CEBA
Clean Energy Buyers Association

Asia Clean Energy Coalition

Expanding Corporate Clean Energy Procurement Options in the Asia-Pacific Region

POWER PURCHASE AGREEMENTS

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ABOUT

CLEAN ENERGY BUYERS ASSOCIATION

The Clean Energy Buyers Association (CEBA) is a business trade association that activates energy buyers and partners to advance low-cost, reliable, carbon emissions-free global electricity systems. CEBA's 400 members represent over $33 trillion in market capitalization and include the world's largest clean energy buyers as well as energy providers, service providers, cities, universities, and nonprofit organizations.

ASIA CLEAN ENERGY COALITION

Founded in 2022, the Asia Clean Energy Coalition (ACEC) is a pivotal initiative aimed at propelling the transition to clean energy across Asia. By uniting leading renewable energy buyers, sellers, and financiers, ACEC works to influence policy in key Asian markets, offering strategic advice and coordination to promote sustainable energy solutions. As a hub for expertise and strategic communication, ACEC plays a critical role in shaping energy policies that drive investment, ensure energy security, and foster sustainable economic growth across the region.

TABLE OF CONTENTS

Executive Summary

To accelerate the clean energy transition and attract corporate investment in clean energy, governments and utilities across the Asia-Pacific (APAC) region would need to offer a diverse menu of cost-effective and impactful procurement options. Physical and virtual power purchase agreements (PPAs) enable corporate clean energy buyers to enter into long-term contracts with developers or power generators for a price per megawatt-hour (MWh) of electricity generated from a clean energy project.

Corporate clean energy procurement in APAC has tripled since 2020, with PPA deals reaching nearly 10 gigawatts (GW) in 2023. Several APAC governments, including Vietnam and Thailand, have developed recent policies to introduce or improve PPA frameworks. This report seeks to share best practices for PPAs in APAC markets as well as support the further development and improvement of well-designed PPAs by describing how they work and analyzing what frameworks have aided or limited their uptake in the APAC region and the United States.

The guiding principles for well-designed physical and virtual PPA frameworks are:

- **Scalable and accessible provisions.** PPA frameworks should avoid quotas or caps on transaction volumes and offer flexible load size across all sectors, enabling customers to transact via a PPA.
- **Transparent and competitive market rules and pricing.** PPAs should be supported by robust electricity market constructs that ensure cost-effectiveness through third-party access to the grid; competitive and transparent pricing; and fair, detailed, and predictable charges. For example, wheeling and balancing fees should be stable and nondiscriminatory and accurately reflect the cost of delivering clean electricity to the buyer.
- **Clarity and flexibility to transact.** PPA programs should include clear frameworks for energy attribute certificates (EACs), accounting treatment, and effective settlement mechanisms to support uptake and financial viability. For example, a surplus power sell-back provision or established market for sell-back for physical PPAs, as well as a two-way settlement framework between buyers and sellers for virtual PPAs, should be established to support financial viability.

Based on these principles, we analyze Japan, Malaysia, South Korea, and Vietnam and present recommendations for improving the current PPA frameworks in these key markets. We also note ongoing challenges in these markets, including high charges for grid access, limited customer eligibility, and contractual complexity. Our key recommendations for these markets:

- **Vietnam:** Expand participant eligibility criteria, remove the ceiling price for physical direct PPAs, and add a cap for increases to clearing cost charges.
- **Malaysia:** Reduce system access charges (SACs), improve their cost predictability and transparency, and introduce a sell-back mechanism for surplus energy for physical PPAs.
- **South Korea:** Enable an effective two-way settlement framework and multi-buyer to multi-developer contracts, disclose calculation methods for wheeling charges, and develop clear accounting guidelines.
- **Japan:** Allow corporate buyers' market participation to trade electricity on the wholesale market, enable free and flexible trade of EACs, and standardize wheeling and grid-related charges for PPAs and clean energy resources.

Introduction: Power Purchase Agreements Support Clean Energy Industrial and Economic Growth

A clean energy transition has become an economic and climate imperative for Asia-Pacific (APAC) economies.[1] The region's high energy demand, significant greenhouse gas emissions, and vulnerability to the effects of climate change make clean energy[2] deployment crucial to energy security and economic stability and growth. APAC leaders are taking critical steps by setting decarbonization targets and supporting clean energy industries. However, mobilizing the investment needed to realize a carbon emissions-free power sector remains a significant barrier to increased use of clean energy. The private sector is well-positioned to play a crucial role in helping governments overcome the investment gap, if policy and regulatory frameworks governing the power sector are in place to facilitate clean energy development, deployment, and procurement.

