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Title of Master's Thesis

THE RISKS IN POWER PURCHASE AGREEMENTS (PPAs) FOR UTILITIES & CORPORATE OFFTAKERS

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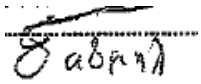

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ABSTRACT

A Power Purchase Agreement (PPA) is a key contract underpinning any independent power generation initiative, particularly in developing markets. It establishes a critical connection between the power producer (project company) and the buyer (offtaker), providing the foundation for sponsors, developers, and lenders to confidently invest in the project by securing a steady revenue stream over its lifespan. The objective of this master's thesis is to provide an overview of the context and key elements involved in drafting a PPA, with a focus on the most crucial clauses. Additionally, it delves into the negotiation process for PPAs in both small- and large-scale projects, while offering updated guidance on emerging topics such as commercial and industrial PPAs, as well as renewable PPAs. Specifically:

In chapter 1 is referred about the drivers for developing a renewable energy strategy and the ways that this can be implemented in various manners.

In chapter 2**,** there is a reference about the origins of PPAs, what they are and since when they are being implemented. In addition, the common PPA and PPA price structures are analyzed. At the end of the chapter the drivers and the benefits of corporate renewable PPAs are being referred.

In chapter 3**,** there is reference related to Risks and the Challenges that offtakes and developers may face during the PPA crafting. Specific Mitigation measures and actions are proposed for each case.

In chapter 4**,** there is a short reference to the financing of the power projects and the significance of it.

Finally**,** in chapter 5 predictions are expressed about the past year and for the following year based on research that have been made.

Chapter 1: Introduction

1.1 Aim of the master thesis

The aim of this master's thesis is to comprehensively explore the risks inherent in Power Purchase Agreements (PPAs) for utilities and corporate off-takers in the energy sector. PPAs are essential contracts that govern the sale and purchase of electricity between generators and consumers, but they also entail various risks that can impact both parties. This thesis seeks to identify and analyze these risks, including market volatility, regulatory changes, contract disputes, and technological uncertainties. Additionally, the study aims to propose effective risk mitigation strategies that utilities and corporate buyers can employ to navigate these challenges successfully. By providing a detailed understanding of the risks associated with PPAs and offering practical solutions for managing them, this thesis aims to contribute to the development of more resilient and sustainable energy procurement practices in the industry.

1.2 Methodology of the master thesis

The methodology of this master thesis combines qualitative and quantitative research approaches to comprehensively explore the risks associated with Power Purchase Agreements (PPAs) for utilities and corporate offtakes. The qualitative approach includes case studies, and content analysis, while the quantitative approach involves surveys and questionnaires to gather data on stakeholder perceptions of risk. Case studies will focus on a selection of utility and corporate PPA agreements across various regions and industries, analyzing documents, contractual terms, and associated risks. Qualitative data identify patterns, trends, and emerging issues, as well as content analysis of PPA documents and legal frameworks to evaluate risk types and mitigation strategies. Validity and reliability will be strengthened by triangulating data from multiple sources and methods such as case studies. This methodology provides a robust framework for analyzing PPA risks, incorporating diverse perspectives to generate actionable insights and recommendations.

1.3 Structure of the master thesis

The structure of the master thesis blends theoretical research with practical analysis, as PPAs are a key part of energy markets and risk management strategies.

This master's thesis is centered around Power Purchase Agreements (PPAs), which are critical contracts for independent power generation projects, especially in emerging markets. It explores the structure and negotiation process of PPAs, focusing on the most important clauses and the context in which they are drafted. Additionally, the thesis examines emerging topics such as commercial, industrial, and renewable PPAs.

Chapter 1 outlines the factors driving the development of renewable energy strategies. It discusses various methods of implementing these strategies, addressing why and how renewable energy is becoming more integrated into global energy policies.

Chapter 2 delves into the history and evolution of PPAs, explaining what they are and how they have been used over time. It also breaks down the typical structures of PPAs and pricing models. At the end of the chapter, the focus shifts to corporate renewable PPAs, highlighting their drivers and benefits for businesses.

The next chapter explores the risks and challenges faced by both offtakers (buyers) and developers during the creation of a PPA. It addresses the potential obstacles and proposes specific risk mitigation measures to ensure the success of PPA contracts.

In Chapter 4, here, the importance of securing financing for power projects is briefly discussed. The chapter touches on how financing affects the overall viability of power projects, including the role of PPAs in securing funding.

In the final chapter, which is chapter 5, presents predictions for the future of PPAs, based on research and trends from the past year and forecasts for the following year. It reflects on how PPAs are evolving and what to expect in the future energy market.

1.4 Contribution of the master thesis

Power Purchase Agreements (PPAs) play a critical role in facilitating the procurement of electricity between generators and buyers, whether they are utilities or corporate entities. However, these agreements come with inherent risks that both parties must navigate to ensure the success and stability of their operations. This master's thesis provides a comprehensive analysis of the various risks associated with PPAs for utilities and corporate offtakes. Drawing on existing literature, case studies, and expert insights, the study identifies and examines key risks such as market price volatility, regulatory uncertainties, contractual disputes, and technological challenges. Furthermore, the thesis explores risk mitigation strategies employed by utilities and corporate buyers to address these challenges effectively. By offering a thorough examination of the risks involved in PPAs, this study aims to provide valuable insights for stakeholders in the energy sector and contribute to the development of more resilient and sustainable energy procurement practices.

Chapter 2: Power Purchase Agreements

2.1 Introduction

A Power Purchase Agreement (PPA) represents a lengthy arrangement for the supply of electricity, involving the purchaser (also referred to as the off-taker or consumer) and the electricity producer (also known as the project developer or plant operator). This agreement entails the procurement of electricity at a predetermined price over a specified period (refer to Figure 1).

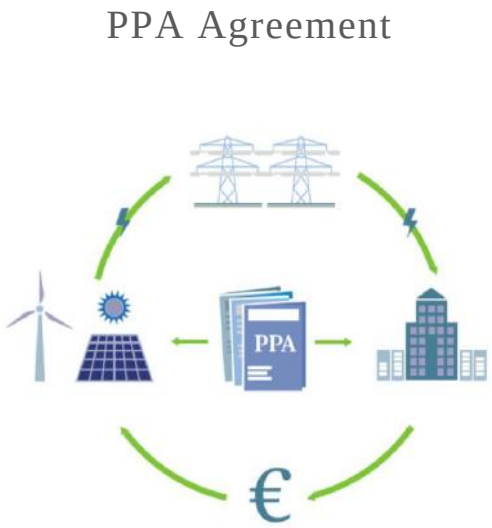

Figure 1: PPA Agreement (Bird & Bird, 2021).

Typically, the electricity is transmitted through the public grid. The agreement encompasses various commercial terms related to the sale of electricity, including contract duration, delivery point, timing of delivery, volume, price, product specifications, accounting procedures, and penalties for non-compliance. The electricity procured may originate from either a newly constructed power plant or an existing facility, the lifespan of which may be extended, for example, following the expiration of a feed-in-tariff system. (WBCSD, 2016). A PPA typically facilitates the construction of a new plant. Building renewable electricity generation incurs significant investment costs. Developers often rely on bank loans to finance plant building, in addition to their own capital. Banks are more inclined to lend to a renewable electricity project if the developer has a long-term (PPA) contract with an offtaker who will purchase the produced electricity. This increases the developer's chances of repaying the loan. Corporate offtakers can help build new renewable electricity projects by entering into a PPA agreement.

As a bilateral agreement, a Power Purchase Agreement (PPA) can vary significantly based on the requirements and capabilities of the two parties involved, as well as the specific context of its application (Next Kraftwerke, 2019). While both renewable and non-renewable PPAs exist, the majority tend to be renewable, which are particularly valuable for emissions reduction efforts. Consequently, this thesis concentrates on renewable PPAs. Depending on market conditions, renewable certificates are issued and delivered alongside the electricity within the PPA (WBCSD, 2016).

In the United States (US), Power Purchase Agreements (PPAs) have been in existence since 2007 and were subsequently introduced to Europe, where they gained momentum in 2014. Initially, onshore wind power dominated the contracted capacity, while in recent years, solar and offshore wind project PPAs have seen growth. As we can see from Figure 2, renewable energy corporate sourcing through PPAs in Europe 2013 -2019 split up between different sources of energy. Initially, PPAs were primarily adopted by technology companies and data center operators, driven by their commitment to renewable energy and significant electricity consumption. However, later on, corporations in industries such as chemicals, communications, and fossil fuels also began entering into PPA agreements (Bird & Bird, 2019; IRENA, 2018).

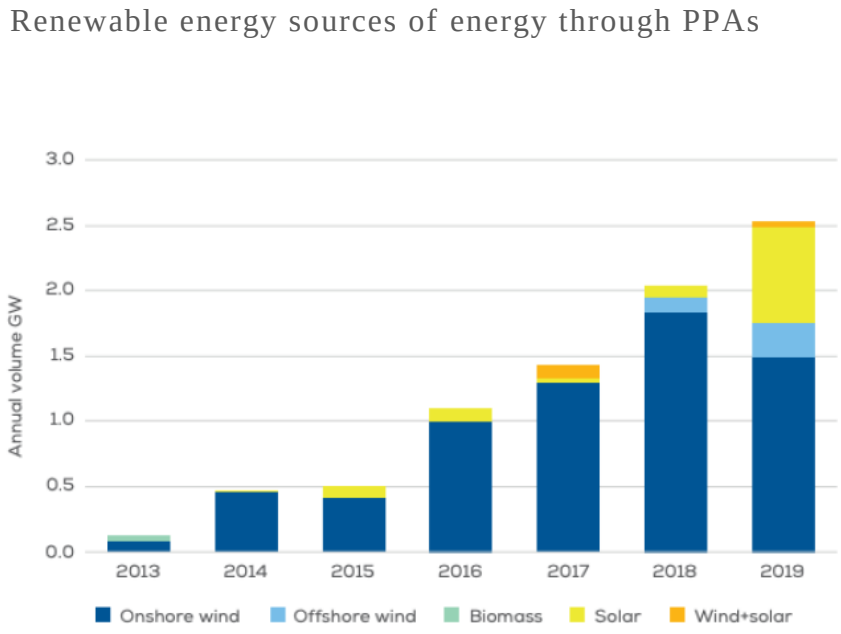

Figure 2: Renewable energy sources of energy through PPAs (Ross, 2017)

2.2 Contract structures of PPAs

There exist various types of Power Purchase Agreement (PPA) structures that a corporate buyer can opt for. The specific structure of a corporate PPA is contingent upon factors such as the regulatory framework of the pertinent electricity market, the strategic approach of the corporate buyer, and the capacity of the off-taker. Corporate PPAs for newly constructed projects are commonly structured as long-term virtual or sleeved PPAs (Proparco n.d, 2017).

2.2.1 Sleeved or Physical structure

In cases where a direct connection to the production asset is not available, but the asset is on the same grid as the company's off-take point, the corporate buyer may choose to enter into a Power Purchase Agreement (PPA) and appoint a licensed utility to handle the physical distribution of power on its behalf. This process, known as sleeving, involves the utility transporting electricity from the generation asset to the buyer. To reduce any risks linked to this arrangement, the buyer typically ensures that the terms in the corporate PPA with the developer, including the transfer of renewable benefits, are consistent with those in a separate agreement between the corporate buyer and the utility (WBCSD, 2016). In Figure 3 is illustrated the Physical/Sleeved PPA Structure.

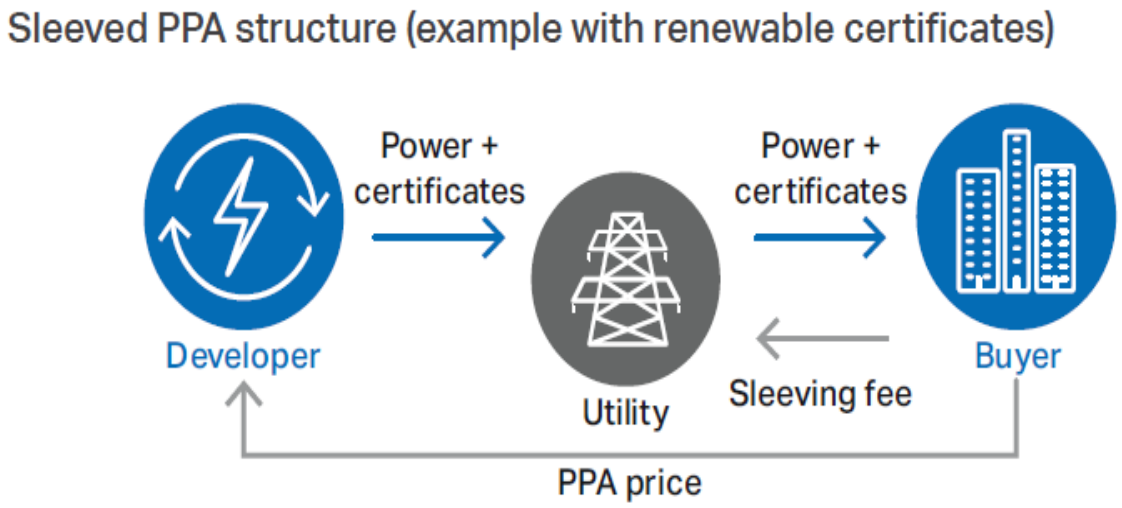

Figure 3: Sleeved PPA structure (WBCSD, 2016;Pexapark, 2024b)

2.2.2 Synthetic, Virtual or Financial structure

Developers and off-takers are not required to be connected to the same network provider, giving virtual PPAs greater structural flexibility. In regions like the US and UK, virtual PPAs are the norm. This arrangement is also widely adopted in other markets globally. It is used to build plants in areas with abundant renewable resources, where the corporate buyer cannot access wholesale power, or when the corporate buyer seeks to avoid paying sleeve fees (Next Kraftwerke, 2017;WindEurope, 2020). In the virtual approach, the traditional physical Power Purchase Agreement (PPA) model is substituted with a financial framework that yields a comparable economic impact for both parties but eliminates sleeving costs. Under this arrangement, the developer sells electricity to the grid and receives payment at the spot price from the utility. Meanwhile, the buyer procures electricity from the utility at the fluctuating market price through a standard electricity supply agreement. Given the variability and potential disparities between spot and market prices, the PPA parties establish a contract for difference (CFD). This CFD, as we can see from igure 4, enables either the buyer or the developer to compensate for the variance between the variable market price and the agreed-upon strike/contract price on a monthly or annual basis.

