk	No	As a synthetic PPA does not involve the physical transfer of power, balancing risk is not relevant. It is relevant, however, for a physical PPA in many markets; the cost of managing this will need to be considered as part of the overall economics of a physical PPA.
Credit risk	Yes	The considerations around credit exposure are similar, although a synthetic PPA minimizes a project's credit exposure to a corporate buyer (in that the exposure is to the differential payments between the market reference price and the agreed price under the PPA).

## Virtual PPAs in detail

Table 4 below looks at the main features and risks discussed in Chapter 1 in the context of selected markets where virtual PPAs are common or have been used sufficiently enough to form a useful discussion point. Examples from the United States and Australia explore these points.

The discussion is based on the experience of the authors and the wider WBCSD working group. However, this is intended to be an overview for discussion. Actual deals within markets can be substantially different from one to the next.



**Table 4:**  
Main features and risks of virtual PPAs in selected markets

Feature/risk	United States	Australia
Evidence of standard documentation and risk allocation	<p>Some evidence of common contract forms being used across market.</p> <p>Most deals have taken a significant period to negotiate.</p>	<p>Multiple forms of corporate PPAs used across market. Synthetic or financial structures most commonly adopted due to local pool market. Three-way arrangements have married offtaker and developer with retailers or intermediaries where regulatory restrictions require this.</p> <p>Aggregated corporate PPAs are being trialed with retailer, developer and multiple offtakers.</p>
Power market	<p>Different market structures in different states and regions.</p> <p>Federal regulation of wholesale sales in interstate commerce; state regulation of all other energy sales. Seven unique wholesale energy markets operated by Independent System Operators (ISOs) or Regional Transmission Organizations (RTOs) encompass all or part of the majority of states. Most projects with virtual PPAs sell into liquid ISO/RTO markets.</p>	<p>Pool structure covers Eastern and Southern Australian states. The latter is an energy-only gross pool with mandatory participation. Capacity and electricity trading-based market systems for Western Australia.</p> <p>Separate markets for retail, network and generation have seen the rise of "gentailers" which have slowed the uptake of corporate PPAs as most offtake has been contracted with retailers to date.</p>

**Table 4: (continued)**

Main features and risks of virtual PPAs in selected markets

Feature/risk	United States	Australia
Parties	Asset owner and corporate as parties to financial hedge where amount payable is determined by difference between contract price and market reference price. There is evidence of increasing use of agents and intermediaries to manage volume and basis risk on behalf of a corporate buyer or the developer.	Asset owner and corporate as parties to financial hedge where amount payable is determined by difference between contract price and market reference price. Where "firm" supply is sought, structures are emerging, with separate firming contracts between a retailer and the corporate buyer to provide this.
Pricing	Initially fixed prices with some degree of inflation indexation are common but moving to price flexibility within cap and floor to account for negative pricing and basis risks.	Generally fixed price with inflation indexation against consumer price index. Evidence of moving to price flexibility or variation of index and fixed pricing. Due to change in law risk and historically high electricity prices in Australia, some offtakers are contemplating a cap and floor regime or price review mechanism.
Tenor	Trend towards long-term deals matching tenor of project debt (e.g., 10–15 or more years).  Short virtual PPAs may be stacked or combined with other PPAs, hedge agreements or revenue streams to support long-term financing.	Both long- and medium-term deal examples (noting that project debt tends to be mini-perm 5–7 year debt rather than long-term debt common in other markets such as United States and Europe).  Longer term contracts out to 2030 currently contracted to take advantage of the benefit of green certificates (large-scale generation certificates, or LGCs).
Volume	Initially large deals covering entire output of facility. Evidence of movement to multiple buyers acquiring different percentages of output.	Early deals have been for majority of facility output. As larger scale generation is commissioned, corporate buyers are seeking percentages of output or developers are looking to contract with multiple offtakers. Due to currently high prices, some developers are contracting a portion and selling the remainder to merchants in the spot market.
Subsidies	Tax credit regime with material value, but currently undergoing government scrutiny.	Decreasing role as LGCs are traded on the market and have no government-imposed floor price. LGC volume cap is anticipated to be met by 2020, at which point value for LGCs will flatline and decrease out to 2030.  Offtakers are currently contracting at bundled (black and green product) rates to have the benefit of LGCs and/or for carbon neutrality objectives.

**Table 4: (continued)**

Main features and risks of virtual PPAs in selected markets

Feature/risk	United States	Australia
Renewable power certification	RECs and solar RECs (SRECs) certified by different tracking systems. Value varies by state/region. RECs and other "environmental attributes" that exist or may be created during the term typically go to the offtaker if the offtaker is an entity that needs RECs to offset emissions or other activities.	LGCs under the renewable energy target (RET). The value of LGCs is driven by the RET. On this basis, the value of LGCs is expected to fall significantly as the RET is met.
Development risk	Common to see development milestones with flexibility for uncontrollable circumstances and a conservative "guaranteed" commercial operation date after which liquidated damages or other remedies may apply.	Focus on target milestone dates for completion with longstop dates (extendable for force majeure). More aggressive than other markets, with inclusion of delay compensation payments to the offtaker and limited excuse events for breach of longstop dates.
Performance risk	Minimum requirements are common, with shortfall payments and limited excuse rights.	Minimum requirements are common, with shortfall payments and limited excuse rights.
Volume risk	Examples of offtaker expectation that seller will meet minimum output requirements over defined periods.	Corporates are increasingly seeking minimum generation volumes and fixed volume requirements are emerging as corporate buyers look to pass volume variability risk back to developers.
Shape risk	As available, but in markets where time-of-use retail rates apply, may see strike price adjustments or other compensating measures.	Developers and banks less comfortable with monthly generation requirements. See further in <a href="#">Chapter 3</a> .
Balancing risk	As a synthetic PPA does not involve the physical transfer of power, balancing risk is not relevant.	The design of the Australian power pool (at least in most regions) does not include direct generator exposure to the system operator for imbalance risk.
Credit risk	Developers and lenders often require substantially more performance security and limit the form of acceptable security to cash or liquid letters of credit due to lower credit quality and long-term performance risk posed by corporate offtaker versus traditional utility offtaker.  Offtakers often typically require liquid performance security and security interest in the collateral, which causes friction with project lenders. Compromises include granting corporate offtaker payment priority in the project's operating cash waterfall; granting a second-priority security interest over all project assets and a first-priority lien over a specified subset of project assets, or a capped first-priority lien over collateral shared by lenders and offtakers.	If low credit rating entity used as offtaker party, then investment grade parent company support or other adequately sized bank guarantee from an A-rated Australian bank or bank with an Australian branch is expected in order to meet lender requirements.

**Table 4: (continued)**

Main features and risks of virtual PPAs in selected markets

Feature/risk	United States	Australia
Price risk	Movement toward price flexibility within cap and floor to account for negative pricing and basis risks.	See previous pages regarding pricing.
Tenor risk	Tenor frequently negotiated against pricing, with price escalation provisions only lasting for first 3-5 years of a PPA.	<p>Project debt market has influenced position, with shorter term PPAs possible to match shorter term mini-perm debt profile. In light of increasing market prices, some corporate buyers are looking for longer term. Among other factors, low interest rates for non- or limited-recourse finance can contribute to lower strike prices being offered to offtakers.</p> <p>By non- or limited-recourse financing we mean where the lenders are focused on the revenue stream as the primary source of repayment and the shareholders of the borrower (typically a special purpose vehicle) are protected to some degree from the lenders' financing security arrangements.</p> <p>Tenor also has an impact on a sector-by-sector basis. For example, the mining sector is seeking shorter term contracts, whereas sectors like telecoms, councils and universities may be more comfortable with 7-year-plus terms.</p>
Change in law risk	<p>Examples of parties agreeing to renegotiate material provisions impacted by a change in law to conform the agreement to the original economic intent.</p> <p>While United States tax code is in flux, seeing a one-time option to reset pricing terms based on material tax revisions.</p>	<p>Recent policy announcements have drawn attention to potential change in law risk that has typically been borne by the offtaker. Examples of parties sharing risk of increases or decreases in costs (often subject to a de minimis threshold borne by the developer) relating to the project as a result of a change in law. As above, price review/reset mechanisms are also being contemplated. In relation to green products, some parties may agree to retain the bundled price without the green product or substitute a new green product if possible.</p>
Force majeure risk	Can enable adjustment to construction longstop.	Construction longstop/sunset date may be extended due to force majeure, usually up to 6-9 months after commercial operation date (COD) target, but corporates typically insist on a finite sunset date even for force majeure events.