Corporate clean energy procurement in the APAC region has risen in recent years, with corporate power purchase agreement (PPA) deals reaching nearly 10 gigawatts (GW) in 2023, triple the volume in 2020. Clean energy demand in APAC is increasing due to:

- economic benefits clean energy can provide in managing volatility risk in electricity costs,
- companies' voluntary commitments to decarbonize their direct operations and value chains, and
- compliance with policies such as the European Union's Carbon Border Adjustment Mechanism.

The deployment of corporate PPAs also accelerates countries' clean energy and economic growth.[3] A recent Asia Clean Energy Coalition report found that Indonesia, Japan, Singapore, South Korea, and Vietnam could collectively produce U.S. $27 billion in economic output; 435,000 new jobs; and 176 metric tons in carbon emissions reductions by achieving their respective 2030 national renewable energy targets.

BENEFITS FOR CORPORATE ENERGY BUYERS

The ability to source and contract for clean energy is a key priority for corporations' global operations. Businesses seek a diverse menu of cost-effective and impactful clean energy procurement options. This includes physical and virtual PPAs, utility green tariffs[4], and unbundled EACs[5].

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1 When referring to the Asia-Pacific region, we are including countries within East Asia, Southeast Asia, South Asia, and Oceania.

2 Clean energy refers to all carbon emissions-free energy, including renewable energy generation sources and clean firm technologies such as nuclear and carbon capture, utilization, and storage (CCUS).

3 The International Energy Agency estimates market-driven growth, dominated mostly by corporate PPAs, accounts for 17% of the world's utility solar and wind expansion. In the United States, a 2022 report by the American Clean Power Association found corporate clean energy procurement was responsible for an estimated U.S. $290 million in local government and landholder revenue.

4 See ACEC and CEBA's report, *The Role of High-Impact Utility Green Tariffs: Expanding Clean Energy Procurement Options in the Asia-Pacific Region*, 2024.

5 EACs are used interchangeably with renewable energy certificates (RECs).

PPAs are a well-established, scalable option for clean energy procurement and are the most common mechanism for large-scale power purchases (10 megawatts and above) by companies globally. PPAs offer the ability to hedge against energy price volatility — reducing exposure to future regulatory, inflationary, or fossil fuel-related price shocks — and provide long-term cost stability for EACs. PPAs can enable deployment of new clean energy capacity onto the grid, and corporate energy buyers can use the associated EACs to support their decarbonization goals.

BENEFITS FOR APAC GOVERNMENTS

Well-designed PPA frameworks provide multiple and significant economic and environmental benefits to APAC governments. Long-term PPAs facilitate private investment in new clean energy projects by reducing risks and providing reliable revenue streams from credible corporate offtakers. This reduces government and ratepayer fiscal liability from long-term clean energy project commitments and supports continued clean energy deployment.