CFD Structure

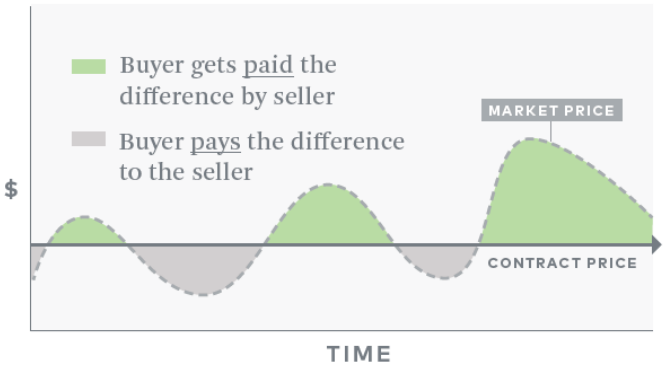

Figure 4: CFD structure (WBSCD, 2016;Pexapark, 2024b)

Renewable energy certificates are directly transferred from the developer to the buyer. This arrangement offers greater flexibility compared to physical PPAs, as it enables the developer and buyer to function on separate grid networks, as illustrated in Figure 5.

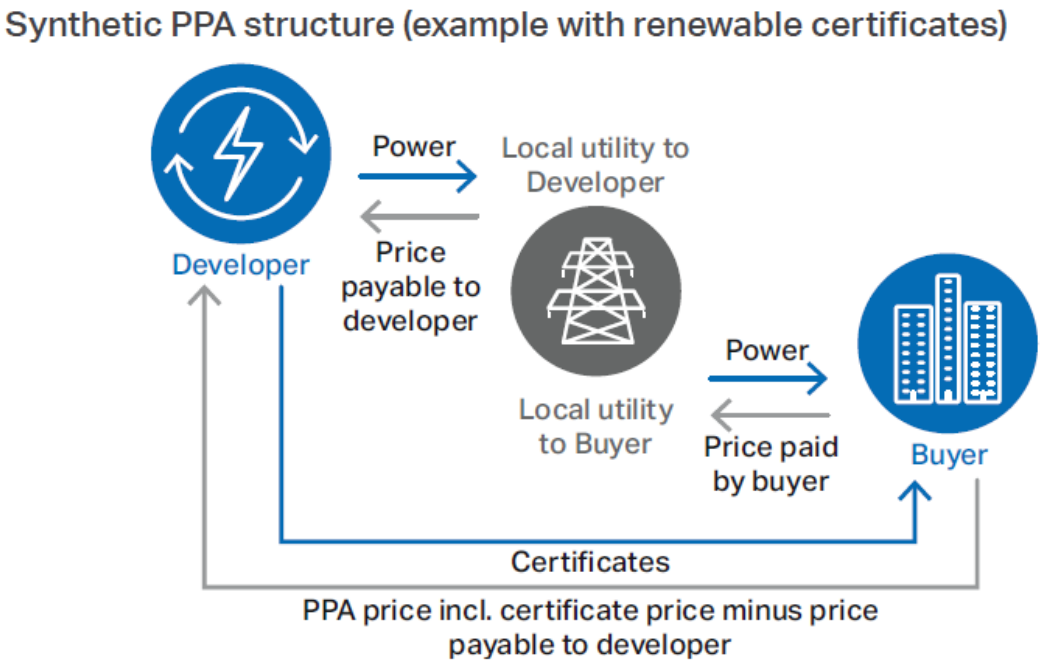

Figure 5: Synthetic PPA structure (WBSCD, 2016)

In essence, electricity can be "virtually" traded between distinct energy markets. Virtual PPAs have emerged as the norm in leading markets such as the UK and the US, with their adoption expanding to other regions globally. Additionally, virtual PPAs allow buyers to bypass the need for a sleeving fee. (WBSCD, 2016;Bird & Bird, 2021).

In addition to physical and virtual PPA structures, there are further variations and aggregation models that will be briefly discussed below.

1. On/near-site PPA: The power plant is situated close to the corporate offtaker's location, with any surplus electricity being sold directly to the grid instead of passing through it. If the power provided by the PPA is insufficient to cover demand, additional electricity is sourced from the utility. On-site installations are typically constructed, owned, operated, and maintained by a third party. This arrangement enhances transparency and builds trust among employees and

stakeholders. This PPA configuration is also known as behind-the-meter or private wire PPA (Bird & Bird, 2021).

2. Multi-buyer PPA**:** Multiple companies have the option to establish a consortium of buyers, collectively entering into identical Power Purchase Agreements (PPAs) with a single generator. This approach serves to diversify the credit risk for the developer while allowing for the sale of more power under a single contract. If these companies span various sectors, it further mitigates risk for the developer in the event of bankruptcy or non-payment by one of the companies. From the perspective of the off-taker, the legal costs and procedural burdens can be distributed among consortium members, although this introduces complexities. Additionally, members must coordinate and agree on uniform terms and conditions, which could prolong the negotiation process (Bird & Bird, 2021).
3. Multi-seller PPA**:** Renewable energy assets are grouped together under one portfolio, with electricity supplied to an offtaker through a Power Purchase Agreement (PPA). This method is advantageous for smaller installations and off-takers with significant energy needs. The portfolio management is handled by an aggregator, who charges a service fee, adding an extra cost to this PPA arrangement.
4. Cross Border PPA**:** When renewable energy facilities and offtaker consumption points are situated in separate countries, a condition known as basis risk emerges. This occurs due to potential differences between the wholesale market price in one country (Country A) and the settlement market price in another (Country B). Furthermore, cross-border transactions introduce foreign exchange risks and create additional complexities in accounting, all of which must be carefully managed.
5. Multi-technology PPA**:** A single Power Purchase Agreement (PPA) can encompass multiple renewable energy technologies, connecting them to an offtaker under one contract. This approach offers the benefit of a more stable and diversified generation profile compared to a PPA centered on a single technology. By doing so, it reduces the shape or profile risk commonly linked to traditional PPAs. Although this model has been implemented in the USA, it has yet to gain significant traction in Europe.
6. Proxy generation PPA**:** The offtaker pays for an estimated amount of power, which is calculated by a third party using actual measurements of natural resources at the installation location (like wind speed or solar radiation), a predefined power curve (showing the relationship between wind speed and electricity production), and a reliability factor (typically between 80% and 100%). The traded quantity is derived from the projected power output under optimal operating conditions, considering

equipment efficiency and industry best practices. If the project produces more electricity than projected, it benefits the generator. Conversely, poor project performance will negatively impact the generator. This strategy shifts operational risk from the corporate to the generator, who is ultimately liable for the installation's operations. This approach incentivizes generators to run efficiently and reduces hazards like misaligned financial incentives or unexpected curtailments. The third party responsible for monitoring natural resource conditions and performing proxy generation calculations incurs an extra expense each hour. Finally, the project's renewable electricity certifications are based on genuine generation, not proxy generation. If electricity generation is low, the offtaker may need to purchase supplemental certificates, incurring additional costs. The proxy generation structure was recently established in the United States (Bird & Bird, 2021).

2.3 Common PPA price structures

Power Purchase Agreements (PPAs) can adopt various pricing mechanisms. When the PPA involves a newly constructed asset, it often necessitates upfront agreement on at least a portion of the revenue per megawatt-hour (MWh). This upfront agreement provides assurance to the developer that sufficient revenue will be generated to meet their return requirements on the initial investment. The choice of pricing mechanism depends on the corporate strategy, developer capabilities, and the risk appetite of both parties involved (British International Investment,2023).

Ideally, developers aim for a higher price, while offtakers prefer a lower price. Therefore, compromises are necessary to arrive at a fair purchase price. These pricing mechanisms are crucial considerations in structuring PPAs and are chosen based on the specific needs and objectives of the parties involved. Some of the main pricing mechanisms are described below (WBCSD, 2016).

A fixed-price PPA involves an upfront agreement on the price movement throughout the contract period, offering various structures to accommodate different needs. This may include a fixed price per MWh with no subsequent adjustments, price modifications tied to inflation or other relevant indexes, or gradually increasing prices based on predetermined escalations, either in real terms or linked to inflation (WBCSD, 2016).

A discount to market PPA is only able to be applied in markets with a fluctuating wholesale market price.

1. Floating: The buyer receives a consistent percentage discount off the wholesale electricity price per MWh.
2. Minimum prices: The buyer pays the wholesale price, but only until it reaches a specific floor price. If the market price falls below this floor price, the buyer pays the floor price instead. This arrangement ensures that the developer maintains a minimum value for the electricity, as illustrated by the dashed red line in Figure 6.

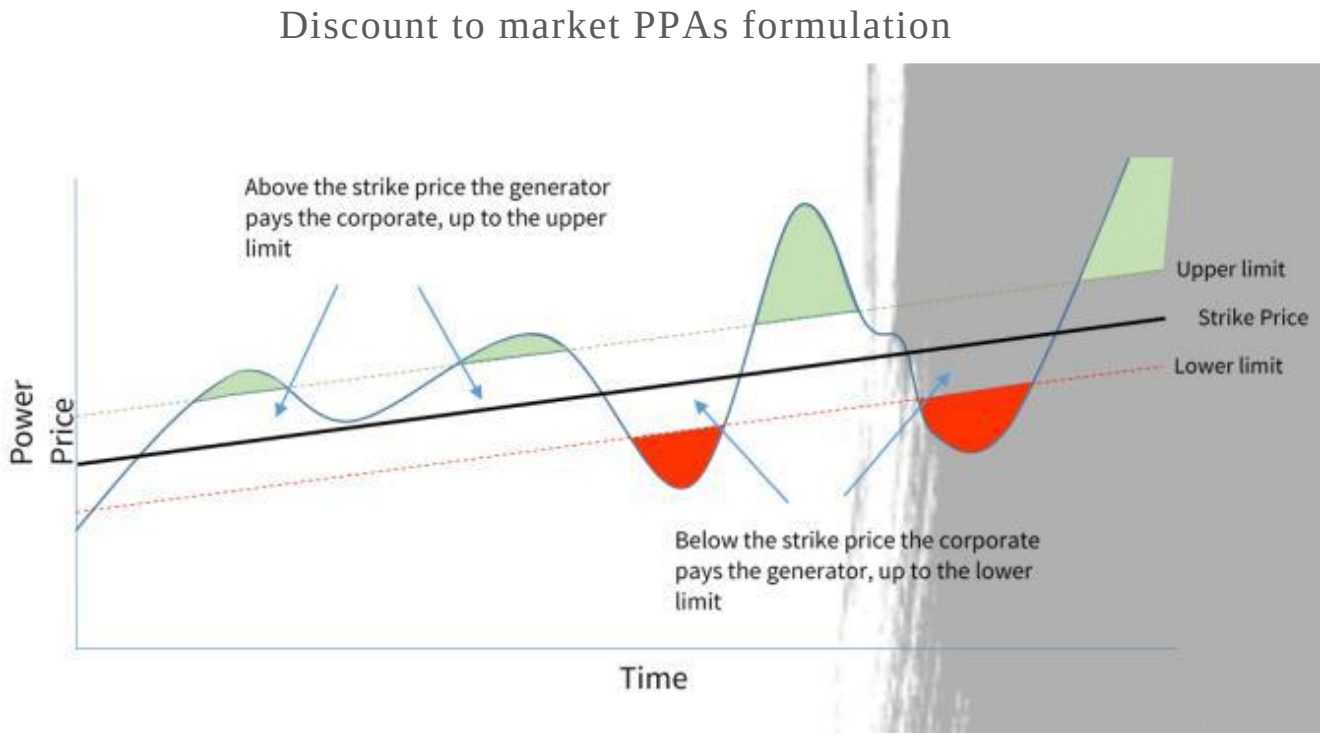

Figure 6: Discount to market PPA formulation (McKenzie, 2015).

3. Maximum prices: The buyer pays the wholesale price, but only until it reaches a predetermined cap price. If the market price exceeds this cap price, the buyer pays the cap price instead. This arrangement ensures that the buyer maintains a maximum level of costs, as depicted by the dashed green line in Figure 6.
4. Hybrid forms: The aforementioned pricing mechanisms can also be integrated, for instance: A price corridor is established with both a floor and a cap (as illustrated in Figure 6), or a fixed price is negotiated for, say, 80% of the generated volume, while the remaining production is procured via spot price indexation. This concept is adapted from (McKenzie, 2015).

2.4 Drivers for corporate renewable PPAs

Different organizations have different motivations for getting businesses to sign corporate PPAs. There is a great variety in risk management techniques, goals for sustainability, governance, operating countries, energy intensity has a background in buying renewable energy. Typically, while creating a plan for using renewable energy in business we are looking for the best answer to the security energy trilemma, as it is illustrated in Figure 7, affordability, and sustainability. Long Corporate PPAs over the long term can arrive at a fair resolution overcoming each of these obstacles (WBCSD, 2016).