## Sleeved PPAs in detail

Table 5 looks at the main features and risks discussed in Chapter 1 in the context of sleeved PPAs. In the markets selected – the Netherlands, the United Kingdom and India – sleeved PPAs are common enough to provide a useful tool for discussion.

Physical PPAs are also common where corporates cannot undertake synthetic PPAs due to conflicts with accounting or financial services regulations. WBCSD's latest [\*\*\*IFRS Accounting Outline for Power Purchase Agreements report\*\*\*](#) (January 2018) provides further detail on this issue.

The discussion is based on the experience of authors and the wider WBCSD working group. However, this is an overview for discussion purposes. Actual deals within markets can be substantially different from one to the next.

**Table 5:**  
Main features and risks of sleeved PPAs in selected markets

Feature/risk	Netherlands	United Kingdom	India
Evidence of standard documentation and risk allocation	Market depth not yet sufficient to underpin PPA form standardization. Most deals have taken a significant period to negotiate.	Multiple forms of corporate PPAs used across market. The majority of these have been based on the house template issued by licensed utilities involved as a physical sleeving agent for the corporate buyer. Most deals have taken a significant period to negotiate.	Synthetic PPAs have not been used. Under physical PPAs, the generator agrees to wheel power from their generating station to consumers' consumption point and pays network use charges (open access charges) to utility that owns transmission/distribution network.
Power market	Wholesale trading system with day ahead, intraday and balancing market.	Wholesale trading system with day ahead, intraday and balancing market.	Companies can purchase electricity from exchange or through bilateral PPA. However, exchange only offers short-term contracts – day ahead and term ahead (~fortnight). The process of getting open access and its charges vary from state to state, hence ease and attractiveness of corporate PPA vary from state to state.

**Table 5: (continued)**

Main features and risks of sleeved PPAs in selected markets

Feature/risk	Netherlands	United Kingdom	India
Parties	Asset owner and corporate as parties to primary corporate PPA. Parties have used qualified agent for the purposes of meeting wholesale power market obligations regarding dispatch and offtake of power.	Asset owner and corporate as parties to primary corporate PPA. Corporate buyer will use licensed utility as agent for physical offtake of power from facility.	Asset owner and corporate are the primary parties in corporate PPA. India also has good number of energy trading firms. Some of them offer "sandwich" PPAs wherein traders sign two separate but in-sync PPAs with the generator and consumer. Generator and consumer also need to execute energy wheeling agreement with licensed utility for power offtake under off-site PPAs in some states.
Pricing	Pricing has been influenced by design of subsidy system. The subsidy system provides a top-up between a market reference price and the agreed subsidy price, but there is a limit to that support. An appropriately designed cap and floor approach under a corporate PPA can mitigate this risk while remaining attractive for the corporate buyer.	Generally fixed price with inflation indexation to date. Some evidence of moving to price flexibility, but derivative accounting concerns remain prevalent.	Most medium to long-term PPAs offer fixed tariff for the term or tariff with annual escalation of 1-3%. Most PPAs with annual escalation also provide ceiling that ensures 10-15% savings on local utility tariff.
Tenor	Limited number of deals but those to date have been long term (>15 years).	Majority of deals >10 years.	Most existing renewable energy (RE) plants look for 2-5 year PPAs and new RE plants look for 7-10 year PPAs. Long-term PPAs of 10-plus years are rare and seen only in states that provide waiver of open access charges for 10 years or more.
Volume	Reported deals have all been for majority of output of facility.	Reported deals have all been for majority of output of facility.	Reported deals have all been for majority of output of facility.

**Table 5: (continued)**

Main features and risks of sleeved PPAs in selected markets

Feature/risk	Netherlands	United Kingdom	India
Subsidies	Top up between a market reference price and subsidy price agreed for particular project. There is a limit to that support in that if the market reference price falls below a certain level, then the top up does not cover that risk.	Previously green certificate scheme. New projects suitable for corporate PPAs will likely be subsidy free.	Many states provide full or part waiver in open access charge for RE power.
Renewable power certification	Guarantees of origin.	United Kingdom form of guarantees of origin known as Renewable Electricity Guarantees of Origin (REGOs).	Under the renewable purchase obligation, power intensive industries/companies are required to buy Renewable Energy Certificates. Presently the Supreme Court of India has put a stay on solar REC trading after the forbearance and floor price were revised to lower numbers.
Development risk	Focus on target milestone dates for completion, with longstop dates. Delay damages after a buffer period have been included on some deals.	Focus on target milestone dates for completion with longstop dates. No delay damages.	Focus on target milestone dates for completion, with longstop dates. Delay damages after a buffer period have been included on some deals. PPA terminates if project fails to achieve revised commissioning date and after it exhausts delay penalty limits.
Performance risk	Minimum capacity availability requirements common for intermittent technologies.	Minimum capacity availability requirements common for intermittent technologies.	Minimum capacity availability requirements common for both RE as well as non-RE technologies.
Volume risk	Deals to date have not extended to minimum volume requirements.	Deals to date have not extended to minimum volume requirements.	Minimum generation volumes are increasingly being sought by corporates and fixed volume requirements are emerging as corporate buyers look to pass volume variability risk back to developers.  In return, corporates provide minimum consumption guarantee and are required to compensate generator if consumption is lower than minimum consumption obligation.

**Table 5: (continued)**

Main features and risks of sleeved PPAs in selected markets

Feature/risk	Netherlands	United Kingdom	India
Shape risk	Corporate buyer responsibility, with leading deals completed by corporate buyers that actively manage their energy position and therefore are experienced.	Corporate buyer responsibility managed through arrangements with licensed utility and wider supply arrangements with the corporate buyer.	This stage of development is still yet to be seen since the market is at a very early stage.
Balancing risk	Trading agent commonly appointed to manage this interface.	Corporate buyer's licensed utility agent commonly manages as it is well placed to do so for generator (costs of doing so factored into commercial terms).	Not applicable for RE power as most states allow banking of RE, thus cost of balancing is not arising.
Credit risk	Parent company guarantees from corporate buyer usually used.  Some examples of project being required to provide credit support but level of such support sensible.	If low credit rating entity used as corporate buyer party, then holding company-level parent company support expected (particularly if lenders involved).  Unusual for credit support to be provided by seller of electricity if that corporate entity is a special purpose vehicle for the asset and in receipt of limited recourse project finance.	If low credit rating entity used as offtaker party, then adequately sized guarantee from bank is expected in order to meet lender requirements. Other forms of guarantee emerging are keeping an amount equivalent to a few months of generation multiplied by price as security.
Price risk	See p. 21 regarding pricing.	See p. 21 regarding pricing.	See p. 21 regarding pricing.
Tenor risk	Tenor has usually reflected at least debt tenor, but can be longer.	Tenor has usually reflected debt tenor.	Tenor has usually reflected at least debt tenor, but can be longer.
Change in law risk	Examples to date include change in law provisions but usually expressed generically without specific cost sharing provisions.	Some examples of parties sharing risk of increases or decreases in costs relating to the project as a result of a change in law, others where robust price will not be altered.	Examples to date include change in law provisions but usually expressed generically without specific cost sharing provisions.
Force majeure risk	Broad scope of force majeure application with long period before termination rights arise.	Broad scope of force majeure application with long period before termination rights arise.	Broad scope of force majeure application with long period before termination rights arise.