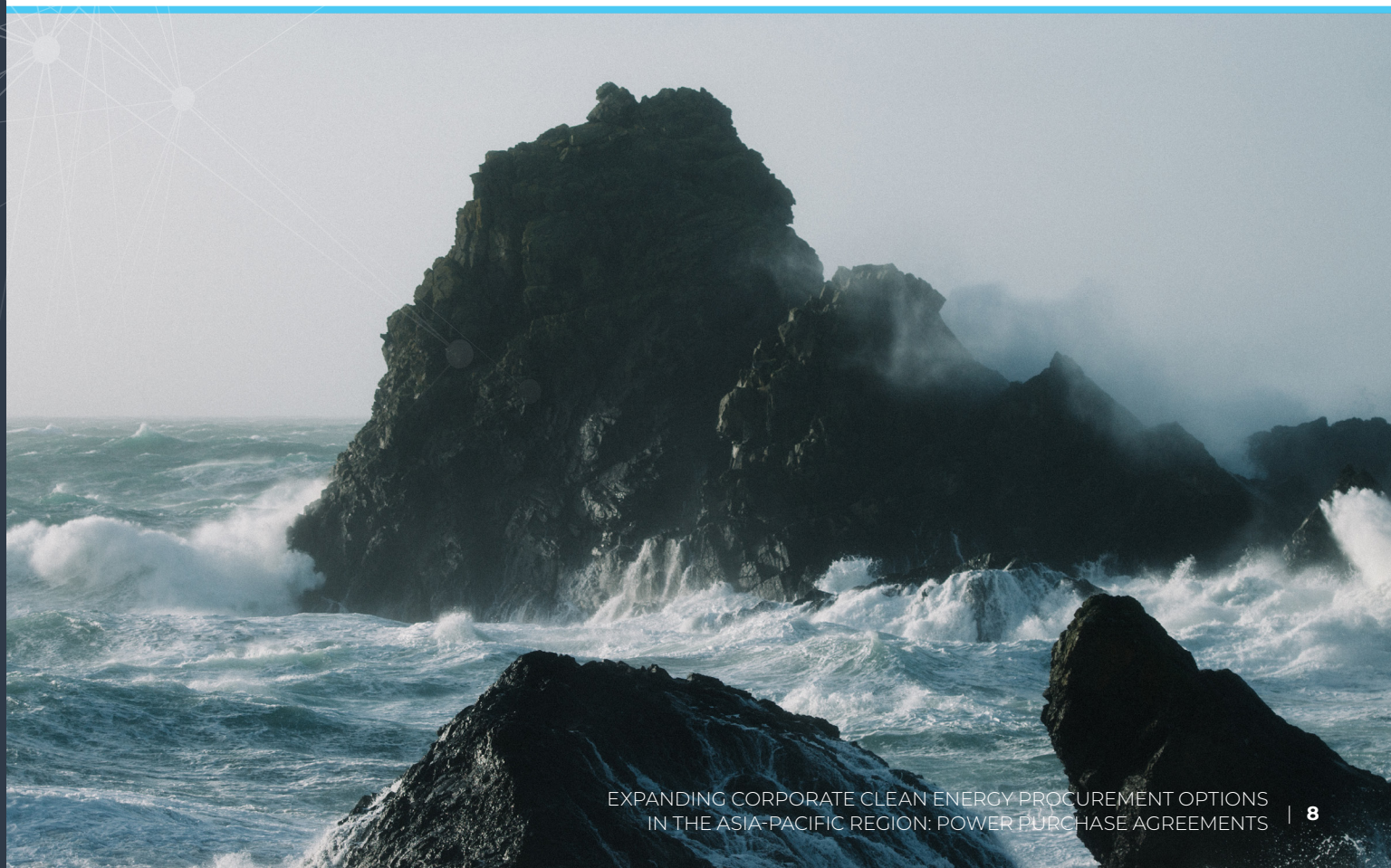
PPAs can help attract foreign direct investment and strengthen a country's position as a competitive green economy. PPAs can also create opportunities for job creation, community development, and environmental stewardship. PPAs support governments in achieving their decarbonization commitments in a timely and cost-effective manner by enabling private voluntary procurement that increases clean energy investment and development, decreases dependence on fossil fuels and volatility in electricity prices, and leads to electricity cost savings and greater energy security. By implementing well-designed PPA mechanisms, APAC countries can position themselves as regional leaders in market-based clean energy deployment and investment.

How Power Purchase Agreements Work

A PPA is a long-term contract between a seller and buyer of electricity for a price per megawatt-hour (MWh) for all or part of electricity generated from a clean energy project or projects. Physical and virtual PPAs (vPPAs) are both relevant procurement mechanisms for corporate energy buyers seeking to transact for clean energy projects not located on the buyer's premises. PPAs provide a stable revenue stream that developers need in order to obtain financing from banks and investors and create new clean energy generation. Having a corporate offtake agreement in the form of a PPA reduces potential risk of financial distress for clean energy projects.

PPAs have most commonly been implemented in liberalized and competitive wholesale markets that offer energy generation companies open access to the grid and enable transparent and competitive selling and trading. PPAs have also been adapted for vertically integrated markets, where a single entity, typically the utility company, acts as the sole purchaser of electricity from independent power producers and owns the transmission and distribution of electricity in the market via exclusive rights over the grid.