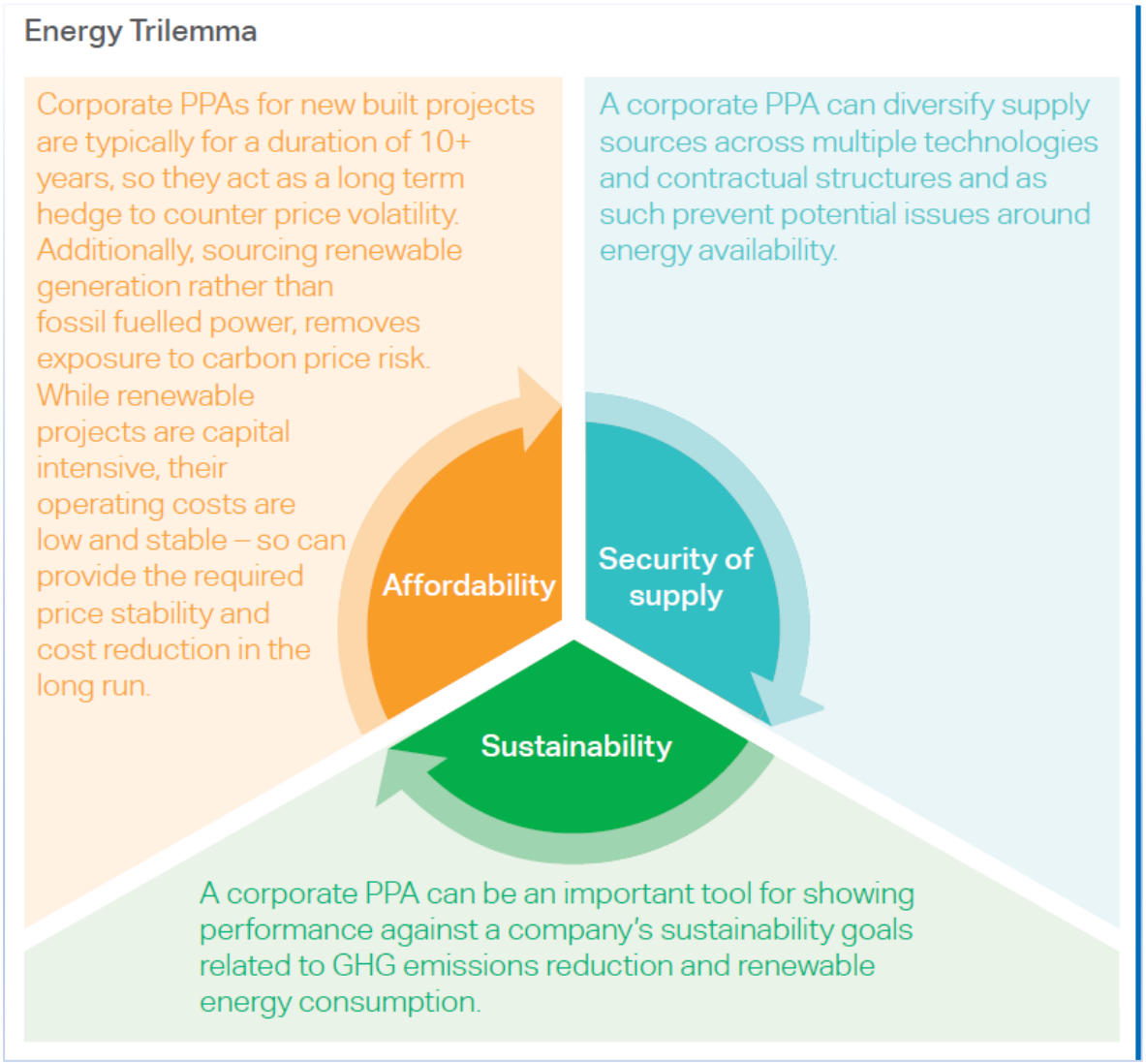

Figure 7: Energy Trilemma (WBCSD, 2016).

2.5 Benefits of corporate renewable PPAs

Contracting corporate PPAs has several advantages for both corporate purchasers and developers. Corporate purchasers use renewable PPAs to better understand costs, save money on power, and achieve sustainability objectives. Risk reduction, improved bankability, and a larger pool of prospective clients are the goals of developers. Below there is a brief report about the benefits for both sides, developers & corporate buyers (Baker & McKenzie, 2015).

The business case for corporate buyers

1. Economics

It allows corporate buyers to lock in a fixed electricity price or price cap without requiring any upfront capital investment, offering insights into anticipated electricity prices while providing protection from fluctuating fuel and energy costs as well as potential future changes in carbon pricing. Additionally, it eliminates operational and management expenses, as the developer assumes the operational risk (IRENA,2019).

2. Sustainability

Complying with SDG 12 and promoting sustainable production practices, some countries implement laws or regulations that mandate or incentivize private companies to increase their renewable energy usage as a requirement for securing financing from regional development banks (IRENA,2019).

3. Brand and Leadership

Raises awareness of achievements in renewable electricity (IRENA,2019).

4. Leverage

Facilitates the establishment of partnerships with a curated group of reliable and knowledgeable counterparts. PPAs allow a business to focus its attention on core activities rather than on managing generation assets (IRENA,2019).

Business case for developers

1. Bankability

A consistent and long-term income stream enhances the bankability of a project with financial institutions. Enables contracting with a highly creditworthy counterparty in most instances (IRENA,2021).

2. Risk Mitigation

It can provide access to cheaper financing by ensuring offtake agreements, while also enabling a shift in revenue sources beyond the traditional reliance on utility off-takers. Cultivating off-take relationships helps mitigate risks associated with building an investment pipeline, and multiple-buyer Power Purchase Agreements (PPAs) further diversify the risk of payment defaults (IRENA,2021).

3. Brand

Deals with like-minded corporate purchasers can significantly impact equities as long as active involvement in development of a sustainable energy system (IRENA,2021).

4. Business Development

It expands the potential pool of off-takers, encouraging greater demand, and enables access to new geographical markets by forming reliable partnerships with corporate buyers. Additionally, it reduces development costs by allowing the creation of standardized terms and conditions through these partnerships (IRENA,2021).

2.6 Conclusions

The text discusses various types of Power Purchase Agreement (PPA) structures available for corporate buyers, highlighting two main categories: sleeved or physical structures, and synthetic, virtual, or financial structures. Within these categories, the text elaborates on several substructures, including on/near-site PPA, multi-buyer PPA, multi-seller PPA, cross-border PPA, multi-technology PPA, and proxy generation PPA. Each structure offers distinct advantages and considerations, such as grid connection, risk distribution, and pricing mechanisms.

Additionally, the text outlines common PPA price structures, such as fixed price PPA and discount to market PPA, detailing how pricing mechanisms can be tailored to meet the needs and objectives of both parties involved. It emphasizes the importance of compromises in reaching a fair purchase price and the significance of pricing mechanisms in structuring PPAs effectively.

Furthermore, the text provides insights into the business case for both corporate buyers and developers in engaging in corporate PPAs. For corporate buyers, benefits include economic advantages such as fixed electricity prices, protection from fluctuating energy prices, and sustainability benefits such as compliance with sustainable development goals and promotion of sustainable production practices. For developers, advantages include improved bankability, risk mitigation through diversified revenue sources, brand enhancement through partnerships with like-minded corporate buyers, and business development opportunities in new markets.

Overall, the text underscores the multifaceted nature of corporate PPAs, highlighting their potential to address economic, environmental, and strategic objectives for both buyers and developers in the renewable energy sector.

Chapter 3: Risks and challenges from offtake's and developer's side-mitigation

3.1 Introduction

The cornerstone of a successful and financially viable Power Purchase Agreement (PPA) lies in achieving a fair balance and distribution of risks among the parties involved. This principle of risk allocation, fundamental in project financing, is particularly pertinent in the context of PPAs. Essentially, risks should be allocated to the party most capable of managing them. Although risk management often falls to a third party, such as the contractor responsible for building the power plant or the transmission company managing interconnection facilities, these parties are not directly involved as contractual partners in the PPA. Therefore, the challenge is to bridge this gap and identify which party to the PPA will take on the assigned risk.

A key element in the PPA is how risks are mitigated. For example, risks that one party to the PPA has taken on, but that are controlled by a third party, can be transferred to the third party through the use of back-to-back clauses in both the PPA and the third party's agreement.

A party will anticipate receiving some sort of reward if they assume risk that is not typically assigned to them. It may be expected that the offtaker would prefer to pay a lesser tariff in this situation. If a project business is taking on that risk, it may be expected to receive a commensurate rise in equity return. As a result, even while a party may benefit financially by shifting risk to its rival, that party will eventually be responsible for covering the risk in one way or another. A PPA's proper risk distribution and balance should strive to give the contractual parties the motivation to fulfill their commitments under the agreement.

In this chapter, we aim to delve into the primary risks associated with Power Purchase Agreements (PPAs). These risks can manifest throughout different phases of a project. Some risks are inherent throughout the entire project lifecycle, while others emerge solely during development and construction, or once the project becomes operational. It is essential to recognize that the risks mentioned here are not comprehensive. Furthermore, the strategies for mitigating these risks may vary from one project to another, shaped by factors such as jurisdiction, regulatory environment, offtaker structure, and specific generation technology, among other considerations (European Investment Bank, 2018;Energy Traders Europe, 2019).

3.2 Challenges and solutions from a corporate buyer's perspective

Corporate purchasers will have to make a lot of choices and take a number of steps to finish a PPA. This section offers advice on important factors for corporate buyers, covering everything from more pragmatic concerns like allocating time and money or obtaining internal permissions to financial and regulatory challenges like comprehending pricing and accounting and competition law issues. Short-term, long-term, fixed-price, and discount-to-market PPAs all offer various potential benefits, commensurate risks, and risk-management alternatives. As a result, each PPA under consideration will have a distinct relation to the themes listed (World Bank Group, 2023;DEG, 2024).

3.2.1 Abandonment

When construction begins, the offtaker will also want to confirm that work is moving forward, and the project hasn't been discarded. A permanent suspension is one way that abandonment could manifest. of the project's development or execution, or could happen through constructive abandonment, the state in which work, or operations are put on hold for an extended length of time. In either scenario, project abandonment will constitute a project company default event, granting the offtaker to end the PPA (European Bank for Reconstruction and Development, 2019).

3.2.2 Delays in achieving COD (Commercial Operational Date)

The timely construction of the power plant is a vital responsibility of the project company as outlined in the PPA. If the Commercial Operation Date (COD) is not achieved within the agreed timeframe—unless due to force majeure or other exceptional circumstances—it will be considered a breach of the PPA. In such cases, the offtaker may have the right to seek delay-liquidated damages and possibly terminate the agreement. To reduce this risk, the project company should ensure that the responsibility for paying delay-liquidated damages is shifted to the Engineering, Procurement, and Construction (EPC) contractor via the EPC contract. It is vital that the amount of these damages' accounts for not only the payments stipulated in the PPA but also the project company's operating costs and debt service obligations under loan agreements.

Additionally, the EPC contract should give the project company the right to terminate the contract and seek appropriate compensation (including the option to reject the contract entirely and recover the full contract fee) if the PPA is terminated due to extended delays. There are also provisions for imposing penalties for delays caused by the project company, especially when the offtaker is open to some delay,

which is common in renewable energy projects. One possible penalty is the reduction of the PPA term for each day of delay. Delays in achieving the COD can impact the project company's expected revenue over the PPA's life. To manage this, an adjustment factor can be applied for each day of delay, effectively shortening the PPA term. While offtakers generally seek the lowest tariff and may allow for some delays, they should recognize that delay-liquidated damages could lead to higher overall costs or, in extreme cases, threaten the project's financial viability. Furthermore, the collateral required to cover delay-liquidated damages will add additional costs, ultimately affecting the tariff. It is critical that the penalties for delays incentivize the project company to adhere to the PPA's timelines (McKenzie, 2015;WBSCD, 2016).

3.2.3 Deemed completion

The project company, along with its contractors, must qualify for relief from delays under various conditions. The concept of "deemed completion" allows for the possibility of receiving financial compensation and/or an extension of time (i.e., the project company may be granted a time extension only). Deemed completion applies when the project is not finished due to risks that fall under the responsibility of the offtaker (and/or the government). Once deemed completed, the project company qualifies for capacity payments based on the power plant's contracted capacity. In cases involving non-dispatchable technologies, like renewable energy, where capacity payments are not applicable, the company is entitled to deemed energy payments from the scheduled Commercial Operation Date (COD) until the actual COD is achieved. Following completion testing, if the plant's performance indicates a capacity below the contracted level, the project company is typically required to address and correct the deficit (WBSCD, 2016).

3.2.4 Interconnection infrastructure construction by offtaker

From a commercial standpoint, the primary motivation for the offtaker to build the transmission line is to avoid the increased construction costs that would result if the project company were responsible for the task. Any extra construction costs incurred by the project company would eventually be passed on to the offtaker through a higher tariff (WBSCD, 2016). However, the potential cost savings from having the offtaker handle the construction must be weighed against two key drawbacks:

Financial Constraints: The offtaker may lack sufficient funds to finance the construction, a challenge faced by many utilities in regions like sub-Saharan Africa.

Liability: If the offtaker agrees to construct the transmission line, they assume responsibility for any delays in its completion in relation to the power plant's commissioning. Under the PPA, this typically means that the offtaker must pay liquidated damages to the power plant, as if the electricity had already been delivered. To mitigate the risk of delays, the offtaker must actively manage funding and procurement of equipment to ensure the timely completion of the transmission line, in line with the power plant's schedule (Impact Investor, 2024).

3.2.5 The offtake obligations

The offtaker's obligations to purchase the capacity and energy from a power plant (referred to as offtake obligations) can vary depending on the details of the power project. For dispatchable power plants, such as thermal power plants and large hydropower projects with reservoirs, these obligations are typically structured as follows:

Payment for available capacity: The offtaker is obligated to pay for the capacity that the power plant makes available (or is considered to be available) (FMO,2018).

Purchase of dispatched energy: The offtaker is required to accept and pay for the energy generated by the power plant and delivered to the designated delivery point.

In contrast, for technologies that rely on intermittent renewable energy sources, such as wind and solar photovoltaic projects, the offtake obligation is usually structured as follows:

Purchase of all generated energy: The offtaker is required to accept and pay for all energy actually produced by the power plant, as well as for any energy that could have been generated if not for curtailments or other interruptions on the grid.

The central idea in both scenarios is to transfer the market risk—the risk associated with supplying electricity and receiving payment for the capacity and energy delivered—to the offtaker, rather than the project company. Even if the power plant is running and able to generate electricity, the offtaker is still required to make payments, regardless of whether the system operator dispatches the plant or accepts the produced electricity. These payments, typically known as availability payments, are designed to ensure that the project company’s capital expenses (including debt service, equity returns and return on equity) as well as its fixed operating costs are sufficiently covered.

Therefore, when the power plant is unable to generate electricity or is unavailable due to reasons that the offtaker (or government) has agreed to bear the risk for—such as political force majeure, force majeure

events impacting the offtaker, legal changes, grid unavailability, or offtaker default—the project company may be entitled to deemed availability or deemed energy payments. These payments are intended to cover capital expenditure (capex) as well. Such contractual provisions are critical for ensuring proper risk allocation in power projects (WBSCD, 2016).

3.2.6 Curtailment

Despite the aforementioned principle, certain offtakers and/or the relevant transmission system operator may choose to retain some flexibility in managing interruptible energy by incorporating curtailment rights. These rights allow the offtaker to reject a predetermined amount of available energy without incurring financial penalties.

From the perspective of the project company and lenders, it is vital that the minimum offtake commitment is sufficient to cover all fixed costs, including debt repayment and a baseline return on equity. To achieve this, they may negotiate PPA terms that include either an automatic extension of the agreement's duration in cases of curtailment or an adjustment to the PPA tariff from the outset.