## Conclusions

The discussion in this chapter and with the wider group of involved corporate buyers, developers and lenders indicates recurring challenges to accelerate the corporate PPA sector.

1. Shape risk is a recurring issue in multiple markets. This risk and its associated costs create barriers to the ease of deployment of corporate PPAs. Corporate buyers are often faced with limited and costly options for managing this risk. Often, there is also a level of complexity to any mitigation that may make it difficult to readily model the overall economics of a transaction for a corporate buyer.
2. Developers are looking for long-term corporate PPAs, usually in order to satisfy the needs of lenders to a project. This and other related requirements of lenders may curb the adoption of corporate PPAs by new corporate buyers. That said, there is no easy solution to this challenge.
3. Lack of standardization and agreed risk allocations are common across markets. Even in mature markets such as the United States, barriers to entry remain high for new entrant corporate buyers in terms of understanding and approving the complexity of long-term corporate PPAs. In addition, different approaches to risk allocation are common across different markets.

The next chapter considers each of these challenges in more detail and explores possible solutions.



### 3. Challenges and innovative market developments



## Challenge 1 – volume and shape risk

As discussed above, the intermittent generation of power from a renewable energy facility creates uncertainty for developers, lenders and offtakers who have to consider the practical and financial impact of the actual output being different from the generation forecasts and, moreover, inconsistent with the baseload demand of the corporate buyer.

The seller needs to be able to forecast generation (and revenues) in order to predict returns, structure project debt and protect itself against loan defaults. To do so, the lender's production requirements for the project are modeled against exceedance probabilities, providing an allowance for poor generation conditions (e.g., P50/P90 exceedance probabilities for wind); but these are modeled probabilities and cannot predict seasonal abnormalities which may cause generation shortfalls. Lenders have traditionally not been willing to allow a project to take and manage volume and/or shape risk. This is in part due to the limited ability of a project to manage this risk. For example, equipment suppliers may be willing to guarantee the mechanical availability of their plant but not actual output, as that is influenced by climatic conditions and an operational strategy over which they have no control. As a result, volume risk and the more challenging shape risk are traditionally seen as risks to be assumed by the corporate buyer.

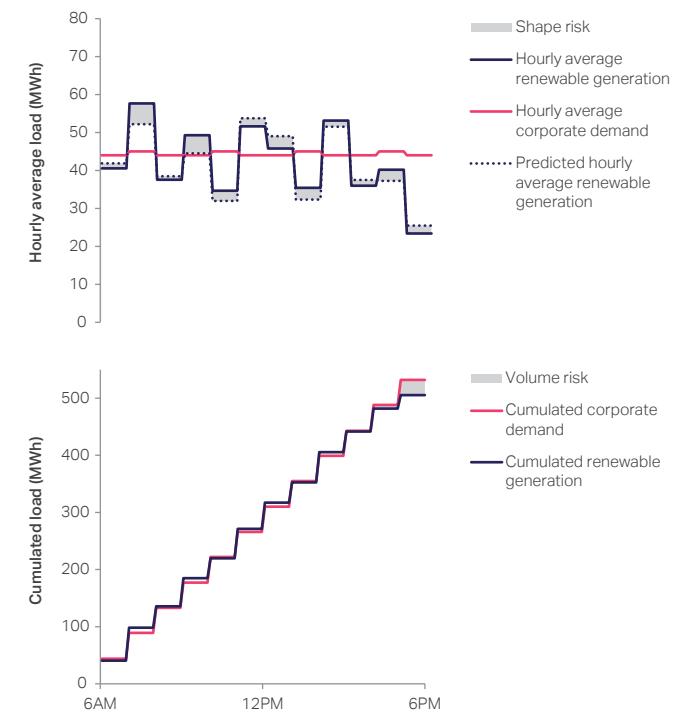
From the corporate buyer's perspective, while it can fix its energy price with the seller during the term of the corporate PPA, forecasting the output of the facility at

any given time during the term of the corporate PPA is difficult. Ensuring that it will be sufficient at such time to meet its demand is harder still. A corporate buyer's demand may be relatively steady; however, at any point in time the generation from a renewable energy facility may vary. This impacts the cost to the corporate buyer in procuring the additional electricity required to meet its demand. For example, if expected volumes from a corporate PPA are firm, then the corporate buyer (or an electricity supplier or utility) is able to purchase the residual requirements with confidence. Where that is not the case, it is likely that the corporate buyer will base procurement decisions on broad output and shape forecasts. The difference between these and actual output will need to be managed. Whether a sophisticated buyer does this itself or outsources that role, it will come at a cost. Volatile market conditions, grid congestion at the point of generation and transmission or distribution issues can exacerbate the cost of managing this.

For a corporate buyer who wishes to support an intermittent technology such as wind or solar via a corporate PPA, a solution for managing volume and/or shape risk is a necessary element that needs to be considered as part of the overall economic benefit of a corporate PPA. The potential uncertainties of the actual cost of managing this risk over time can also complicate the assessment of a potential corporate PPA and associated internal approvals. However, with the evolution of the market and the advancement of renewable energy technologies, a number of innovative strategies and solutions are emerging that could address or mitigate these issues.

A few of the most prevalent and interesting innovations are discussed below, divided into contractual and physical innovations. As corporate PPAs become a viable option in a growing number of markets around the world, it is important that market participants also look to analyze whether such solutions are appropriate.

**Figure 5:**  
Example of shape risk and volume risk



## Contractual innovations

### Seller - Project internalizes volume and/or shape risk

As mentioned, historically buyers have assumed both volume and shape risk arising from the intermittency of generation from renewable sources. This is derived from the typical utility offtaker model where a utility is best suited to manage and aggregate that risk as a buyer of power from multiple sellers and from different technologies. This is not the case for a corporate that may be buying power from a single renewable energy plant and then managing that as part of a wider demand profile.

Various markets show examples of how corporate PPA arrangements can be made more palatable for corporate buyers:

- Accepting volume risk by offering minimum volume guarantees over an appropriate period of time (such as a year); and
- Less frequently, accepting shape risk by committing to an actual shaped delivery profile, such as seasonally or monthly.

In each case, failure to comply with such provisions would lead to contractual damages being payable. Such damages compensate the corporate buyer for the actual or notional cost of buying additional power to make up for the non-performance.

A recent example is the Nordic Wind Power transaction with Norsk Hydro for a 650 MW wind farm. This is reported by the parties as a 20-year baseload transaction of between 0.6TWh and 1 TWh per year.

As such, it offers an annual volume guarantee to the buyer but would not necessarily address shape risk. Another is the PPA between Innogy and Deutsche Bahn in Germany for the supply of 900 GWh of renewable energy per year (which covers the electricity demand of one-third of the long distance train fleet in Germany).

From the corporate buyer's perspective, the best outcome would be a cost-effectively priced volume guarantee with an associated baseload shape commitment (either steady or seasonally shaped) throughout the corporate PPA term. Although examples exist of volume guarantees being given by project, this is not yet common for corporate PPAs. The accounting treatment for a corporate buyer of a corporate PPA is relevant in this context. The firmness of the corporate PPA can undermine the desired accounting analysis of a corporate buyer. See WBCSD's latest [\*\*IFRS Accounting Outline for Power Purchase Agreements report\*\*](#) (January 2018) for a more detailed discussion. Projects offering to manage the more challenging area of shape risk are far less common. The complexity for the seller is such that it would likely require the project to manage a firm commitment versus an actual output profile that will vary day to day (and, within that, hour to hour). Both lenders and developers will be concerned about the financial impact on the project of such guarantees not being met.