Though off-site physical and virtual PPAs are the most prevalent models, variations have been created to accommodate different market structures and customer demands. Third-party PPAs and on-site PPAs for projects located on a buyer's premises are also prevalent globally, and in recent years, buyers and sellers have collaborated to create new innovative structures such as aggregated and portfolio PPAs, enabling multiple buyers to participate in a PPA with a clean energy project.



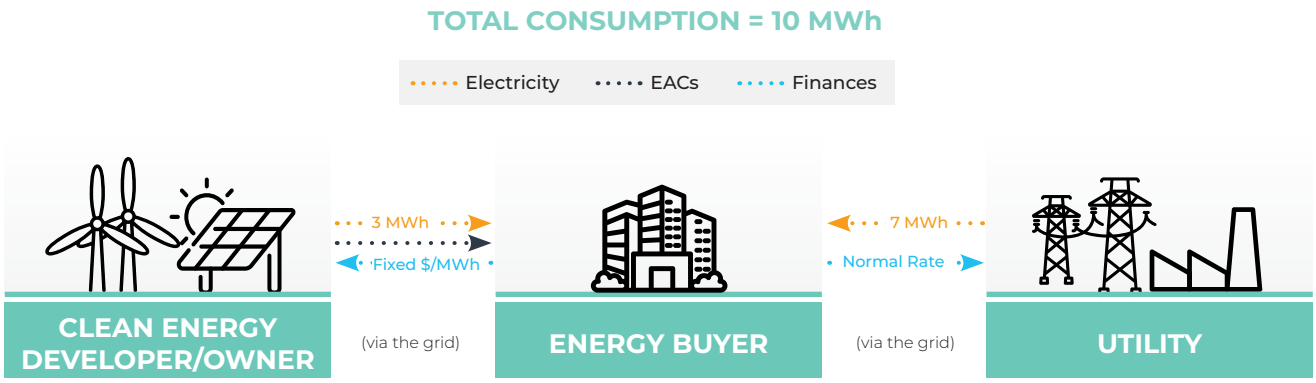
OFF-SITE PHYSICAL POWER PURCHASE AGREEMENTS

A physical PPA is a long-term contract (typically 10-25 years) between a corporate energy buyer (offtaker) and clean energy project developer (seller) to procure and physically deliver clean electricity from off-site sources to the buyer. Depending on the market, an off-site physical PPA can also be called a direct, retail, or sleeved PPA. Physical PPAs are often preferred by businesses with concentrated large loads, because PPAs' simple structure allows buyers to buy clean energy and associated EACs at a fixed price.

The offtaker agrees to purchase clean electricity and the associated EACs from the seller at a fixed price, providing price stability for the buyer and revenue certainty for the seller. The final price for delivered electricity is a function of the contracted PPA price plus transmission and distribution-related costs and other regulated expenses.

Physical PPAs entail delivery of contracted clean electricity to the buyer via the power grid. This requires third-party access, which means independent power producers have a legal right to access and utilize the transmission and distribution network owned by a different entity. Given this, physical PPAs are mostly found in liberalized electricity markets.

However, physical PPAs are possible in vertically integrated markets, as seen in Malaysia and Vietnam, where the utility acts as a third-party intermediary known as a "sleeve" between the seller and buyer. In this case, additional contracts may be required with the main utility, such as in Malaysia, where the buyer must sign an agreement with the utility to allow the transfer of clean electricity from the project to the energy buyer. The utility and/or grid operator handles the transmission and delivery of electricity from the clean energy generation project to the buyer. Pending the market structure, the regulator or transmission operator determines and approves the grid charges applicable to PPAs.