If the latter option is chosen, the offtaker must acknowledge that the PPA pricing will be calculated based on the assumption that curtailment rights will be fully exercised. Should these rights remain unused or only partially exercised, it is important to revise the PPA pricing accordingly. This ensures that the pricing aligns with the actual extent of curtailment and fairly compensates the project company (WBSCD, 2016).

3.2.7 Performance (both offtaker's and project developer's)

When entering into the Power Purchase Agreement (PPA), the parties involved will establish the contracted capacity of the power plant. Reaching the Commercial Operation Date (COD) requires the power plant to undergo rigorous testing and validation to confirm that it achieves a defined percentage of the contracted capacity, often called the minimum capacity requirement. This testing process generally involves the collaboration of the project company, the offtaker, and an independent engineer mutually appointed by the parties.

The capacity verified at the Commercial Operation Date (COD) can influence the capacity charge payable by the offtaker to the project company, especially for power plants where the tariff structure includes both capacity and energy charges. If the plant meets or surpasses the minimum capacity requirement by the scheduled COD but falls short of the contracted capacity, the project company may be

allowed to repair or replace the deficient components within a set timeframe to attain the full contracted capacity.

In some instances, the project company may be unable to increase the tested capacity to meet the contracted capacity, despite efforts to resolve deficiencies. If the minimum capacity requirement is not achieved by the agreed deadline or the long-stop date for the Commercial Operation Date (COD), the offtaker typically reserves the right to terminate the Power Purchase Agreement (PPA). Certain PPAs may restrict the project company from delivering energy exceeding the tested capacity determined at COD, while others may specify that the offtaker is not obligated to pay for any surplus energy generated beyond the tested capacity.

In Power Purchase Agreements (PPAs) that include both capacity and energy charges, the offtaker is generally required to pay for the plant's capacity, making it critical to ensure that the capacity remains reliably available. To address this, the offtaker typically establishes minimum availability requirements to confirm that the plant is operational as needed. Availability is assessed over a defined period, with minimum thresholds agreed upon by both parties. These thresholds are shaped by factors specific to the project site, such as environmental conditions, the plant's technical design, and efficiency standards outlined in the PPA (WBSCD, 2016;European Commision, 2022).

The Power Purchase Agreement (PPA) typically outlines remedies if the project company fails to meet the minimum availability threshold. These remedies may include the offtaker's right to terminate the agreement or require the project company to pay performance liquidated damages. In a properly designed tariff structure, the offtaker should not be obligated to pay for capacity that is not available for their use.

3.2.8 Allocating time and resources to a non-core area

Electricity procurement is often incorporated into corporate procurement strategies. However, the degree of proactive electricity procurement can differ significantly across organizations. Higher levels of electricity usage are commonly seen in industries with significant energy demands and in regions where electricity costs are elevated. In such cases, electricity expenses can heavily influence overall profitability, potentially creating a competitive edge for businesses. Establishing a renewable electricity procurement strategy may require additional resources, depending on the company's existing internal expertise and capabilities. These resources might include:

Grasp the important elements of the electricity sector in its main operating countries and the resulting opportunities for Power Purchase Agreements (PPAs).

Determine the most suitable Power Purchase Agreement (PPA) structure that aligns with their electricity needs, operational sites, and business objectives.

Carry out competitive procurement processes to identify, assess, and choose the most appropriate developers, projects, and Power Purchase Agreements (PPAs).

To make sure the procurement is successful, interact with other company stakeholders.

The extent and intricacy of a company's renewable electricity procurement strategy are entirely at their discretion. To ensure successful implementation of the strategy, it may require more internal resources initially than standard electricity management practices. If there is a shortage of internal expertise, one approach is to seek guidance from advisors or consult during the exploration of new markets, while simultaneously working to enhance internal capabilities over time (WBSCD, 2016;IRENA, 2020b;IRENA, 2020a).

3.2.9 Entering into a long-term contract

Corporate Power Purchase Agreements (PPAs) are not always characterized by long durations, but those that are typically offer price stability and cost advantages over periods spanning ten years or more. Consequently, for some businesses, a corporate PPA may represent the longest contractual commitment they ever undertake. As a result, internal approvals that were previously unnecessary for electricity procurement may now become necessary.

When considering entering into a long-term corporate PPA, it's essential to assess the anticipated future electricity demand of the corporate buyer and gather insights from relevant decision-makers. Business models and their related power requirements can change considerably over time. Many companies often take a conservative approach when predicting their long-term electricity needs. To reduce the risk of a future decrease in electricity consumption, strategies such as acquiring a portion of the demand that is less than the currently anticipated requirement or choosing a shorter-term corporate Power Purchase Agreement (PPA) may be more appropriate.

Additional approaches to tackle this challenge include allowing the corporate buyer to assign its rights and obligations under the Power Purchase Agreement (PPA) to another party, pre-negotiating exit fees, or permitting volume adjustments in response to significant fluctuations in demand (WBSCD, 2016).

3.2.10 Understanding power price forecasts

Companies think about their long-term outlook on power costs, such as for the next 5 to 10 years, when choosing whether to enter a long-term fixed-price corporate PPA in order to comprehend the financial ramifications of an agreement. In jurisdictions with wholesale energy exchanges, there is usually a reliable

indication of power pricing for the next 1 to 3 years, but forecasts typically do not extend beyond that period. As a result, organizations often need to depend on pricing scenarios provided by market experts. Like all forecasts, predictions about power prices involve assessing the most likely trajectory based on fundamental supply and demand analysis, which often includes various downside and upside sensitivities. There is always a risk that projected electricity price trends over a longer period, such as 15 years, may be inaccurate. For instance, in 2015, there was an unexpectedly large drop in wholesale electricity prices across multiple regions, including Europe and the United States, which had not been foreseen by predictions supporting various project-financed renewable energy initiatives. As a result, certain corporate customers who secured fixed-price Power Purchase Agreements (PPAs) close to the prevailing wholesale market price are now facing substantially higher premiums relative to the current wholesale rates. Conversely, the reverse situation could also occur, depending on the market dynamics within a given jurisdiction. The critical issue lies in determining the extent to which actual prices diverge from the estimates outlined in the corporate buyer's business plan. When evaluating the value of a corporate Power Purchase Agreement (PPA), the fixed rates in the PPA should be compared to expected market prices over an extended period, usually the next 10 to 15 years. Any short-term periods marked by price premiums are likely to be balanced out over this longer timeframe. Furthermore, corporate buyers would benefit from price certainty during the interim period (WBSCD, 2016).

3.2.11 Securing internal approvals

Establishing a corporate Power Purchase Agreement (PPA) can involve various functions within a company, including purchasing teams, operational and supply chain management, facility and energy management departments, corporate social responsibility and environmental management departments, marketing and communication divisions, finance and treasury units, legal departments, and the board of directors.

The critical element is ensuring proactive and clear communication about the benefits of corporate Power Purchase Agreements (PPAs) to all relevant departments. For example, while the procurement team might recognize the advantages of PPAs, operational staff may have concerns about the adequacy of current power supply agreements and the technical difficulties involved in integrating a corporate PPA. Gaining approval from all necessary stakeholders is essential to prevent delays. Strategies that can enhance success include:

Identifying the departments and/or management who will be responsible for approving important elements of a corporate PPA (such price, tenor, and accounting).

Creating an integrated approval process that involves all necessary stakeholders and allows issues to be raised and resolved in a single step.

Early in the process, workshops are conducted with representatives from corporate purchasers who have experience with Power Purchase Agreements (PPAs) to enhance internal understanding. It’s important to note that short-term PPAs may necessitate fewer internal approvals compared to longer-term PPAs (WBSCD, 2016).

3.2.12 Finding suitable projects

If a purchaser decides to enter into a corporate Power Purchase Agreement (PPA), it must begin the search for a developer and a project that meets its specific requirements. This process is shaped by the buyer's overall electricity strategy, the specific renewable technologies they are interested in, the project's location, and pricing considerations. However, in certain regions, particularly where the corporate PPA market is still developing, there may be a mismatch between the available projects and the buyer's requirements. It can also be difficult to quickly identify ongoing initiatives and initiate discussions. There are, however, tools available for locating projects, which may vary by country. An increasing number of governmental and private databases now track and map developing renewable electricity projects (WBSCD, 2016).

3.2.13 Benchmarking prices via tenders

Depending on the currencies they are exposed to, how they perceive future expenses, and how much risk they are willing to take, various corporate buyers will have varying opinions about what constitutes excellent value for money for them. Corporate PPAs are not standardized products, and the cost of the electricity acquired through them does not have a set price.

They are affected by variables like the choice of technology, investment costs, cost of capital, length of the contract, profit margin, and O&M expenses over the course of the contract.

To establish a competitive price within a country, a corporate buyer can initiate a tender process to evaluate bids from multiple developers for comparable projects. These tenders should outline key details of the Power Purchase Agreement (PPA), such as output, duration, and location, while ensuring the criteria are broad enough to attract a diverse range of bids. Evaluation criteria might encompass price competitiveness, project feasibility, developer expertise and history, as well as the creditworthiness of the renewable project's owner. It is crucial to closely examine the developer's capability and track record to ensure the project's long-term success and alignment with overall sustainability and marketing goals.

Additionally, corporate buyers can look into unofficial data sources, such as public results from major government auctions for long-term fixed-price renewable electricity contracts, which often reflect a steady decrease in the capital costs associated with solar or wind installations. Many organizations conduct thorough analyses of the levelized cost of power generated by renewable technologies, and detailed insights are also available in various publicly accessible reports for developed economies like the United States (WBSCD, 2016;PWC, 2017).

3.2.14 Clarifying accounting treatment

Depending on the exact wording of the final agreement and prevailing accounting standards, entering into a long-term corporate Power Purchase Agreement (PPA) could lead to significant accounting implications, akin to other lengthy contracts. It is recommended to seek expert advice, either internally or externally, as determining the appropriate accounting treatment depends on various specific terms within the PPA. In specific scenarios, the agreement might be classified as a lease according to the International Financial Reporting Standards (IFRS). The application of these regulations is context-dependent and challenging to generalize. Although the International Accounting Standards Board (IASB) hasn't issued explicit guidance regarding the treatment of PPAs, the language used in drafting aims to clarify contract and lease classification. If analysis reveals that a PPA constitutes a lease, further examination is necessary to determine whether it qualifies as an operating or financial lease. In the case of a financial lease, the entity would need to recognize a liability (and an asset) on its balance sheet. The company's gearing ratios, debt covenants, or other KPIs may be impacted as a result. However, operating leases produce a flat cost profile over the project's duration, which reflects the underlying rent payments, rather than any balance sheet debt. At the latest in 2019, IFRS 16 will do away with the distinction between operating and financial leases. All leases will be handled similarly to finance leases under the new standard as opposed to the previous one. The new standard has various adjustments that may affect whether or not a contract is categorized as a lease, such as examples relating to PPAs. It's possible that new contracts won't be categorized the same way as earlier recommendations did for similar agreements. Consequently, when a contract involves a lease extending beyond 2019, the effect on the balance sheet hinges on the magnitude of any predetermined payments from the corporate buyer to the developer for energy. Smaller fixed payments lead to lower assets and liabilities. To reflect the agreement on the company's balance sheet at fair value relative to prevailing electricity prices for a virtual Power Purchase Agreement (PPA), derivative accounting might be required. In cases where hedge accounting isn't applicable, this could likely lead to fluctuations in the income statement. It's crucial for corporate finance and accounting teams to be engaged early in the project development phase to ensure favorable negotiation terms (WBCSD, 2016).

3.2.15 Engaging a utility to sleeve the corporate PPA

If a buyer chooses a sleeved corporate Power Purchase Agreement (PPA), they must confirm whether their utility supplier is capable of offering sleeved PPA contracts. If not, the buyer may need to organize a targeted tender to identify an appropriate sleeving utility provider. When it comes to sleeved corporate PPAs, some utilities are more efficient and cost-effective than others, and their willingness to assume balancing risk can vary. In the final stages of PPA negotiations, it is common to work with a seasoned sleeving utility to ensure proper risk management by closely aligning with the developer's PPA terms. This strategy, known as "back-to-back" contracting, significantly reduces the administrative burden on the buyer throughout the procurement process (WBCSD, 2016).

3.2.16 Transmission

In a bundled system, the power purchasing, transmission, and distribution functions are combined within a single entity, usually a state utility, referred to as the offtaker. The offtaker is responsible for ensuring the transmission of electricity generated by the project company and sold to consumers. Additionally, the offtaker handles the maintenance of the connection between the power plant and the power grid.

In contrast, an unbundled system, like the one in Greece, separates the functions of power purchasing, transmission, and distribution, assigning each responsibility to different entities. The degree of this separation varies depending on the specific electricity reform strategy implemented in a particular jurisdiction.

An unbundled system introduces particular concerns regarding transmission. One key issue is the creditworthiness of the transmission company and its ability to manage the risk of failing to transmit power when it's ready for delivery, as outlined in the Power Purchase Agreement (PPA). From the offtaker's perspective, transmission risk falls beyond their control and is a risk they are unwilling to assume.

From the project company's standpoint, they typically have limited control over transmission risk and believe that this risk should be assumed by the party with greater control over the transaction—the offtaker. This argument holds particular weight when the offtaker and the transmission entity have an established relationship, such as both being government-owned or part of the same corporate group. The project company contends that since the government, as a whole, benefits from a stable power supply, it should bear the risk if one of its entities fails to connect the power plant or transmit power as required. Consequently, in an unbundled power market, Power Purchase Agreements (PPAs) often place the majority or all of the transmission risk on the offtaker, who serves as a guarantor for the transmission company's obligations (WBCSD, 2016;Wind Europe, 2020).

However, it's important to acknowledge that this setup creates a moral hazard risk, as the transmission company might not meet its obligations under the transmission contract, knowing that any financial consequences will be absorbed by another government entity. Therefore, it is crucial to include appropriate back-to-back clauses between the offtaker and the transmission company to ensure that the offtaker compensates for any transmission issues that arise (WBCSD, 2016).

3.2.17 Assessing regulatory restrictions and competition law

Certain regulatory challenges that may impact the structure of corporate Power Purchase Agreements (PPAs) have been addressed in earlier sections, particularly when legal constraints exist on non-utilities directly procuring energy from generation asset owners.

It is expected that regulatory hurdles will have to be addressed individually in countries where corporate PPAs are less common but still viable, until a set of standardized procedures and approved protocols has been established.