However, finding balanced solutions for volume and shape risk would increase the attractiveness of corporate PPAs for potential corporate buyers. It would, for example, make it easier for a corporate buyer to manage the long-term price exposure it accepts under a corporate PPA.

This is because a corporate PPA that provides a firm volume and shape commitment enables the corporate buyer to manage it more easily. It could, for example, more easily back off parts of the corporate PPA by moving into liquid trading markets that are based on baseload products. Whether that is possible depends on the overall cost of any solutions. Any such solution needs to also consider the costs and risks a developer would incur.



In assessing whether it is appropriate for a greater number of projects to offer such a solution to corporate buyers, there are a number of relevant considerations.

**Market context** – The wholesale market context is fundamental to the appropriateness of this for a project. In a mature market with stable and known fundamental wholesale price drivers and liquidity, volume or shape risk will be more manageable. In such a context, the cost of managing any shortfall between the commitment of the project to a corporate buyer and actual generation can be dealt with more cost effectively. Where the converse applies, the potential cost to the project of having to purchase make up volumes in, for example, a volatile market with high short-term price spikes could make the risks far outweigh any economic benefit that may arise for the project in offering a volume or shape risk product.

**Volume** – Any volume guarantee would need to be sized based on an appropriate percentage of the overall expected output from the facility. This provides comfort that the guarantees should be met in all but unforeseeable circumstances. The minimum output guarantee may therefore be significantly less than the installed capacity of the facility. This could impact on the commercial attractiveness of any guarantee for both the developer or the corporate buyer. The role of lenders will exacerbate this as they are likely to insist on a conservative approach to any modelling of risks.

**Ability to back off risk** – A project may look to mitigate the risk of generation falling short of any output commitments by obtaining corresponding protections. Mechanical availability commitments from its primary construction and/or operations contractors for a project are common. There are also indications that some contractors are considering what form of volume guarantee they could give a project. This may be more likely where the contractor is also an equity investor in the project. Insurance is also relevant. Significant shortfalls in production (at least those that would cause production to fall below the minimum guaranteed levels) could be, and often are, caused by insured events. Thus, the project will need to assess the impact on the cost of appropriate business interruption insurance or similar cover that will respond in such circumstances. Finally, there may be a range of trading services available to a project whereby the project could outsource elements of risk management by, for example, optimizing the value of any uncontracted volumes or procuring shortfalls on a timely basis.

**Who is best able to manage the risk** – Assessing whether there is an enhanced role for a project to offer these types of guarantees is one of cost versus benefit. On balance, the consideration costs a project may require in order to absorb and manage such risks may make any solution more expensive than an alternative. For example, the nature of the business of a utility supplier to a corporate buyer may mean that it is better placed to manage volume and shape risk at the right price. Similarly, the rise of aggregators discussed in [Challenge 3](#) of this chapter is another potential source of cost-effective solutions.

Below is an actual innovative solution that is emerging in the United States to address volume and, potentially, shape risk.

### **Seller – Proxy revenue swaps and other hedging solutions**

Hedging solutions have traditionally been used in power projects to address volatility in energy price-focused variables such as market energy prices, foreign exchange or interest rates. Fixed volume price swaps, forex and interest rate swaps are relatively commonplace tools in project financing to provide additional revenue and economic certainty to renewable energy project investors and financiers. Where in the past, the uncertainty of natural phenomena (such as weather) was seen as the last frontier of project risk that could not be packaged and priced, proxy revenue swaps have recently emerged in the renewable energy market to address generation intermittency caused by unpredictable weather conditions. Hedge providers with a specific appetite for “weather risk” have emerged, seeking to make investments that are correlated only with natural phenomena and are not affected by other parts of the economy.

As part of the proxy revenue swap, the hedge provider pays the seller a pre-agreed fixed price per annum (rather than providing a fixed unit price per MWh generated or sold). The value of that fixed annual payment reflects an agreed long-term price and wind resource assessment, thereby removing merchant power and weather risk in an integrated derivative contract.

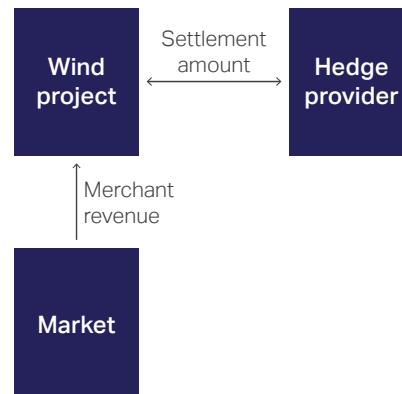
The actual payment is the net amount payable after comparing the agreed fixed annual payment to actual market revenues of the project (at the agreed floating reference price). Under this structure, the hedge provider is taking weather risk and price risk. How the hedge provider manages that risk may differ from deal to deal. In some deals in the United States, the hedge provider has backed off the price risk to a corporate buyer under a matching derivative with that corporate buyer.

Figure 6 shows how the project continues to receive merchant revenues and then financially settles the proxy revenue swap in different scenarios.



**Figure 6:**  
Proxy revenue swap – financial flows

**Project receives merchant revenues**



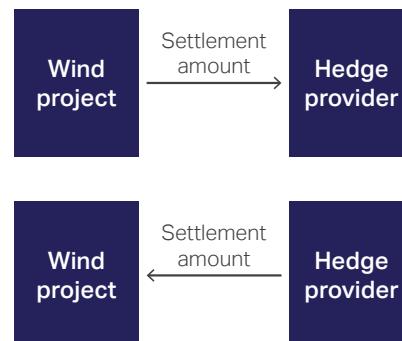
**Two-way settlement**

If proxy revenue > fixed payment

High winds, high prices, or a combination during settlement period

If proxy revenue < fixed payment

Low winds, low prices, or a combination during settlement period



Incentives to ensure that the project operates efficiently are built into the structure in that the project pays the hedge provider a fixed percentage of its "proxy revenue." This is typically calculated by multiplying an agreed index-linked electricity price with the proxy generation for the project. Proxy generation is calculated as the power that would have been produced by the project based on measured wind speeds or solar radiation and assuming pre-agreed fixed operational efficiencies. The assumed operational inefficiencies are fixed variables within the calculation of proxy generation and include the availability of the project, performance and electrical losses. This creates a threshold for the project to aim for in order to make the transaction economically efficient.

In effect, the project has swapped the uncertain annual volume of electricity that would be generated by an efficient project with a firm payment at a firm long-term price. It therefore addresses price and volume risk. This product was created in the United States, where specialist agencies in weather risk transfer and power price forecasting combined their expertise using the latest data and technology. In 2016, three 10-year proxy revenue swaps were executed for wind projects that were supported by third-party debt and tax equity commitments. Putting in place the structure incurred fees, including upfront structuring fees to the hedge provider, an annual fee to the hedge provider and service fees to the third-party agent that provides calculation and reporting services to the parties.

This area continues to evolve, with new products currently being developed that will also address shape risk.

**Table 6:**  
United States proxy revenue swaps in 2016

Project	Market	Sponsor	Lender	Tax equity	Hedge provider	Back-to-back hedge provider
Bloom (KS)	SPP	Capital Power Corp.	N/A	Goldman Sachs	Allianz Risk Transfer/ Nephila Capital	Microsoft Corporation
Old Settler (TX)	ERCOT	Apex Clean Energy	Deutsche Bank	JP Morgan	Allianz Risk Transfer/ Nephila Capital	Confidential
Confidential	SPP	Confidential	N/A	N/A	Allianz Risk Transfer/ Nephila Capital	Confidential

Whether a proxy revenue swap is an appropriate tool for other projects and corporate buyers involves a similar assessment of market dynamics and costs.