VIRTUAL POWER PURCHASE AGREEMENTS

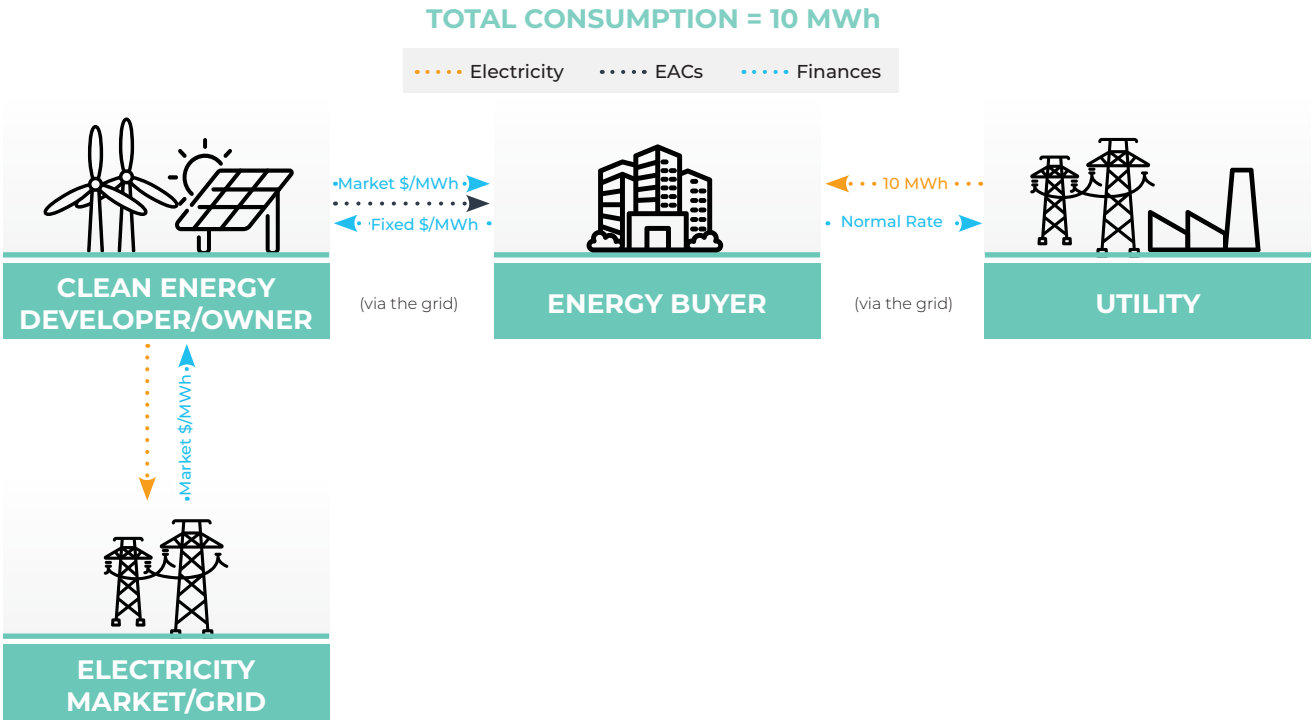
A virtual PPA (vPPA) is a long-term (typically 10-25 years) financial contract or contract for difference between a corporate energy buyer (offtaker) and clean energy project developer (seller) that does not involve the direct provision of clean electricity from seller to buyer. Depending on the market, a vPPA may also be called a financial PPA, synthetic PPA, a fixed for floating swap, or a contract for differences.

The buyer agrees to pay a fixed (or strike) price for clean energy but does not physically receive the energy and instead receives the EACs associated with the purchase of the clean electricity. The settled financial payment is determined by the differences between the market price (also known as variable, floating, or spot price) and the agreed fixed/strike price, providing a guaranteed cash flow for the developer to secure financing for the project. The buyer continues paying its utility for electricity to receive physical power for operations, including applicable grid charges for the electricity it consumes.

A vPPA typically requires a liquid and transparent wholesale market or a regulated market price, because the transaction relies on settling the financial difference between the agreed upon PPA strike price and the market price.

The market price is generally determined by nodal, zonal, or hub pricing, which is the average of nodal prices in a given area. For example, Japan uses zonal pricing to determine a single clearing price per utility service area, and the Philippines uses zonal pricing to determine a single clearing price per group of its islands. In the case of Malaysia, which has no wholesale electricity market, the reference market price is determined by the regulator.

Since it is strictly a financial contract, a vPPA does not alter any existing utility agreements to supply electricity to the customers' facilities. Because the buyer doesn't receive legal title to the electricity generated by the clean energy asset, vPPAs may provide flexibility benefits that certain corporate energy buyers may find valuable. Specifically, a vPPA may enable a company to add clean energy and receive EACs at scale from multiple facilities or locations as well as maximize investment where clean energy is most abundant.