An ongoing dialogue among developers, buyers, lenders, external advisors, regulators, and local electricity providers may be necessary for this case-by-case assessment. These regulatory challenges can lead to delays during the navigation process. Therefore, it is recommended to address these issues as early as possible, in conjunction with the aforementioned parties. Legislative restrictions on competition can pose difficulties for both purchasers and developers, and these challenges will vary by jurisdiction. To promote competition in the electricity market, many regulatory frameworks have imposed limits on large consumers from selecting a single supplier for the majority of their needs over an extended period. These restrictions are often tailored to specific circumstances, so each situation will require careful consideration. In some cases, these limits might even be lifted for a corporate PPA buyer (WBCSD, 2016;Stanford University, 2008).

3.2.18 Challenges in specific sectors: heavy industry renewable PPAs

Regarding corporate PPA procurement, different sectors encounter distinct difficulties. An excellent sector to examine those in is heavy industry. Businesses in this industry have certain needs, such as a reliable source of power. In the Table below is described how PPAs can still be a good choice for their renewable strategies (WBSCD,2016).

Table 1: Problems & Solutions in PPAs (U.S Department of Commerce, 2017)

Concerns	Solutions
Heavy industry processes are energy intensive. As a result, fluctuations in electricity prices are a critical topic for this industry's competitiveness. Therefore, in this industry, a corporate PPA with a set price may not be acceptable.	When considering fixed-price Power Purchase Agreements (PPAs), it is advisable to use them to cover only a portion of the corporate buyer's energy demand. This strategy helps reduce the risk of market prices dropping below the fixed PPA prices, thereby minimizing the impact on the buyer. Recalibration points for pricing can be established, enabling the corporate buyer and developer to renegotiate for lower prices should wholesale rates decrease by a predetermined percentage. Floating price structures, offering increased responsiveness to market fluctuations, are also a viable option.
If production processes do not align with the output profile of a renewable power plant, contracting through corporate Power Purchase Agreements (PPAs) may result in sites facing intermittent electricity supply or incurring higher balancing charges.	Generally, the risk associated with variable generation is transferred away from both the corporate buyer and the developer. In sleeved corporate PPA structures, this risk is typically entirely alleviated as the corporate buyer engages in a 'back-to-back' electricity supply agreement with an electricity supplier. This ensures the continuous and reliable provision of electricity to the corporate buyer. The electricity supplier assumes the risk associated with the intermittency of generation, referred to as balancing risk, rather than the corporate buyer. In certain jurisdictions, 'net metering' agreements are permitted, where the grid operator monitors the project generation profile over predetermined periods, such as daily, weekly, or monthly intervals. This setup neutralizes the effects of within-day generation fluctuations. In such

Concerns	Solutions
	markets, the balancing risk is assumed by the grid operator. In some instances, corporate buyers may set up an internal balancing or trading team or hire external contract specialists to ensure a continuous and reliable supply of electricity.
For heavy industries connected to the high voltage network, where power rates are lower than those for most businesses linked to lower voltage networks, the financial rationale for Power Purchase Agreements (PPAs) is less compelling.	Although an offsite Power Purchase Agreement (PPA) might entail higher costs, an onsite generation asset could offer a more cost-effective pathway to the market. This can be achieved through financing via a PPA or direct investment, bypassing grid fees. Therefore, heavy industrial entities are provided with a more economically viable route to market.

3.2.19 Conclusions

From the texts and all the risks above one can extract extremely useful, comprehensive advice for corporate purchasers engaging in Power Purchase Agreements (PPAs), covering various aspects from practical considerations to financial and regulatory challenges. Corporate buyers must ensure mechanisms are in place to address project abandonment and delays in achieving Commercial Operational Date (COD), including provisions for delay-liquidated damages and termination rights. Evaluating the risks and benefits of having the offtaker undertake transmission line construction is essential, considering financial constraints and liability implications. At the same time, corporate buyers must understand their obligations regarding capacity and energy purchases, ensuring they align with the nature of the power project and market risks. Furthermore, understanding power price forecasts and their implications on long-term PPAs is essential for making informed decisions and managing financial risks and selecting an experienced utility for sleeving corporate PPAs can help mitigate risks and ensure effective risk-sharing arrangements. It must be pointed out that industries with unique energy demands, such as heavy industry, face specific challenges in procuring renewable PPAs, requiring tailored solutions to address intermittency and financial viability. In summary, it is highlighted the complexity of corporate PPAs and emphasizes the importance of thorough evaluation,

proactive risk management, and strategic decision-making to ensure successful outcomes for corporate purchasers (Nyberg, 2020).

3.3 Challenges and solutions from a developer's perspective

In several markets, developers have taken an active role in fostering the expansion of corporate PPAs. This segment examines the difficulties faced by developers as they expand into new global markets and how to work together with corporations.

Customers can assist in overcoming those for all parties' gain. Challenges in the developers comprise corresponding corporate customer requirements and project accessibility, juggling the numerous conflicting demands of corporate purchasers and lenders, and balancing conflicting priorities with relation to matters like cost and credit-worthy (WBSCD,2016).

3.3.1 Bridging the knowledge gap

As the corporate Power Purchase Agreement (PPA) market grows, developers are facing an increasing number of new corporate participants interested in projects. This diversification is a highly positive trend. However, for newcomers with limited experience in energy project financing, there will be an initial phase of collaboration aimed at enhancing understanding of the preferred risk allocation between both parties. This process involves demonstrating successful solutions that have proven effective in the past, as well as developers familiarizing themselves with the corporate buyer's procurement policies and commercial expectations.

Although this collaborative process improves the quality of PPA transactions, it may also extend the duration of initial negotiations. Prolonged delays can reduce the net benefits for developers working with corporate buyers. Conversely, as the corporate PPA market continues to grow, corporate buyers will increasingly have access to a wealth of information sources that provide insights based on past experiences (IRENA, 2019;DFC, 2024).

3.3.2 Expanding the pool of buyers

Although it is currently very modest, the number of corporate purchasers that are interested in corporate PPAs is expanding. Additionally, a corporate buyer may choose to use long-term PPAs for only a portion of their total electricity demand as part of a broader renewable energy procurement strategy. When large projects target a single corporate buyer, the pool of potential buyers becomes smaller. In cases

where a large project does not have a single buyer, corporate PPA models that involve multiple buyers or a combination of buyers and utilities can help generate more interest. This challenge is anticipated to lessen as more corporate buyers enter the market. In the meantime, developers can broaden the market by securing agreements with a variety of corporate buyers (IRENA, 2019).

3.3.3 Assessing counterparty strength

A developer's project's ability to attract a reputable corporate buyer will decide its viability and profitability in part. Locating corporate purchasers with favorable credit scores enables developers to construct bankable PPAs that entice lenders. Historically, developers found utilities to be highly appealing counterparties due to their robust balance sheets and willingness to engage in longer-term agreements.

Contracting with significant corporate purchasers outside the traditional energy sector may be more attractive, particularly given the pressure on traditional utilities' credit ratings, depending on the jurisdiction and timing. Developers might seek to enhance off-takers' creditworthiness by requiring credit enhancements, such as parent company guarantees (WBCSD, 2016;World Bank Group, 2008).

More on bankability concerns are covered in a later Chapter.

3.3.4 Determining pricing and transaction costs

As was mentioned earlier, pricing is discussed from the viewpoint of the buyer. It is probable that developers have a minimum price in place that they must meet in order to advance their projects. However, a variety of reasons may eventually cause changes in the cost necessary to build projects, which may have a detrimental effect on pricing discussions. Shorter-term variables, such as times of exceptionally low electricity rates, can also complicate talks when attempting to lock in prices over extended periods of time.

Third-party sources of information on pricing trends can offer an impartial basis for discussions, although developers and buyers often form their own views on future price changes. One significant challenge for a developer aiming to build a portfolio of smaller generation assets is the absence of economies of scale, which can result in higher costs for the company. Transaction costs may escalate if the issues encountered in developing a large asset are repeated for each smaller deal (IRENA, 2019;World Bank Group, 2013).

3.3.5 Meeting corporate buyer’s and lenders’ opposing needs

To find a solution that works for everyone, both will frequently turn to the developer. For instance, when it comes to newly constructed projects, lenders (and consequently developers) frequently try to align the PPA's length with the financing's debt period.

Later, these bankability issues are covered in further detail. Finding a compromise may take time and is often resolved by the developer bringing all parties together to find mutual solutions.

3.3.6 Dispatch

The Power Purchase Agreement (PPA) mandates that the project company must strictly follow the dispatch instructions from the grid operator. Any failure to comply with these dispatch instructions falls under the responsibility of the project company. The grid's dispatch protocol may be outlined in the PPA or detailed in the transmission connection agreement between the project company and the transmission company. The project company is provided with dispatch plans for monthly, weekly, and daily load management (WBCSD, 2016).

3.3.7 Special thoughts for renewable energy projects

Allocating performance risk in renewable energy projects is difficult because renewable energy generation is intermittent. In non-dispatchable renewable energy Power Purchase Agreements (PPAs), the offtaker is only required to pay for the energy that is actually delivered. The offtaker's obligation to pay the agreed tariff for the delivered energy is usually capped at a predetermined limit stated in the PPA. Any energy produced beyond this cap may be compensated at the prevailing spot prices, if a spot market is available.

Since the project company cannot control output, which is dependent on weather conditions, the offtaker cannot impose a minimum supply obligation on non-dispatchable plants for any specific day. Renewable energy installations are significantly affected by factors such as sunlight, rainfall, and wind patterns, making it impossible to guarantee a specific level of production on a given day. However, requiring a minimum availability threshold after the Commercial Operation Date (COD) could be considered reasonable to ensure that the project consistently produces the expected electrical output while taking weather conditions into account.

Availability refers to the plant's ability to generate and supply power as per its design specifications, factoring in any degradation over time. It's important to distinguish between availability and output. When setting a minimum availability requirement, both the project company and its financiers will need to ensure sufficient time for procuring and installing necessary replacement parts in case of unforeseen malfunctions

that result in the plant's unavailability. This can be achieved by assessing the minimum availability required over a reasonable period, allowing for longer durations in cases of specific equipment failures, especially if replacement parts are unavailable from suppliers.

Power Purchase Agreements (PPAs) for photovoltaic (PV) solar projects require the project company to confirm that the PV plant—comprising panels, inverters, transformers, and other associated equipment—has met a specified performance ratio. This ratio gauges the plant's efficiency in converting solar energy into electricity, especially at the Commercial Operation Date (COD) prior to the commissioning certificate being issued. Over the duration of the PPA, the performance ratio is expected to decrease as the solar panels' ability to convert solar energy declines. PPAs typically account for a steady rate of degradation in the panels over time. As a result, the calculation of deemed energy payments will factor in the expected degradation of the solar panels throughout the project's lifespan.

The project company's responsibility to achieve the expected performance ratio at the Commercial Operation Date (COD) is backed by a performance guarantee from the solar panel manufacturer. This guarantee is generally designed to meet or slightly surpass the performance ratio requirements outlined in the Power Purchase Agreement (PPA) (Lechtenböhmer, Nilsson, Åhman, Schneider ,2016).

3.3.8 Developing established positions and templates

Utilities typically have longer-standing stances on important contractual negotiations issues and more experience entering into PPAs.

This can make the contracting procedure simpler. Since the corporate PPA market is still in its infancy, there isn't as much precedent for established roles and preferred form templates. It is possible that neither corporate purchasers nor developers are conversant with the phrases that matter most to their counterparty.

Developers can mitigate this possible challenge by collaborating with corporate customers early on and reaching consensus on important points before delving into in-depth talks.

Developers have been working to tackle the issues of lack of standardization, high transaction costs, and business development challenges by creating a template Power Purchase Agreement (PPA) or at least a unified strategy for recurring issues. Implementing template PPAs with relatively similar commercial terms, while considering jurisdictional variations, is an effective approach to scaling corporate PPA strategies.

Flexibility will always be necessary, depending on the specific context. Nevertheless, similar contract arrangements between a developer and a corporate buyer across different markets can be structured around these templates (USAID, 2015).

3.3.9 Providing renewable certification

In order to satisfy purchasers' requirements regarding renewable certification, developers will probably have to furnish off-takers with documentation verifying the amount of clean electricity that was delivered.

It will be crucial to comprehend corporate buyers' requirements for additionality at the commencement of the negotiation process.

While the approach can vary significantly depending on the corporate buyer, it is generally necessary to include some form of contractual protection concerning the qualification of the renewable attributes that will be provided to the corporate buyer (WBSCD,2016).

3.3.10 Forming a public image

Developers can benefit from the advantages of partnering with reputable and well-known corporate buyers, just as corporate buyers can enhance their public image by entering into corporate PPAs, assuming they are willing to disclose that level of information (WBSCD,2016).

3.3.11 Entering into new markets

As discussed, corporate PPAs are expected to rise in number and volume in many markets. Moving into new markets can be challenging for developers. This is particularly the case where the support systems for renewable electricity projects are new or recently reformed.

Establishing a long-term partnership with a multinational buyer can facilitate developers' entry into new markets. The right partnership can provide several advantages, including ensuring price certainty in the absence of reliable subsidy regimes or unpredictable income streams, accelerating project deployment by replicating key commercial principles across new initiatives, and enhancing collective brand visibility to improve access to policymakers. As market practice advances, initial movers' problems are frequently fixed over time. It is probable that developers will have to collaborate with regulators to surmount regulatory obstacles, and occasionally, rules or guidelines may need to be modified to facilitate the implementation of corporate PPAs (WBSCD,2016;European Union, 2009).

3.3.12 Failure to commence construction

The offtaker requires confirmation that the project company will commence construction within a designated period after the Power Purchase Agreement (PPA) becomes effective. Even if delays are caused

by factors beyond the project company's control, such as the failure of an Engineering, Procurement, and Construction (EPC) contractor to fulfill its obligations, the project company remains responsible for the liabilities resulting from these defaults. If construction does not start within the agreed timeframe, the PPA may automatically terminate, or the offtaker may have the right to terminate it at any point. Furthermore, the project company's failure to begin construction could activate payments under construction or performance bonds.

The project company has limited options for addressing a delay in starting construction. Some Power Purchase Agreements (PPAs) may permit an extension of the commencement period, with liquidated damages applied to offset the initial delay. If the delay is caused by a force majeure event (including political force majeure) or a default by the offtaker or any related parties in other project agreements, the commencement period may generally be extended on a day-for-day basis. This extension is valid as long as the force majeure event or default prevents the project company from beginning construction.