Some factors that may need to be considered in assessing the appropriateness of a proxy revenue swap in other markets include:

- Depth of hedge provider appetite for such weather risk products;
- Location of the project (i.e., the quality of weather data available);
- The size of the project (as proxy revenue swap structures come at a cost in terms of complexity and associated fees, they may be more appropriate for larger projects); and
- Interface with usual practice for corporate PPAs (with proxy revenue swaps working more easily in markets where synthetic PPAs are common).

Although the above are some important caveats, in the right market circumstances, proxy revenue swaps look to have the potential to evolve into a crucial cost-effective tool to accelerate corporate PPA deployment.

## Physical innovations

### Seller - energy storage

One way a project can internalize imbalance and shape risk is to integrate a method of energy storage together with the chosen renewable energy technology (e.g., wind or solar) that can be used by the generator to control or smooth output profiles or provide other (revenue generating) ancillary services, such as helping with grid balancing and frequency control.

This “behind the meter” application of energy storage technologies is very much in its early stages, but recent and rapid technology developments, increasing efficiency and a continuing decline in costs mean that opportunities for the integration of energy storage technologies within renewable energy projects are becoming more and more attractive and commonplace.

In essence, the storage can be used to smooth peaks and troughs in generation from the project as well as assist with imbalances or other technical constraints on the grid. Currently the primary technology attracting interest for integration is lithium ion batteries. However, flow batteries could also perform a similar load or generation shifting function. Lithium ion battery costs have fallen dramatically in recent years due to the burgeoning electric vehicle sector. With the enhanced output flexibility and consistency provided by a battery, a generator can be much more comfortable in assuming shape risk and offering an output guarantee to a corporate buyer. As discussed above, this can have the dual effect of improving the bankability of the project and making the corporate PPA structure more attractive for a corporate buyer.

Energy storage technologies are still considered relatively new and possibly risky for financiers. The bankability of the project will still be heavily dependent on the terms of the corporate PPA, its duration and the creditworthiness of the buyer and/or any credit support provided.

#### Buyer – demand-side response

The other side of the coin from managing imbalance and shape risk is to decrease or increase the demand of the buyer to match the generation profile of the seller. If the consumer has flexibility behind the meter to adjust its load on the grid to correspond to the generation profile of the renewable energy facility or imbalances on the grid, this can provide an efficient and economical way for energy suppliers and generators to balance the system.

In recent years, large commercial and industrial consumers have been installing smart digital telemetry and process controls that talk to their equipment and assets and adjust energy consumption within different processes in their business. For example, if a supplier notifies a buyer that there is an imbalance in the grid that means system prices will increase, the technology can respond by switching off equipment that does not immediately require power to reduce the buyer's load until after the price spike has passed. When this technology is applied across a fleet of assets, such demand-side flexibility can achieve a significant reduction in the consumer's power consumption at the precise moment in time when the electricity supplier needs it.

Going one step further, as commercial and industrial consumers become more sophisticated and capable of managing their exposure to wholesale price risk, there may be opportunities for corporate buyers to install on-site technologies such as battery storage or combined heat and power systems that work in harmony with their digital energy management systems (as described above). By providing greater control and demand-side flexibility, a corporate buyer may be able to manage all or part of the volume or shape risk itself.

## Challenge 2 – managing lender expectations

Banks and other lenders are often involved with projects that are seeking to put in place a corporate PPA. They have requirements that they will seek to have accommodated in order to get through their credit committees and facilitate lending. Under project finance deals, the majority of the funding for the project will come from long-term debt provided by senior lenders or third-party equity, which can often have debt-like features. Project cash flows are the primary means for repayment of that debt. Therefore, the project and its fundamental contracts must sufficiently mitigate default risks to those cash flows. A bankable project has a sufficiently balanced risk profile so that lenders are willing to finance the project. This means mitigating project risks to an acceptable level, whether these be construction risks, technology risks or power offtake price risks. A long-term fixed or minimum price PPA may be one of the most attractive features as it protects project revenues.

Lender requirements will not always remain the same. The level or structure of equity investment in a project can influence the lenders' risk perspective. Requirements can also change due to wider changes in market practice, the lender's risk appetite, or deal-specific issues, such as the location of the project. That said, there are common risks that PPAs need to address for project-financed renewable electricity developments. The main considerations for lenders that influence the features of a corporate PPA include:

- **Revenue certainty** – Lenders look to revenues from the corporate PPA in order to repay and service their loans. Lenders will want to see long-term, predictable cash flows with appropriately sized volumes, fixed pricing and robust default provisions. This is strongly influenced by the role of any available subsidies. Where these are low or uncertain, the pressure on a corporate PPA as the source of revenue certainty increases. Where any volume or shape risk guarantee is included, this will also be considered closely in order to assess the downside risk to revenue of such guarantees.
- **Tenor** – Lenders will want to see long-term PPAs that at least match the term of the loan agreement and preferably include a "tail" period after the scheduled final maturity date of the loan.
- **Counterparty risk** – Lenders will run their own credit and other checks in order to confirm the corporate buyer's credit risk, track record and reliability.



- **Credit support** – If lenders are not comfortable with the credit rating or financial capability of a corporate buyer, they may require a parent company guarantee, bank guarantee or some other kind of credit support in order to give them comfort that the offtaker will be able to meet its payment obligations under the corporate PPA. Even where a corporate buyer has an appropriate credit rating, lenders will want to see provisions that would require credit support if that credit rating should deteriorate.
- **Security** – Lenders will want to take security over certain project assets. If a corporate buyer also wanted security over project assets as a form of protection against project default, then this will need to address the lenders' interest and first ranking priority.
- **Termination** – Lenders will closely consider any termination payment on default or early exit. Lenders may also seek step-in rights to try to remedy any default before any termination rights under the PPA are triggered.
- **Country risk** – Replicating corporate PPA structures from mature markets into new emerging markets can be complicated by lenders' views of the political or regulatory stability of the country.

Developers and corporate buyers often comment that the issues above can limit the flexibility of corporate PPA transactions. Yet a lender providing the majority of upfront capital to build a project has every right to take a prudent and risk-averse approach in order to ensure debt repayment is assured.

The remainder of this chapter explores some significant areas of tension with a view to enabling a better understanding of the perspectives of lenders and corporate buyers. The objective is to identify in what circumstances greater flexibility could be achieved. Developing an increasing number of solutions could enable corporate PPAs to be a more significant catalyst for the accelerated roll-out of renewable energy developments.

## Merchant price risk

In markets where there is no subsidy system available that provides material long-term revenue certainty (or one that provides only a low degree of certainty) then the robustness of revenues for power sales becomes critical to financing a project. A corporate PPA can provide the solution to that challenge. In such a scenario, lenders would expect the term of the corporate PPA to at least match the loan repayment period. This is particularly the case if lenders are requested to provide a high proportion of the capital to build a project.

Corporate buyers can use a corporate PPA as a long-term hedge against future changes in electricity prices. In many cases this has formed an important part of the commercial basis for the growth of corporate PPAs in a number of markets, particularly the United States. However, a significant number of potential corporate buyers are also interested in a corporate PPA but not for a long period of, for example, 10 or 15 years. There is no easy path to resolving the tension this creates between a developer's pursuit of cost-effective debt, a lender's expectations and the availability of corporate PPAs.

Exploring where flexibility can be found in this context involves first understanding how lenders approach merchant price risk. This is crucial as any proposal to include greater flexibility will likely involve asking lenders to accept a degree of current or future exposure to variable power prices. That could arise in the following examples.

- Price certainty from one or more corporate PPAs only covers part of the debt tenor (for example, 10 years for a 15-year loan), with the expectation the remaining five-year period will be contracted during the loan term.
- A corporate PPA is for a long term, such as 15 years, but includes price reopeners or other flexible mechanisms that allow the long-term price certainty to be rebased or otherwise adjusted within limits acceptable to lenders.
- A corporate PPA solution is only put in place for part of the overall output of a renewable energy project, with the expectation that the remaining capacity will be sold into the market on shorter term contracts that respond to market conditions.