Key Considerations for Well-Designed PPAs

To ensure PPA mechanisms are well-designed, policymakers and regulators should undertake transparent and robust stakeholder consultation processes that include early industry feedback, to ensure customer needs are met. A wide menu of clean energy procurement options that include physical and virtual PPAs can provide the greatest accessibility for all clean energy buyers. A whole-system approach is crucial to ensure adequate transmission infrastructure buildout that can accommodate corporate clean energy demand, mitigate grid congestion and curtailment, and maintain reliable and affordable grid integration. Overarching best practices that policymakers and regulators should consider for both physical and virtual PPAs are:

- **Scalable and accessible provisions:** PPA frameworks should avoid setting a quota or cap on transaction volumes and should provide flexible load size across all sectors, enabling all customers that are ready to transact to do so.
- **Transparent and competitive market rules and pricing:** PPA frameworks should be supported by robust electricity market constructs that ensure cost-effectiveness through third-party access to the grid and competitive and transparent electricity prices, with fair, detailed, and predictable charges.
- **Clarity and flexibility to transact:** PPA programs should include clear frameworks for EACs and accounting treatment, and effective settlement mechanisms to support uptake and financial viability.

KEY CONSIDERATIONS FOR WELL-DESIGNED PPAs

SCALABLE AND ACCESSIBLE PROVISIONS

Quota/Cap-Free PPA programs	Avoid setting arbitrary caps to project size or overall capacity quotas to PPA programs, in order to reap economies of scale.
Broad Customer Eligibility	Exclusionary eligibility criteria such as minimum capacity or sector-based restrictions should be avoided, to ensure PPAs are accessible to all energy customer types. Multi-party contract structures should be allowed, to enable multiple buyers to pool their purchasing power and negotiate a single PPA with a project developer. Aggregated PPAs can lead to better pricing and broader access to clean energy for individual companies that may not be able to transact for a PPA individually.

TRANSPARENT AND COMPETITIVE MARKET RULES AND PRICING

Competitive and Cost-Reflective Power Generation	Clean energy generation should be competitively priced and reflect true costs, and independent power producers should be granted nondiscriminatory third-party access to the grid.
Fair, Transparent, and Predictable Charges	**Physical PPAs:** Charges corresponding to the use of the electricity grid (often referred to as wheeling charges or grid charges) should be transparent, nondiscriminatory, and predictable over the duration of the PPA. **vPPAs:** Additional vPPA-specific charges beyond the buyer's normal electricity tariff should be avoided, as a vPPA should not alter the buyer's normal electricity use agreement with its utility.
Transparent Electricity and Wholesale Market Prices	Electricity and wholesale electricity market prices should be transparently established, since they provide critical information for contract negotiation between developers and buyers. Market prices should reflect competitive, nondiscriminatory generation costs, and there should be forward visibility on policies that could influence wholesale market price formation. **Physical PPAs:** While physical PPAs are not financially settled against a market price, a transparently established electricity price and wholesale market can support their economic viability by facilitating the selling and buying of clean energy when there are load-generation imbalances. **vPPAs:** Wholesale spot or market pricing that is significantly higher than the regulated electricity tariff will increase vPPA prices and disincentivize buyers, due to the high premium.