In markets where the offtaker expects the commercial operation date to align with a specific timeframe—such as due to anticipated population growth or increased industrial demand—it is crucial for the offtaker to have the option to terminate the Power Purchase Agreement (PPA) if the project company fails to commence construction. This clause allows the offtaker to promptly seek another project company to develop the project.

This approach is particularly beneficial for renewable energy projects in competitive regions, where finding an alternative project developer is relatively easy. By keeping the option to exit the PPA and collaborate with another project company, the offtaker can ensure timely project development and remain more flexible in responding to evolving market needs (WBSCD,2016).

3.3.13 Construction cost escalation

From the offtaker's perspective, ensuring pricing certainty—particularly regarding the project's capital costs—is a primary objective when tendering or negotiating a power project for private sector development. Consequently, the tariff is set according to the outcomes of competitive bidding or based on an agreed-upon construction cost.

In response, the project company typically seeks to lock in the construction cost by negotiating a lump-sum, date-certain, turnkey contract with its Engineering, Procurement, and Construction (EPC) contractor. The core principle is that any cost overruns will be the responsibility of the project company, as outlined in the Power Purchase Agreement (PPA), and the EPC contractor, as specified in the EPC contract. However, there are exceptions to this principle.

If the construction cost increases due to variations required by the offtaker or changes in the law, the PPA should allow for either direct compensation from the offtaker to cover the incremental construction cost or for

adjustments to the tariff to account for the increased capital cost (along with any associated financing costs) (WBSCD,2016).

3.3.14 Transmission interconnection

The project company and the offtaker typically determine early on which party will be responsible for constructing the transmission line, as well as for its long-term ownership and maintenance.

3.3.15 Interconnection infrastructure construction by project company

When the project company is tasked with constructing the transmission line, the offtaker will aim to control construction costs, as these will affect the tariff paid. To achieve this, the offtaker may require competitive bidding for all significant supplier contracts and appoint a qualified engineer to oversee the installation of the transmission line. These strategies help ensure cost efficiency and accountability throughout the construction process (WBSCD,2016).

3.3.16 Delivery point

Upon completion of the transmission line, the Power Purchase Agreement (PPA) outlines the developer's responsibility to deliver energy to a specified delivery point, which is defined in the agreement. The developer typically prefers this delivery point to be located as close to the power plant as possible. Once the energy reaches this point, the transmission line risk is assumed by the offtaker. However, this arrangement can be subject to negotiation, especially if the transmission line is operated and maintained by a third-party company unaffiliated with the offtaker (WBSCD,2016).

3.3.17 Testing and commissioning

Testing and commissioning of the power plant are essential steps taken before the Commercial Operation Date (COD) to verify that all components and equipment operate as per design specifications and contractual performance standards. This process involves not only testing individual equipment but also conducting a comprehensive evaluation of the entire plant to assess key performance parameters such as installed capacity, voltage output, frequency, and specific fuel consumption.

The project company is tasked with carrying out the testing and commissioning activities, ensuring that the necessary expertise and testing equipment are available before the Commercial Operation Date (COD). Adequate notice must be given to the offtaker and lenders, as they may wish to send their own experts to

observe the testing alongside the project company’s engineer. This collaborative effort enhances the thoroughness and accuracy of the testing process, ensuring the power plant's operational readiness prior to commercial operation.

As part of the testing process, electricity generation is required to verify the plant's capacity, meaning the offtaker must be prepared to accept the energy before testing and commissioning begin. If the interconnection line or network is unavailable, the project company may be entitled to liquidated damages for a delayed COD, in accordance with the Power Purchase Agreement (PPA), potentially invoking deemed completion clauses. Therefore, it is crucial for both parties to coordinate their requirements before and during the commissioning phase, including for the transmission line, if applicable. If the offtaker's facilities are not ready during testing or commissioning, the project company could seek damages, which may include deemed capacity and energy payments. As a result, the offtaker must carefully assess its ability to meet the necessary conditions for the testing and commissioning of the power plant (WBCSD,2016).

3.3.18 Failure to meet contracted capacity

During testing and commissioning, the project company may experience outputs that fall short of expectations or fail to meet performance standards, such as dependable capacity and specific fuel consumption (heat rate). Depending on the extent of the deviation from the expected performance, the plant may require modifications to achieve acceptable levels. These necessary adjustments can lead to delays in reaching the Commercial Operation Date (COD). If improving the power plant's performance proves unfeasible, the offtaker typically has two options:

First of all, acceptance of the resulting output, with penalties imposed for not meeting the guaranteed output as stipulated in the Power Purchase Agreement (PPA).

Secondly, rejection of the project plan and termination of the PPA. The Power Purchase Agreement (PPA) includes provisions to manage reduced performance output levels, often handled through capacity fee payments for dispatchable power plants. If testing reveals performance levels that are deemed unacceptable, the PPA may need to be either terminated or significantly revised, along with the implementation of corrective actions to enhance performance to acceptable standards. During the entire term of the PPA, the project company is responsible for any risks associated with the power plant's performance (WBCSD,2016).

3.3.19 Output/heat rate risk allocation

If a thermal plant's output and fuel consumption capacity fails to meet the agreed performance levels during testing, the project company may pursue remedies under its EPC contract against both the EPC

contractor and the equipment manufacturer warranties and guarantees. However, because the offtaker is not a party to the EPC or equipment supply agreements, these protections are not directly available to the offtaker under the terms of the Power Purchase Agreement (WBSCD,2016).

3.4 Conclusions

The chapter outlines various challenges and considerations faced by developers in the Corporate Power Purchase Agreement (PPA) market. Here are some useful conclusions drawn from the chapter:

Collaboration is Key: Developers need to collaborate closely with corporate buyers to bridge the knowledge gap and align important points before entering into detailed negotiations. This collaborative approach enhances the quality of PPA transactions but may require additional time.

Diversification is Positive: The expansion of corporate participants in the PPA market is viewed positively, but developers need to adapt to the increasing number of buyers and their diverse requirements.

Creditworthiness Matters: Developers must ensure that corporate buyers have favorable credit scores to attract lenders and construct bankable PPAs. Exploring partnerships with major corporate purchasers outside the traditional energy sector could be beneficial.

Navigating Pricing: Developers face challenges in determining pricing, considering factors like electricity rates and economies of scale. Third-party sources of information can provide a starting point, but developers and buyers typically form their own views.

Flexibility is Necessary: Flexibility is crucial in navigating conflicting needs between corporate buyers and lenders. Developers often need to find compromises to ensure mutually beneficial outcomes.

Special Considerations for Renewables: Renewable energy projects face unique challenges, such as intermittent power generation. PPAs must account for these challenges, with compensation mechanisms for delivered energy and limitations on minimum supply obligations.

Standardization is Lacking: The lack of standardization in the corporate PPA market presents challenges for developers. Developing template PPAs and collaborating with corporate customers early on can mitigate this challenge.

Market Entry Strategies: Entering new markets can be challenging, but partnerships with multinational buyers can facilitate market entry by providing price certainty and enhancing brand visibility.

Risk Management is Key: Developers must implement robust risk management strategies to address challenges such as construction delays, cost escalation, and underperformance. This may involve contractual provisions, collaboration with stakeholders, and recourse mechanisms.

Chapter 4: Financing of power projects

4.1 Introduction

Power project financing is available through a variety of structures and choices, the terms and conditions of which vary based on how the partners divide the risk and the project's commercial viability. The project company's budget and schedule, which are the most crucial factors to manage when it comes to fulfilling construction milestones and, eventually, COD, will be directly impacted by the structure and finance source(s) selected.

The financial viability of the project is influenced by risk factors that affect its ability to generate consistent and adequate cash flows for meeting repayment obligations, as well as how the funding sources impact the tariff. Therefore, the creditworthiness of the offtaker and the effectiveness of risk mitigation strategies are critical in assessing the project's bankability and its ability to secure long-term debt financing. As the most reliable creditor in the country and an indirect beneficiary of the project, the host government is in a strong position to offer credit support to honor its commitments under various agreements. Due to its key role in ensuring the project's success—particularly in PPAs with state-owned offtakers—the host government is often called upon to manage political and environmental risks and provide essential infrastructure, such as fuel supply and transmission and distribution networks (European Investment Bank, 2024).

4.2 What is project finance?

Project finance involves funding a project company through equity investors and lenders, primarily based on (a) the expected contractual cash flows from the project and (b) the inherent value of the power asset. These financing structures are typically either restricted or non-recourse, meaning lenders have limited or no recourse to the project's owners but can seek repayment from the project company and its assets. The project's cash flows are primarily used to service the debt. In case of default, lenders have the right to take control of the project's assets and foreclose, disregarding termination payments or government support-related issues. In limited recourse financing, lenders may also receive support from the sponsors, including guarantees to help mitigate specific risks.

In a typical project financing structure, a Special Purpose Vehicle (SPV) is established to handle the project assets and manage the financing and project contracts, such as the Power Purchase Agreement (PPA). The project finance lenders obtain a security interest in all project assets, which includes the PPA and other key project documents. They also secure rights to the project accounts and any funds tied to these accounts.

Lenders often impose strict conditions on the location of these accounts and the flow of funds within them (WBCSD,2016;CIBC, 2020).

Importantly, cash flow is frequently limited to ensure that the project company cannot distribute dividends or payments until certain conditions are met. In many instances, sponsors are prohibited from receiving any distributions for a designated time period.

The diagram below (Figure 8) illustrates the typical financing arrangements associated with a project finance structure.

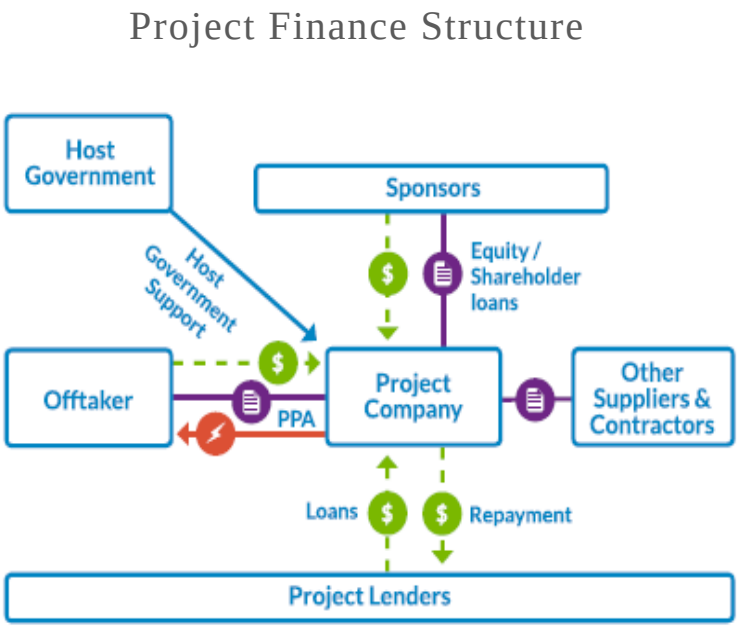

FIGURE 8: Project Finance Structure (U.S Department of Commerce, 2017).

The primary advantage of project finance is that it enables the host government to avoid making an initial capital investment. However, this financing method necessitates a complex set of customized agreements, as lenders have security interests and play a significant role in overseeing project contracts, especially those related to cash flows and capital management decisions. The extensive coordination needed among the parties to navigate this complexity can lead to elevated transaction costs and delays in execution (Africa Finance Corporation, 2024).

4.3 Why project finance?

Why do power projects require lender debt? Can big corporate sponsors finance these projects using their balance sheets? Or should they be built by the host government? Without the presence of a lender, project design and construction as well as PPA negotiations are already difficult tasks. Why should one worry about appeasing lenders' fears regarding bankability?

Politicians frequently pose these valid issues, and each project should have a response that takes into account the fact that producing dependable power at the lowest feasible cost is the main objective of any power project.

Debt, particularly in the form of project finance, is often costly, especially when compared to the ability of a host government to fund power project construction through its sovereign balance sheet. Additionally, there are alternative borrowing options, such as concessional financing from Development Finance Institutions (DFIs), which offer more favorable terms than standard market-priced financing.

But it's crucial to take more than just these funding sources' costs into account. Although host government funding might be less expensive, it might not be a sensible policy choice to lock up enormous amounts of public funds that could be utilized for other infrastructure projects, national security initiatives, or social programs. Like traditional commercial financing from DFIs, concessional financing is also quite limited and typically reserved for high-risk or emerging technology sectors that wouldn't be financially viable without the lower cost of capital it provides. As a result, there is an opportunity cost in utilizing government or concessional funds, as these resources could potentially be better allocated to other high-impact projects that are more cost-sensitive.

Development Finance Institutions (DFIs) must conduct separate analysis and justification of the development impact when deploying concessional resources (Africa Finance Corporation,2024).

Power projects can also be financed using the balance sheets of large corporate developers. While financially robust developers may access low-cost capital through the markets, their management typically treats all internal funds as equity when assessing investments. These companies aim to achieve high internal rates of return on their equity, considering alternative investment opportunities for these funds. Consequently, host governments may find that this strategy does not always result in cost savings for the project (African Development Bank Group,2013). As we can see in Figure 9, we can observe the main sources of financing in power projects.

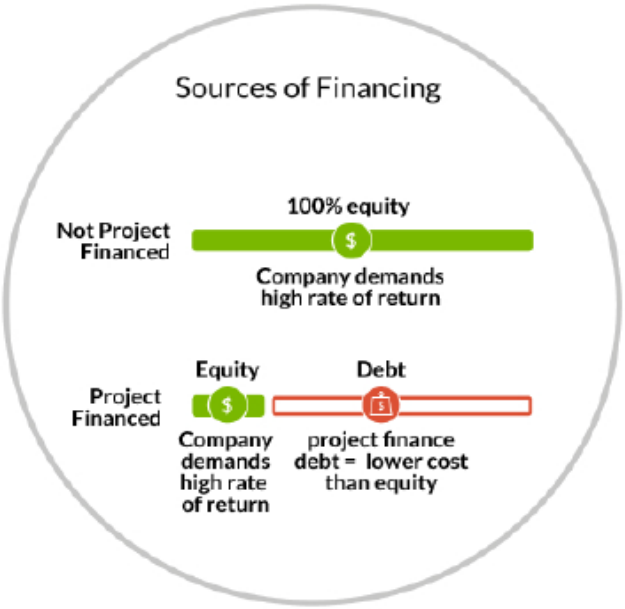

FIGURE 9: Main sources of financing in power projects (U.S Department of Commerce, 2017).