A significant consideration for a lender when requested to accept a degree of merchant price risk is how it will identify and determine an appropriately prudent view on forward market price developments. Before taking a view on merchant price exposure, lenders (particularly their credit committees) will need to be able to access independent price forecasts from a reputable industry source that the lender is comfortable using. Common issues that occur in this context include:

- Whether it is legitimate for a lender to focus primarily on the low-price case in a reputable price forecast or whether they should work with a prudent middle ground; and
- The uncertainty of any price forecast where it is being used to try to support the acceptance of merchant exposure a long time in the future.

When designing a debt package for a project where there is a degree of merchant price risk, lenders have a number of tools available to them. Some of these are outlined below. The overriding theme is that many things are possible but most come at a cost in terms of the expectations of developers and their investors.

- **Debt sizing** – Put simply, the greater the level of merchant price risk, the lower the proportion of debt (as compared to the overall capital required) that will be offered by a lender. This is also influenced by the lender's determination of an appropriate debt service cover ratio. Where there is strong certainty of revenues being sufficient to meet debt repayments, the debt service cover ratio determined by a lender will be easier to satisfy.

An example would be a project with a corporate PPA with a creditworthy corporate buyer for the entire output of the project and the full debt term. This enables a greater proportion of debt (as compared to the overall capital required) to be provided because the risk that cash flows will be insufficient to meet debt repayments is lower.

Where this is not the case then lenders may impose a higher debt service cover ratio (which is a measure of the cash flow required to pay debt obligations) and the only way to meet the debt service cover ratio using assumptions regarding less certain revenues will be to reduce the amount of debt that lenders provide to a project. This means the developer will need to find additional equity funding to build the project (which is likely to be more expensive than debt would have been).

- **Reserves** – Tools such as cash reserves accumulated from project revenues and cash sweeps can be used to ensure that prior to moving into a merchant exposed period, the project has built up some protection against the risk of default on debt repayments. However, as this will tie up revenues within the debt structure, it again impacts on investors' expectations for the timing and level of dividend availability from the project.
- **Cost of debt** – Lenders can increase the interest rate payable by the project in order to account for the greater risk they are taking. The extent of any such change will depend on how competitive the debt market is, which could potentially be limited by the number of lenders that would be prepared to work with merchant risk exposure. Any increase in interest rate for debt will reduce equity returns from the project.
- **Debt term** – Lenders can propose different products, such as a mini-perm loan. Such loans are for a shorter term and at their expiry require the project to refinance or face the inability to meet the balloon payment due on expiry of the loan. This shifts the risk to equity owners.

What could work will be a complex balancing act between power market prices, equity expectations and lender appetite for innovation. The recommendations below are drawn from WBCSD discussions with a variety of lenders and the consideration of lending models in other contexts:

- **Developer refinancing strategy** – The developers of a project with merchant exposure could work with the best debt package available in order to build the project and then look to refinance that debt when the project is operational and either market prices look better or additional sales contracts with corporate or other buyers are put in place.
- **More innovative corporate PPAs** – A variety of approaches to corporate PPA pricing could be relevant here. For example, some developers are looking at staggered pricing models on a put and call basis to help mitigate price risk. This could involve a structure whereby pricing is fixed for an initial term, after which, if the market goes up, the offtaker has the option to extend for another three years at a higher price. If the market goes down, the developer has the option to extend the PPA at a lower price, with the put and call prices fixed in advance at acceptable cap and floor prices. This can help the bankability of a project as the lenders have the comfort of an initial fixed price revenue stream and can then effectively price the remainder of the term by looking at the cap and floor price. It is worth noting that accounting considerations for a corporate buyer of any innovative pricing structure are important issues that need to be assessed carefully. Those issues are discussed in more detail in the [\*\*\*IFRS Accounting Outline for Power Purchase Agreements\*\*\*](#) report issued by WBCSD in January 2018.
- **Sharing value with a corporate buyer** – In the scenario where an efficient debt package is only available where a long-term corporate PPA can be offered, a developer and a corporate buyer could explore the value that such a corporate PPA brings to the developer. For example, the sharing of a portion of potential upside equity returns with a corporate buyer may alter the view of a corporate buyer on the term of a corporate PPA they would be prepared to offer.
- **New sources of debt** – The approach to bankability is often derived from past practice for project finance transactions and the major lenders involved in that sector. Yet financial markets are changing and new sources of capital are looking for new opportunities. These new sources may be prepared to take a higher degree of risk in order to deploy capital quickly.



- Rolling power sales** – There are a number of examples in different contexts where the level of merchant price exposure is managed on a rolling basis. For example, loan documentation can set parameters that result in the project locking in forward sales on a variety of shorter to medium term tenors. This can have the effect of reducing the risk of short-term price movements negatively impacting the project's ability to meet debt repayments. This type of model would work well as part of a wider strategy whereby a project puts in place a long-term corporate PPA for a significant portion of the capacity and shorter term corporate PPAs for other portions, and then manages a forward-looking process to replace them. However, the importance of long-term market price curves remains fundamental. This approach is a sensible mitigation strategy rather than a solution to a downside forward price forecast not being able to support a workable debt package.
- Public sector support** – Particularly in emerging markets, a variety of existing and new sources of public and multilateral finance providers are seeking to support the accelerated deployment of clean technology. A number of these – such as loan guarantees or first loss products – could be tailored to support the roll out of corporate PPA solutions in emerging markets.

In each of the cases above, the discussion earlier in this chapter on volume and shape risk and the potential rise of innovative products to hedge these risks shows that these are important developments. Where products are available that can convert the intermittent generation of a renewable project into a baseload product, this will have a significant impact on liquidity. A project that can offer a baseload product into liquid wholesale power markets has a better risk mitigation tool than otherwise, meaning the project would have a greater ability to access markets that trade on the basis of standard products such as baseload blocks. This should be relevant to lenders as it would enable more flexible and longer term hedging of capacity that is not committed to a corporate PPA.

## Credit support

Credit support is a general term to describe the provision of additional financial comfort regarding the ability of a party to meet its payment obligations under a contract (for example, providing a parent company guarantee). Lenders will apply a relatively stringent credit assessment to the corporate entity that will be a party to the contract, including net asset tests and size measures for non-rated entities. In most cases, they will look for a rated entity or a parent company guarantee from such an entity. If that is not available, then the discussions will likely focus on alternative support, such as a bank guarantee/letter of credit.

The approach to credit risk is perhaps one of the most contentious areas on a number of corporate PPA transactions. Discussions are often made more difficult by differences in approach between lenders and large corporate buyers. Many large corporate buyers that manage significant procurement functions will have views on what they are prepared to offer. In many cases these views do not line up with lender expectations. Examples of this issue include:

- Where a special purpose vehicle with no credit rating, trading history or other assets is used by a corporate buyer, the provision of robust parent company support in respect of that entity;
- Where credit support is to be provided, the level of that support (that is, whether it is consistent with the potential total loss that could arise from termination of the corporate PPA); and
- Whether the corporate buyer can obtain credit support or other security with respect to the project company's obligations under the corporate PPA.

The detailed discussion in [Chapter 2](#) shows that different approaches to these issues have been agreed for different markets and deals.

In order to improve the chances that credit support issues will not cause corporate PPA transactions to be delayed or aborted, there are some areas for further discussion by the participants, working groups and industry bodies involved. As flagged in Challenge 3 below, greater commonality of appropriate risk allocation approaches can assist even if it does not go as far as full standardization of contracts or approaches.

Recommendations here include work on:

- Greater acceptance and education among corporate buyers of the necessity for credit support where the corporate PPA forms a significant revenue element for the success of the project; and
- An appropriately balanced approach by lenders on the level of credit support to be provided, meaning an approach that considers the actual risk of payment default by the corporate buyer and the ease and cost for the seller of finding a replacement corporate PPA with another buyer in the market in question.