As noted, typically, the lower the equity invested in a project, the lower the overall financing cost is expected to be. However, this can vary depending on the level of credit support required for the project financing, as each form of credit support can increase the total costs. Additionally, the required rates of return on equity and the interest rates on debt also play a significant role in determining the final cost.

Even when large corporate developers have access to low-cost capital funding, they might still opt for limited or non-recourse financing to keep the loan from appearing on their balance sheet. Lenders may also find it more appealing to provide loans to new Special Purpose Vehicles (SPVs) since these entities do not carry existing liabilities.

For the reasons outlined above, project finance has become the preferred financing method for large-scale power projects in emerging markets over the past two decades. However, it is crucial to assess whether this approach is appropriate for a specific project. Once the decision is made to proceed with a project finance structure, it is vital to address lenders' concerns during PPA negotiations to ensure the project's successful execution. An offtaker who is unfamiliar with lenders' expectations will be at a significant disadvantage during project negotiations (WBCSD,2016).

4.4 Bankability of a project

4.4.1 What is ‘bankability’?

Bankability refers to a project's ability to meet the criteria required by lenders to secure financing, typically focusing on aspects evaluated in the commercial lending market. However, funding isn't restricted to commercial banks; projects can also attract financing from sources like Development Finance Institutions (DFIs) and private equity funds. As such, bankability encompasses the capacity to secure investment from diverse funding sources, not just one. Both corporate buyers and developers must understand what lenders look for in a bankable project and proactively address potential concerns during Power Purchase Agreement (PPA) negotiations. These concerns often include price stability, credit support, and currency risk. In project finance structures, a significant share of funding generally comes from long-term debt supplied by senior lenders or equity investments with characteristics similar to debt. Repayment of this debt relies primarily on the project's cash flow, highlighting the necessity for the project and its key contracts to sufficiently mitigate default risks to these cash flows.

A bankable project features a well-structured risk profile that makes it attractive to lenders for financing. This requires effectively mitigating risks associated with construction, technology, or power off-take pricing to acceptable levels. In markets where long-term revenue stability is unpredictable, a Power Purchase Agreement (PPA) offering a fixed or minimum price over an extended period is especially beneficial, as it provides a safeguard for project revenues.

Lender requirements can vary over time. Factors such as the level or structure of equity investment can influence lenders’ perceptions of risk. Additionally, lenders' risk appetites, shifts in market practices, and project-specific factors, such as location, can lead to changes in requirements. However, PPAs should incorporate safeguards against common risks associated with financing renewable energy projects. Although specific challenges will differ by project and country, corporate buyers can enhance their position during PPA negotiations by being aware of these typical obstacles.

While it's essential for corporate buyers to understand the challenges and previous solutions that lenders have endorsed, they are not obligated to adopt these past solutions as the definitive approach moving forward (WBCSD,2016;Asian Development Bank, 2023).

4.4.2 The role of PPA in bankability

The Power Purchase Agreement (PPA) is vital for establishing the bankability of a power project, as it serves as the primary revenue source through payments from the buyer. If the buyer defaults on these

payments, the project may face difficulties in fulfilling its repayment obligations to lenders. Furthermore, the PPA plays a critical role in addressing the specific requirements unique to electricity projects.

Power generation is distinct from other high-value commodities like hydrocarbons or minerals because electricity is sold within a geographically confined market that is frequently subject to strict regulations. Unlike transportable commodities, which can be delivered to meet demand in different locations, power projects depend on the demand within the local market. In many emerging markets, regulatory frameworks often override market dynamics in setting electricity prices for end users (Pexapark,2020).

The Power Purchase Agreement (PPA) is essential for reducing uncertainties around demand and pricing. It secures a long-term purchasing commitment, providing the producer with predictable revenues and the offtaker with a dependable electricity supply. Additionally, the PPA incorporates a tariff formula designed to be forecasted over the project's lifespan, aligning with the project's technology, operational requirements, and financing structure.

This structure allows the PPA to set an electricity price that accurately reflects the actual costs of power production (WBCSD,2016).

4.4.3 Risks to bankability

In conventional power project financing, lenders derive returns exclusively from the repayment of debt, interest payments, and specific agreed fees. However, they demand strong project sponsorship and thorough documentation to guarantee the project's successful completion and commercial operation. Given their significant capital exposure and dependence on project-generated revenues for repayment, lenders are highly motivated to avoid project failure, particularly during the critical development phase.

The primary operational goal is to ensure that revenue is sufficient to meet debt obligations (Adamkiewicz,2024).

Below there is a list of the key considerations which, if not sufficiently covered, will make a project unlikely to receive debt financing.

Term**:** Lenders typically require a PPA to last for the duration of the debt, if not longer. There may be instances in which local power costs are sufficiently high to provide lenders significant reassurance, for instance. Furthermore, for the duration of the PPA, important clauses that guarantee the bankability of the agreement must be in place.

A corporate PPA with a long duration will help with project financing costs. Even though they might affect the amount of debt made available or its cost, shorter-term PPAs can still be bankable. A longer-

term commitment should result in cheaper financing costs, which should translate into a lower price that a corporate buyer must pay (WBCSD,2016).

Tariff-Price certainty: Long-term price stability is typically provided through bankable Power Purchase Agreements (PPAs) in the form of fixed prices or prices with predetermined escalators. When a creditworthy buyer supports this pricing, it instills confidence in lenders. Consequently, this may lead to reduced financing costs and potentially lower PPA prices (WBCSD,2016).

However, not all fixed-price arrangements are simple. Different types of agreements may involve put-call options or mechanisms like partly floating price structures, which combine fixed price volumes with discounted market price volumes to reduce the risk of a corporate PPA becoming disadvantageous if market prices fall. In certain situations, corporate buyers may be asked to offer minimum or floor pricing arrangements to enhance a project's bankability. Furthermore, it is essential to define and agree on mechanisms for addressing electricity price volatility during project delays, along with step-in rights that enable the replacement of project suppliers or developers if required.

Change in law and Tax**:** Lenders are typically unwilling to assume any risk associated with changes in laws or taxes throughout the project's lifespan. When evaluating change in law risk, lenders focus on scenarios where costs stemming from such changes might be transferred between parties. Many lenders initially consider this a risk that should fall on the buyer, based on the following reasons:

Energy buyers typically face exposure to legal changes because these alterations often lead to higher wholesale power costs, impacting the generation sector.

In a long-term fixed-price agreement, the developer has limited ability to offset the financial impact of rising costs caused by changes in laws affecting generators. Unlike market-based sales, where developers can adjust pricing to reflect new legal requirements, a long-term electricity hedging agreement is designed primarily to provide price stability from the corporate buyer's standpoint.

The resolution of these issues hinges on the project's dependence on funding from the corporate Power Purchase Agreement (PPA). Lenders will aim to preserve the security offered by the long-term price, even amidst legal changes. Previous solutions have concentrated on establishing triggering conditions for when relief can be sought and limiting the degree to which the price can be modified. (WBCSD,2016).

Credit Support: If the offtaker lacks sufficient creditworthiness, lenders will demand other forms of credit support, leading to higher costs and added complexities for the project. This issue is common even in developed markets, where many offtakers do not have the required creditworthiness to secure project financing.

The term "credit support" refers to providing additional financial assurance regarding a party's capacity to meet its financial obligations under a contract, such as obtaining guarantees from a parent company. Lenders typically perform a thorough credit evaluation of the corporate entity entering the contract, assessing factors like net assets and size metrics for entities that are not rated. The size of the Power Purchase Agreement (PPA) should align with the scale of the entity involved. Lenders typically prefer a rated entity or a guarantee from a parent company; if this is not feasible, alternative forms of support, such as bank guarantees, may be considered. The PPA may also include liability caps for corporate buyers.

During negotiations for corporate PPAs, one of the most common inquiries is whether credit support is necessary. This often arises from differing expectations between lending institutions and the procurement practices of corporate buyers. While most supply contracts require financial support from corporate purchasers, the specific terms can differ significantly from one contract to another (WBSCD,2016).

While flexibility from corporate buyers in addressing lender requirements is beneficial, lenders can also adopt innovative strategies for credit support. In situations where multiple buyers are represented by a single entity that consolidates demand, lenders may consider developing a customized credit rating. This group could include both rated and non-rated entities, such as private and public companies. In these cases, lenders may prioritize creating an internal credit rating for the collective buyer rather than relying solely on external credit support.

The composition of the group is crucial; if one or more corporate buyers exit, the overall structure and credit profile must remain stable, necessitating agreed-upon mechanisms to maintain this integrity. It's essential to emphasize the importance of credit triggers in discussions about credit support. Lenders expect that a Power Purchase Agreement (PPA) or a credit support mechanism, such as a parent company guarantee, will include clauses that mandate initial or additional credit support if the financial health of the business falls below a specified threshold. (WBCSD,2016).

Billing and Payment**:** The billing cycle from the offtaker to the producer should be frequent, ideally on a monthly or bi-weekly basis. This regularity helps minimize the accumulation of unpaid energy bills and ensures timely debt service payments. Additionally, it serves as an early indicator for lenders of any potential payment or liquidity issues that may arise. (WBCSD,2016).

Currency Risk/Calculation: PPA calculations and payments are typically made in the same currency used for loan repayments. However, if this is not the case, strategies such as exchange rate indexation, foreign exchange hedging, or a true-up mechanism may be required. Additionally, challenges may arise regarding the convertibility of the payment currency. In such cases, the offtaker or host

government may need to offer guarantees for currency conversion, or lenders may demand payments in an alternative currency (WBCSD,2016).

Currency risk can significantly impact a project's financing costs. For instance, if the project's debt is in USD but the long-term power revenues are in a local currency prone to volatility, the project faces increased currency risk. This risk can be partially mitigated through hedging strategies, though these strategies come with their own expenses. Alternatively, if the payments under the Power Purchase Agreement (PPA) were made in USD, the project's risk profile would improve as the currency risk would shift to the buyer. However, the acceptability of this arrangement depends on the buyer's capability and experience in managing currency fluctuations. Furthermore, there are other strategies to mitigate currency risk, which may vary based on market conditions. National governments or development organizations might provide products to certain developing markets to help reduce this risk (WBCSD,2016).

Compared to other counterparties like regional state-owned utilities, corporate PPA buyers may be able to provide more adaptable solutions for this problem. Global corporate buyers will have a lot of experience with several currency income streams. As a result, their willingness to assume or at least share the currency risk may vary depending on the nation. This situation is more probable when national energy prices are linked to the US Dollar. In such cases, the corporate buyer will likely need to explain to the lenders how they manage this risk internally. A critical point to address during PPA negotiations is the degree to which any benefits accrued by the developer are reflected in the PPA price (WBCSD,2016).

Termination**:** Lenders are focused on ensuring that the offtaker cannot easily bypass the long-term purchase commitment specified in the PPA, as this would jeopardize the project's ability to generate the revenue needed to repay its debt. Consequently, lenders take precautions to ensure that force majeure events and seller defaults do not provide the offtaker with grounds for early termination of the project. Additionally, lenders typically require assurances that the project debt will be repaid if termination occurs (WBCSD,2016).

Remedies upon Buyer Events of Default**:** Lenders specifically require that the seller (the project company) retains the right to exercise certain actions, including the right to terminate the PPA, in situations where the offtaker fails to make payments or provide the necessary payment security (WBCSD,2016).

Lenders' rights**:** Typically, through the loan and direct agreements, lenders establish step-in rights and secure a claim over project assets. While the preceding points offer valuable guidance, bankability is ultimately a dynamic concept. The requirements of the loan market can evolve, and what is considered a "market" standard for power project terms may differ depending on factors such as technology,

project scale, location, and scope. Experienced developers or sponsors often possess greater leverage in persuading lenders to agree to terms that are more advantageous for the project company. Furthermore, lenders may be open to accepting certain provisions or risks at the project level if there is sufficient guarantee or credit support from the sponsor or offtaker (WBCSD,2016).

It is important to recognize that in certain mature power markets, particularly in developed countries, Power Purchase Agreements (PPAs) may not always be required to secure project financing. Merchant power plants, which operate without a dedicated buyer, can be developed based on independent evaluations that forecast sufficient spot market demand. However, the absence of a long-term PPA can result in higher project financing costs, even in developed markets. Despite this, traditional bankable PPAs remain essential in the energy markets of developing countries and are necessary in almost all market contexts (WBCSD,2016).

4.5 Conclusions

This chapter outlines various aspects related to the financing of power projects, emphasizing the importance of project finance structures and the key considerations for ensuring the bankability of such projects**.** Here are the main conclusions from this specific chapter:

Project Finance Structures: Power projects are typically financed through project finance structures, where equity investors and lenders finance the project based on projected cash flows and the underlying value of the power asset. These structures often involve special purpose vehicles (SPVs) and limited or non-recourse financing arrangements.

Importance of Bankability: Bankability refers to a project's ability to secure financing by being deemed acceptable to lenders and other funding sources. It is influenced by factors such as the project's risk profile, the terms of its contracts (particularly Power Purchase Agreements or PPAs), and the level of credit support provided.

Role of PPAs in Bankability: PPAs are crucial for bankability as they provide revenue certainty for power projects. Long-term PPAs with fixed or minimum prices help mitigate revenue risks and increase lender confidence.

Risks to Bankability: Various risks, such as changes in law, currency risks, credit support, billing and payment issues, and termination clauses, can impact a project's bankability. These risks need to be addressed through appropriate contractual arrangements and risk mitigation strategies.

Lenders' Requirements: Lenders typically require certain provisions in project agreements to mitigate risks and ensure repayment, including long-term PPAs, stable tariff structures, and remedies for buyer defaults.

Flexibility and Adaptation: Bankability requirements may vary based on market conditions, project specifics, and the parties involved. Experienced developers and sponsors may have better leverage in negotiating favorable terms, and lenders may accept specific provisions if adequate guarantee or credit support is provided.

Importance of PPAs: While in mature power markets PPAs may not always be necessary for project financing, they remain essential in developing country energy markets and are crucial for ensuring revenue certainty and bankability in almost every market scenario.

Overall, the chapter highlights the complex interplay of factors involved in financing power projects and underscores the importance of structured financing arrangements and risk mitigation strategies to ensure successful project implementation.