The assumption should not be that the only acceptable level of support is for the full replacement cost of the corporate PPA.

In conjunction with the above, some developments around multiple-buyer structures are noteworthy:

- At a minimum, for larger transactions, buyer's club structures can help spread credit risk. The Krammer onshore wind project in the Netherlands benefited from four large corporate buyers (Google, DSM, AzkoNobel and Philips), which allowed project financiers to better manage counterparty risk. Each corporate buyer entered into a corporate PPA on identical terms. This created a scenario whereby one or more of the corporate buyers could exit the transaction or become insolvent by way of a requirement for the other corporate offtakers to take up the shortfall or source an alternative corporate buyer. However, such structures can also mean that each buyer participant is expected to have an appropriate credit standing in order to participate.

- Buyer's clubs can also operate on an aggregated basis so that a large number of smaller offtakers can each take a slice of the output of a particular project. Credit risk is mitigated by the larger number of offtakers – and can be mitigated further with structures requiring a pool of offtakers to either exercise pre-emption rights or find a replacement offtaker acceptable to the lenders in order to keep lenders whole. For example, in multiple-buyer structures where there is a single buyer representing the aggregated demand of those buyers, lenders could consider a bespoke rating. The buyers could be a mix of rated and non-rated entities (potentially including private and public companies). In these circumstances, the lender assessment can look to develop an internal credit rating for the blended buyer vehicle rather than solely rely on third party credit support. For such a rating, the granularity of the group is important – when one corporate buyer (or several) leaves the group, the structure and credit profile need to stay intact and mechanisms to ensure this need to be agreed.



## Challenge 3 – managing complexity and time to complete deals

The growth of corporate PPAs has been significant for a number of years in markets such as the United States. Even in successful markets, there is evidence that much more can be done under the right conditions. For example, 13% of Fortune 100 companies have signed corporate PPAs, compared to 63% that have set sustainability goals. Importantly, there is also evidence that there is significant untapped potential in mid-tier sectors. For example, only 0.6% of companies in the Fortune 101 to 250 have signed corporate PPAs, while 53% have sustainability goals.<sup>1</sup>

Looking further afield, the generation capacity supported by corporate PPAs is low compared to the overall level of renewable generation development. In an environment where many governments are reducing subsidies for new renewable energy projects, solutions to ramp up corporate PPA deployment are needed in order to support the clean energy revolution. However, as [Chapter 2](#) highlights, a recurrent theme in different markets is that the process to complete a corporate PPA is time consuming, complex and includes a steep learning curve for many corporate buyers. This creates a barrier to entry as many companies (particularly smaller companies) do not have the time or resources to engage with these challenges.

The following explores what can be done to resolve this.

### Accounting

Accounting issues are discussed in more detail in the WBCSD [IFRS Accounting Outline for Power Purchase Agreements](#) report (January 2018). Overwhelming feedback from WBCSD working group interviews and from multiple markets is that accounting issues have a significant impact on the commercial terms of corporate PPAs and that locating consistent external advice on how to mitigate these impacts is difficult to obtain. As the accounting report highlights, work on identifying appropriate analysis and ensuring that leading accounting firms can offer this is required.

### Standardization

Although there is some evidence of contract standardization in mature markets such as the United States, [Chapter 3](#) confirms that most other markets do not show much evidence of this yet.

There is potentially a role for greater standardization of contract forms to assist developers and corporate buyers to more quickly reach agreement. There are a variety of other commodity markets where standardization has evolved over time. However, the work of the WBCSD working group flags the following issues:

- A long-term contract informed by local or regional laws and accounting considerations is not a simple thing to standardize;
- For long-term and high value contracts, it is unlikely that a standardized contract would wholly prevent detailed negotiations by well-advised parties;

- Some corporate buyers are concerned by the simple locking in of long-form PPA precedents used by utility buyers and the like as the basis for corporate PPA standardization, calling instead for a fresh look at how to simplify and thereby increase ease of access to new entrants.

An early step toward standardization recommended by the WBCSD working group would be for relevant industry bodies to work toward suggested fair risk allocations across the main features and risks of a corporate PPA. Although there would always be room for negotiation, it is likely that a broad recommendation across these areas could narrow the range of discussions and give new entrant corporate buyers comfort that the deal offered is consistent with regional or international market practices.

A related point is the importance of corporate buyers adopting clear and robust tendering processes for corporate PPAs. Large numbers of corporate buyers consistently coming to market with a clear set of requirements that reflect an understanding of the risks discussed earlier in this report will enable both standardization and innovation. Developers recognizing the consistent requirements of corporate buyers will drive standardization while competition between developers (and potentially aggregators, as discussed below) to find the most workable solution will drive innovation. The role of matching hubs discussed below is relevant here as they can provide a mechanism for standardizing procurement processes, thereby making it easier for buyers and sellers to set out their requirements.

<sup>1</sup> Martin, K. (2017, August). Corporate PPAs in 2017. *NewsWire*, 13. Norton Rose Fulbright LLP.

Beyond this, the most likely near-term path to simple standardized corporate PPA offerings would be via the increasing role of aggregators discussed below.

### Aggregators

In developing this report, the WBCSD working group challenged a number of experienced market participants on how to get from “50 to 50,000.” That is, how to get from a small number of global corporate buyers to participation by a massive number of corporate buyers. One common response was the important role that aggregators can play. Broadly, an aggregator is a creditworthy entity that will front a long-term purchase arrangement with a project and then on-sell that to a range of corporate buyers. The aggregator could be a large corporate buyer itself or a sophisticated market trader such as a utility or wholesale trader with appropriate credit strength to satisfy developer and lender requirements for a long-term offtake.

For instance, one respondent predicted that in the United States, where synthetic PPAs are prevalent, the

commodity trading desks of large banks may focus on this market and look to develop aggregation roles as they may be better placed to manage the risks associated with that role. Similarly, in a physical PPA arrangement, a utility or electricity supplier may be engaged to act as an intermediary by entering into the PPA on behalf of one or, acting as an aggregator, on behalf of multiple corporate buyers. By the nature of its business as a utility or electricity supplier, it is better positioned to take on the volume and shape risks associated with the project than a corporate buyer would be under a traditional PPA. The intermediary can then reshape or “firm” the volumes to more closely resemble customer demand by managing the allocation of power among corporate buyers according to their demand (where it acts as an aggregator for multiple corporate buyers, procuring additional power where required or absorbing excess power generated by the project and liquidating it in the wholesale market on behalf of the corporate buyers). The power generated from the project may also be combined with traditional retail power and risk management products as a bundled power solution for the corporate

buyer. As with other innovations, consideration must be given to the additional costs of using an intermediary to absorb and manage such risks.

The advantages from aggregation include:

- Simplicity for developers – Large projects would only need to agree a single PPA with the aggregator rather than multiple PPAs, while smaller projects might find an easier route to market.
- Greater flexibility – An aggregator may be able to offer a wider range of PPA options to a variety of corporate buyers. Those could be, for example, PPA contracts with a different range of tenors (for example shorter than the term of the debt) or PPA contracts starting at a later stage than the commercial operation date. Also, as an aggregator increases the depth of its portfolio of projects, it may be able to offer additional products, such as those discussed earlier, to manage volume or shape risk. Other innovative areas being explored in this context include products with price escalation linked to commodities relevant to the onward buyer cost of the production of goods.



Against this, it is important to remember that many corporate buyers are interested in identifying a renewable energy project and then having a clear and important link to that project via a corporate PPA. An aggregation model needs to offer flexibility while also preserving the ability to show a clear link between the corporate buyer and a project (such as via exclusive marketing rights and the transfer of renewable energy attribute certificates from the project to the ultimate buyer).