Chapter 5: Conclusions and predictions

Concerning 2023's back-testing predictions, the popularization of short-term PPAs means that it is anticipated that managing renewable energy revenue through a combination of short-term (ST) and long-term (LT) PPAs will become standard practice. While this trend has occurred, it has not reached the expected levels. We have seen the rise of 3-year PPAs for projects still under development, while 1-5-year PPAs for operational assets have remained steady. The introduction of windfall taxes has significantly impacted the use of dynamic selling and hedging strategies, especially those aiming to capitalize on high-reward opportunities within 1-year periods. However, a growing trend among merchants is the adoption of a "tenor flexibility" strategy. This approach aims to reduce dependence on long-term PPAs and their associated discounts, while catering to corporate preferences for managing short-term pricing risks (Pexapark,2024).

The Evolution of the Tripartite (third-party) PPA**:** The forecast indicated a shift towards collaboration among project owners, utilities, and corporations, aiming to assert dominance in the PPA market by leveraging their distinct capabilities and expertise. Through back-to-back PPA agreements, utilities and traders could effectively mitigate project risks by securing long-term volume sales to corporates, facilitated by the enthusiastic participation of these corporations. This trend validated the earlier prediction. Utilities capitalized on their role as risk managers to position themselves as "market integrators," thereby facilitating the execution of all physical PPAs [36].

The Coming of Age of Co-location & Flexibility**:** Around 2018, the concept of energy storage started gaining traction in industry discussions, especially with the standalone business model in Great Britain. At the same time, collocation was seen as a promising idea in theory, though it faced ongoing challenges in assessing its benefits. However, as market dynamics evolved, new tools became available to build a stronger business case, and the emergence of the first Hybrid PPAs for subsidy-free assets marked a significant milestone in market progress (Pexapark,2024).

After a thorough review and expectation commentary of all the major developments in the European PPA market, below are the pick of Top Predictions for 2024.

Moving on, there is strong evidence that Germany will topple Spain in PPA activity. Energiewende has high forward trading liquidity compared to other European markets, making price discovery easier. The market is becoming more diverse, with a shift away from focusing solely on offshore wind.

The solar deal counts and volumes in 2023 underscore the seriousness of the sector, with growing anticipation fueled by synergies with energy storage. The notably high demand from industrial players

is expected to stimulate activity. However, close attention will be paid to regulatory shifts concerning government-backed subsidy schemes and potential competition within the PPA market (Pexapark,2024).

Furthermore, the PPA market will surpass 20GW according to valid predictions. The European market is currently experiencing the Golden Era, largely driven by the strong demand from corporate entities seeking hedging solutions. The long-term PPA market is expected to surpass 20GW, spread across around 350 deals. While Spain and Germany will continue to be key markets, their share of the overall volume may decrease as emerging jurisdictions capture a larger slice. France, for example, could rise to the top three in deal count by 2023, depending on its alignment with subsidy schemes and the availability of nuclear energy for large consumers. The country's credit guarantee system could attract more small and medium-sized corporations, potentially increasing the number of deals, even for smaller PPAs. Additionally, greater participation is anticipated in Southeastern European markets, such as Greece and Romania (Pexapark,2024).

As far as the geographical scope of hybrid PPAs is concerned, it will expand beyond GB. The UK's first Hybrid PPA for a subsidy-free asset was made possible by advanced grid services, industry maturity, and skill in commercializing energy storage assets. The country's solar permit applications typically contain co-location with storage, indicating a good prediction. Furthermore, we expect the notion will spread to new jurisdictions. When more than 19GW of solar is injected into the grid at the same time, portfolio owners want physical hedges to mitigate volatility and depressed wholesale pricing. Spain is a perfect candidate for this (Pexapark,2024).

Germany's innovative tenders for solar-plus-storage projects have collectively amassed over 890MW of hybrid capacity. Some of these pipelines may pursue additional contractual agreements, though it could involve higher risks due to the subsidized price premium. In the Nordics, the introduction of wind-plus-storage PPAs is anticipated, driven by the risk of cannibalization from onshore wind (Pexapark,2024).

The share of utility PPAs will level up. In 2023, reduced market volatility created a more favorable environment for utility offtakes, leading to 4.02GW of capacity, more than double the 1.96GW in 2022. This growth was driven by 48 deals, a 60% increase from the 30 deals the previous year. While market volatility has improved, significant risks remain. However, with a stable market environment and strong corporate demand, utility offtakes are expected to continue expanding in 2024 (Pexapark,2024).

Utilities are looking into alternative risk management strategies beyond the traditional stack-and-roll model. One such approach is entering back-to-back PPAs with corporate offtakers, providing an umbrella solution that helps both buyers and sellers address price volatility, intermittency challenges,

and meet stricter green criteria. Structured PPAs are anticipated to become increasingly important as project owners, utilities, and corporations work together to leverage their respective strengths. Utilities, in their role as risk managers, have the potential to become market integrators, fostering innovation within the industry (Pexapark,2024).

References

1. Adamkiewicz, K. (2024). *IFC launches initiative to help European banks manage climate risks.* Retrieved 11 September 2024 from https://impact-investor.com/ifc-launches-initiative-to-help-european-banks-manage-climate-risks/

2. Africa Finance Corporation (2024) *State of Africa's Infrastructure Report 2024.* Available at: https://www.africafc.org/our-impact/our-publications/state-of-africas-infrastructure-report-2024 (Accessed: 15 February 2024).

3. African Development Bank Group (2013). *AfDB's Integrated Safeguards System: Policy Statement and Operational Safeguards.* Available at: https://www.afdb.org/en/documents/document/afdbs-integrated-safeguards-system-policy-statement-and-operational-safeguards-34993 (Accessed: 20 November 2023).

4. African Development Bank Group (2013). *General Cooperation Agreement Korea-Africa Economic Cooperation Trust Fund*. Available at: http://www.afdb.org/en/projects-and-operations/project-cycle (Accessed: 3 November 2023).

5. AFRY Management Consulting (2022): *High-level analysis of possible options for a centrally organized RES PPA platform.* Retrieved 25 May 2024 from https://www.rae.gr/wp-content/uploads/2022/11/AFRY-Report_PPA-Platform.pdf

6. Asia Development Bank (2023): *Operations - Project Design and Management: Project Cycle 2023*. Retrieved 15 March 2023 from http://www.adb.org/what-we-do/public-sector-financing/project-cycle

7. Baker McKenzie (2015): *The rise of corporate PPAs - A new driver for renewables.* (Accessed 15 January 2024) Available at : https://www.bakermckenzie.com//media/files/insight/publications/2015/12/therise-corporate-ppas/risecorporateppas.pdf?la=en

8. Bird & Bird (2021): *Bird & Bird & Corporate PPAs: An international perspective*. (Accessed 8 February 2024) Available at : https://www.twobirds.com/en/news/articles/2018/global/bird-and-bird-andcorporate-ppas-an-international-perspective

9. British International Investment (2023): *Annual Review 2023, page 31-42,* (Accessed 25 April 2023) Available at : https://www.bii.co.uk/reviews/annual-review-2023/#page=1

10. CIBC: Personal Banking and Financial Services (2020): *Sustainability Report 2020.* (Accessed 20 April 2023) Available at : https://www.cibc.com/content/dam/about_cibc/corporate_responsibility/pdfs/cibc-esg-2020-en.pdf

11. Energy Traders Europe (2019): *Corporate Power Purchase Agreement.* (Accessed 5 September 2023) [Online] Available at: https://efet.org/Files/EFET%20PPA%20Final%20Full%20PDF.PDF

12. European Bank for Reconstruction and Development (2019): *How we assess transition impact 2019. (*Accessed 11 May 2023), Available at : https://www.ebrd.com/what-we-do/economic-research-and-data/transition-impact.html

13. European Commission (europa.eu) (2022): *Public consultation launched on renewables permitting and Power Purchase Agreements.* (Accessed 15 March 2024) Available at : https://commission.europa.eu/news/public-consultation-launched-renewables-permitting-and-power-purchase-agreements-2022-01-18_en

14. European Investment Bank (2018): *Guide to Procurement for projects financed by the EIB 2018.* (Accessed 23 April 2023) Available at : https://www.eib.org/attachments/strategies/guide_to_procurement_en.pdf

15. European Investment Bank (2024): *EIB Investment Survey 2024 - European Union overview*. (Accessed 8 February 2024) Available at : https://www.eib.org/attachments/lucalli/20240238_econ_eibis_2024_eu_en.pdf

16. European Union (2009): *Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending subsequently repealing Directives 2001/77/EC and 2003/30/EC.* (Accessed 20 April 2024) Available at : https://eur-lex.europa.eu/eli/dir/2009/28/oj

17. FMO: *Dutch Entrepreneurial Development Bank (2018): A Guide to Insurance for Project Finance Transactions*. (Accessed 10 January 2023) Available at : https://www.fmo.nl/l/library/download/urn:uuid:a905a5d9-3d5d-4216-855d-abec3f9670f2/fmo%20insurance%20guidelinesv2.pdf

18. International Finance Corporation-World Bank Group (2023): *Scaling up Private Finance for Clean Energy in Emerging and Developing Economies.* (Accessed 19 November 2023) Available at : https://www.ifc.org/content/dam/ifc/doc/2023-delta/scaling-up-private-finance-for-clean-energy-in-edmes-en.pdf

19. International Renewable Energy Agency (IRENA) (2018): *Corporate Sourcing of Renewables: Market and Industry Trends – Remade Index 2018*. (Accessed 26 April 2023) Available at : https://www.irena.org//media/Files/IRENA/Agency/Publication/2018/May/IRENA_Corporate_sourcing_2018.pdf

20. International Renewable Energy Agency (IRENA) (2019*): Renewable Power Generation Costs in 2018.* (Accessed 29 April 2023) Available at : https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2019/May/IRENA_Renewable-Power-Generations-Costs-in-2018.pdf

21. International Renewable Energy Agency (IRENA) (2020a): *RENEWABLE CAPACITY STATISTICS 2020.* (Accessed 18 November 2023) Available at : https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2020/Mar/IRENA_RE_Capacity_Statistics_2020.pdf

22. International Renewable Energy Agency (IRENA) (2020b*): Renewable capacity highlights.* (Accessed 19 September 2023) Available at : https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2020/Mar/IRENA_RE_Capacity_Highlights_2020.pdf

23. International Renewable Energy Agency (IRENA) (2021): *World Adds Record New Renewable Energy Capacity in 2020*. (Accessed 6 November 2023) Available at : https://www.irena.org/News/pressreleases/2021/Apr/World-Adds-Record-New-Renewable-Energy-Capacity-in-2020

24. KFW-DEG Investment Company (2024): *Promoting Private Sector Development in Emerging Markets*. (Accessed 18 March 2024) Available at : https://www.deginvest.de/DEG-Documents-in-English/About-us/Responsibility/DEG-Impact-Climate-Commitment-2024.pdf

25. Lechtenböhmer, Nilsson, Åhman, Schneider (2016): *Decarbonizing the energy-intensive basic materials industry through electrification: Implications for future EU electricity demand*. (Accessed 4 February 2024) Available at: https://www.sciencedirect.com/science/article/abs/pii/S0360544216310295

26. Nyberg, S. (2020): *Future scenarios of the electricity system and Power Purchase Agreements (PPAs). Master's thesis. Lund University*. (Accessed 13 December 2023) Available at : https://lup.lub.lu.se/luur/download?func=downloadFile&recordOId=9026970&fileOId=9026971

27. Next Kraftwerke (2019): *What is a Power Purchase Agreement*? (Accessed 8 November 2023) Available at: www.next-kraftwerke.com/knowledge/ppa-power-purchase-agreement

28. Pexapark (2020): *EFET PPA Template.* (Accessed 7 November 2023) Available at: https://pexapark.com/blog/efet-ppa-power-purchase-agreement-template

29. Pexapark (2024a): *EuropeanPPA_Market_Outlook_2024*. (Accessed 19 May 2024) Available at : European_PPA_Market_Outlook_2024_V7

30. Pexapark (2024b): *PPA Academy Foundations.* (Accessed 28 May 2024) Available at: https://pexapark.com/power-purchase-agreement-ppa-academy

31. Proparco (n.d.) (2017): *Investing for a greener future.* (Accessed 16 December 2023) Available at: http://www.proparco.fr/en/ressources/investing-greener-future

32. PWC (2017): *Optimizing Energy Procurement via Corporate PPAs.* (Accessed 6 December 2023) Available at: https://www.pwc.com.au/publications/pdf/optimising-energy-corporate-ppas-nov17.pdf

33. Stanford University (2008): *Demise of the Standard Model for Power Sector Reform and the Emergence of Hybrid Power Markets.* (Accessed 9 November 2023). Retrieved from https://stanford.io/2KwyOGS

34. U.S. Department of Commerce (2017): *Understanding Power Purchase Agreements (Second edition), author Wilbur Ross, U.S Secretary of Commerce*. (Accessed 4 May 2024) Available at: https://cldp.doc.gov/sites/default/files/PPA%20Second%20Edition%20Update.pdf

35. U.S. International Development Finance Corporation (DFC) (2024*): Environmental and Social Impact Assessment for Enerjisa Wind Power Plants, Turkey*. Available at: https://www3.dfc.gov/environment/eia/enerjisa/eia_enerjisa.html (Accessed 20 August 2024)

36. WindEurope (2019): *Financing and Investment Trends 2019.* Available at: https://windeurope.org/wp-content/uploads/files/about-wind/reports/Financing-and-Investment-Trends-2019.pdf (Accessed: 19 January 2025).

37. World Bank Group (2008): *Regulatory review of power purchase agreements: a proposed benchmarking methodology (English).* (Accessed 5 December 2023), Available at: http://documents.worldbank.org/curated/en/121201468003603841/Regulatory-review-of-power-purchase-agreements-a-proposed-benchmarking-methodology

38. World Bank Group (2013): *Small scale generation: issues in standardizing power purchase agreements (English).* (Accessed 18 December 2023). Available at: http://documents.worldbank.org/curated/en/707071468333856377/Small-scale-generation-issues-in-standardizing-power-purchase-agreements

39. World Business Council Sustainable Development (WBCSD) (2016): *Corporate Renewable Power Purchase Agreements (2016).* (Accessed 18 October 2024) Available at : https://www.wbcsd.org/resources/corporate-renewable-power-purchase-agreements-scaling-up-globally

40. USAID (United States Agency for International Development) (2015): *Expanding the Understanding of Power Purchase Agreements.* (Accessed 18 September 2023). Available at https://issuu.com/usaid/docs/understanding_power_purchase_agreem?utm_medium=referral&utm_source=www.usaid.gov