### Efficient matching

In recent years, a variety of initiatives have emerged to try and make it easier for sellers and buyers to find each other. These have been backed by industry groups seeking to expand the market, as well as private organizations. Such hubs can drive the standardization of contracts and the speed of transactions.

Table 7 sets out examples of these various developments.

**Table 7:**  
Examples of matching platforms

<b>RE-Source platform</b>	Launched in 2017 by SolarPower Europe, WindEurope, RE100 and WBCSD, it is focused on the European Union.
<b>Renewable Energy Buyers Alliance (REBA)</b>	Run by the World Wildlife Fund, the World Resources Institute, the Rocky Mountain Institute and Business for Social Responsibility, it is focused on the United States market.
<b>Energy Web Foundation</b>	Founded by the Rocky Mountain Institute and Grid Singularity, this group is not directly focused on corporate PPAs but represents the way in which blockchain technology can create innovations in energy trading that will support new models to bring generators and users together.
<b>Green Electricity Consumption Cooperative Organization (GECCO)</b>	Launched in June 2017, this collaboration between developers and corporate buyers in China provides an exchange platform to facilitate the trading of new Green Electricity Certificates (GECs) and to encourage investment in new renewable energy projects.
<b>New Energy Opportunities (NEO) Network</b>	Created by Schneider Electric, this collaborative online platform connects corporate buyers to viable projects, developers and technology providers, as well as affiliates such as investors and law firms.
<b>Powerbloks</b>	Edison Energy offers its corporate customers Powerbloks, a shorter term (10-year) PPA executed in 10 MW increments, as an alternative. They are intended to provide accessibility to medium to large corporates with smaller load requirements.
<b>PowerX</b>	This is an aggregator in South Africa that buys renewable energy from independent power producers and sells it directly to corporate buyers. It acts as a conduit between buyer and seller, assuming and actively managing the risks that they cannot assume or mitigate themselves and thus facilitating corporate PPA arrangements that might not otherwise be viable.

**Table 7: (continued)**  
**Examples of matching platforms**

DLT-based energy trading platforms	An interesting area of accelerating innovation is also the role of distributed ledger technology (DLT, but often referred to as blockchain). These platforms are marketed as allowing developers and producers to raise funds to build projects by selling energy tokens representing kWh units of future energy as an alternative to traditional debt or equity capital. These tokenized rights to the power produced are sold at a discount from the market price, much like a forward power purchase agreement. This approach is reported to have been pioneered by <a href="#">WePower</a> . Other examples include <a href="#">SunContract</a> .
	DLT may also offer cost-effective, "local" energy solutions. While many of these are focused on residential users (that is, enabling the "prosumer") they also offer interesting entry points for corporations looking to be part of a wider renewable energy solution for their areas of activity. Some examples:
	<b>PowerLedger</b> and the Brooklyn micro-grid project enabled households to trade excess solar power directly.
	<b>Sonnen</b> has established a community of decentralized photovoltaic domestic storage batteries ( <i>sonnenBatterie</i> ) in Germany, whose members can trade power among themselves.
	<b>Verv</b> is a scheme launched in East London that allows residents of a housing estate to share solar power.
	<b>Drift</b> has established a platform that connects consumers in New York with generation (such as small hydro and solar producers) and demand-side response (such as large buildings that are able to "shed" load in periods of high demand). Drift reportedly reduces consumer power prices by 10-20%. Their operating model is based on residential consumers paying a weekly fixed fee of USD \$ 1 plus the cost of power. Drift then leases distribution and transmission capacity based on the amount of power needed to satisfy demand.



## 4. Conclusions



**This report is both a snapshot of current market practices and an identifier of future growth and innovation.**

Its focus on the main risks relevant to various parties to a corporate PPA under different types and markets shows some commonality in approach. However, overall a lot of room remains for further development in standardization internationally.

The working group considers that relevant industry groups could undertake additional international or at least regional work to identify broad approaches to fair risk allocation. While they will need to continue to account for differences between the structure and maturity of different energy markets, they remain worth the effort. The greater the availability of transparent information regarding risks, the greater the opportunities to accelerate the speed at which corporate PPA transactions will be. This is particularly important for bringing in new corporate buyers to the sector, as they will be able to understand more quickly the relevant risks and how others have dealt with such risks previously. It can also underpin the success of the various emerging matching hubs between sellers and buyers.

That said, continuing innovation in contract terms and conditions is crucial to significantly increasing the number of corporate PPAs in the future. Some of the findings from this report on sources of future innovation include:

- The role of creditworthy aggregators is a fundamental step toward getting to scale as it can resolve corporate buyer concerns on lack of different products.
- There is evidence that corporate buyers with a good understanding of relevant risks and their preferred solutions have driven market developments through tendering.
- Developments in volume and shape risk management are interesting and worth exploring in more markets to determine commercial feasibility, subject to managing accounting issues, meaning that markets that are less mature than those in the United States should consider avenues to leapfrog to new commercial solutions.
- There is no easy answer to lender requirements for greenfield developments with no or low subsidy support. Lender requirements will be different depending on the market and the availability of capital and alternatives. One vital action is for developers to continue to work closely with corporate buyers (or aggregators representing that demand) to better understand the impact of PPAs having a tenor that is less than a project's debt term.



## WBCSD's REscale business solution

Through REscale, leading companies are working together on solutions to accelerate the deployment of renewables beyond average growth and transition to a low-carbon electricity system. The group shares the view that renewable energy is reliable and increasingly competitive, and that 3.5 TW of capacity can be deployed by 2025.<sup>1</sup>

In 2016, REscale published the report 'Corporate Renewable Power Purchase Agreements: Scaling up globally' that guides companies through the process of procuring renewable power via Power Purchase Agreements (PPAs). This report continues our work focusing on the IFRS accounting outline for PPAs to increase awareness, understanding and use of Corporate Renewable PPAs. The platform undertaking this work is called the global Corporate Renewable PPA Forum.

To find out more about REscale, the global Corporate Renewable PPA Forum and previous reports, visit our website.

## About the World Business Council for Sustainable Development (WBCSD)

WBCSD is a global, CEO-led organization of over 200 leading businesses and partners working together to accelerate the transition to a sustainable world. We help make our member companies more successful and sustainable by focusing on the maximum positive impact for shareholders, the environment and societies.

Our member companies come from all business sectors and all major economies, representing combined revenues of more than \$8.5 trillion and 19 million employees. Our global network of almost 70 national business councils gives our members unparalleled reach across the globe. WBCSD is uniquely positioned to work with member companies along and across value chains to deliver impactful business solutions to the most challenging sustainability issues. Together, we are the leading voice of business for sustainability: united by our vision of a world where more than 9 billion people are all living well and within the boundaries of our planet by 2050.

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This publication is released in the name of the World Business Council for Sustainable Development (WBCSD). This document is the result of a collaborative effort between WBCSD, Norton Rose Fulbright LLP and representatives from companies participating in the global Corporate Renewable PPA Forum.

A wide range of WBCSD members reviewed the material, thereby ensuring that the document broadly represents the majority view of the global Corporate Renewable PPA Forum.

It does not mean, however, that every company within the forum agrees with every word.

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## Acknowledgements

The global Corporate Renewable PPA Forum has brought together companies from different industries and markets to collaboratively develop this report. We wish to thank the following people for their contributions and thought-leadership:

- CLP: Dipjay Sanchania
- EDP: María Paz García Alajarín and Ainhoa Anda Apodaca
- Enel: Olivier Bardet and Caterina Giorgi
- Royal Dutch Shell: Shelley McCain
- Solvay: Pierre Bartholin and Alexis Manuel
- Unilever: Andrea Rickert-Pulvermann

The global Corporate Renewable PPA Forum currently consists of the following companies supporting this report:



<sup>1</sup> The 3.5 TW figure is based on the International Energy Agency's 2° scenario.

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