KEY CONSIDERATIONS FOR WELL-DESIGNED PPAs

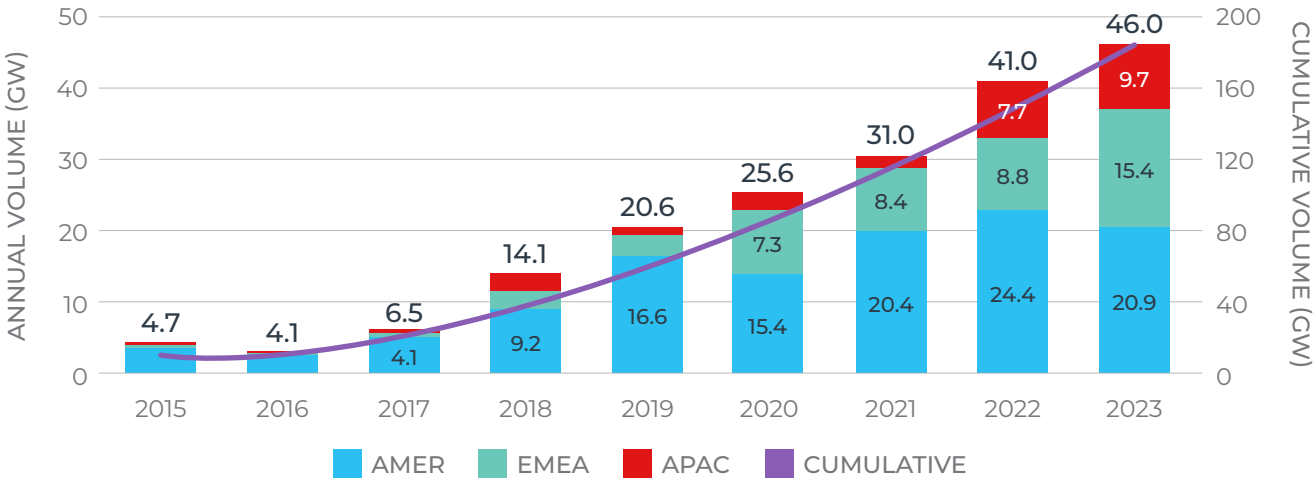
CLARITY AND FLEXIBILITY TO TRANSACT

Exclusive EAC Ownership	Ensuring the EACs associated with the clean energy projects contracted via a PPA can be exclusively claimed by the offtaker without risk of double accounting with compliance markets is crucial for energy buyers to credibly account for carbon reduction.
Clarity on Accounting Framework	**Physical PPAs:** Ability to sell clean energy generated in surplus of consumer demand is key to the financial viability of a physical PPA, providing customers with flexibility when demand and generation do not perfectly align and promoting further integration of renewables onto the grid. Surplus clean energy may be sold back to the grid via access to a wholesale electricity market or a transparently established "buy-back" price representing the fair value of the clean energy resource to the system. **vPPAs:** A two-way settlement framework is important for both the buyer and seller to hedge against price volatility. In markets where only a one-way contract for difference is possible, vPPAs are far less financially viable to buyers due to this risk.
Settlement Mechanisms to Support Uptake and Financial Viability	Provide clear derivative treatment rules to remove risks and uncertainties linked to accounting and financial reporting. Energy buyers want to avoid classifying a PPA as a derivative because it requires more complex accounting and financial impacts. Clear criteria and guidelines enable buyers to prove that a physical or virtual PPA is not a derivative. However, if a PPA is categorized as a derivative, accounting clarity should be published on how PPAs can qualify as hedging instruments against future electricity price risk.

PPA Developments in the Asia-Pacific Region

The last decade has been transformative for corporate clean energy procurement in the APAC region. Until the mid-2010s, corporations largely relied on on-site generation and the purchase of EACs to meet both power demand and sustainability targets. PPAs were not widely used, with annual PPA volume less than 1 to 3 gigawatts (GWs) annually, until more than doubling in 2022. The 2022 growth was primarily driven by large industrial offtakers in India and Australia. The upward trend has persisted, driven by decarbonization goals and the economic advantages of fixed-price clean energy, along with cost savings from the declining levelized cost of electricity for renewables in markets like India and Australia.

CORPORATE POWER PURCHASE AGREEMENT VOLUMES, BY REGION



Source: BloombergNEF

Note: Chart is for off-site, publicly disclosed deals only and may be subject to change as more information is made publicly available. Capacity is in GW DC.

Despite the advantages of PPAs and recent growth, overall off-site PPAs have had slow uptake in APAC compared to markets in North America and Europe. In 2024, RE100 companies reported that PPAs represented less than 10% of corporate renewable energy procurement in Asia. The vertically integrated structure of many regulated APAC power markets has slowed the introduction and widespread utilization of PPAs in the region, with some markets having yet to enable them and others, such as Vietnam and Thailand, now piloting and implementing PPAs.

In some APAC markets that have implemented PPA mechanisms, corporate buyers experience barriers such as:

- high and opaque cost components,
- financing and eligibility limitations, and
- a lack of standardized contract guidelines and knowledge.

CORPORATE CLEAN POWER PROCUREMENT OPTIONS FOR TOP APAC MARKETS
(in terms of GDP)

MARKET	ON-SITE PPA	PHYSICAL PPA	vPPA
AUSTRALIA	●	●	●
BANGLADESH	●	●	●
CHINA	●	●	●
HONG KONG	●	●	●
INDIA	●	●	●
INDONESIA	●	●	●
JAPAN	●	●	●
MALAYSIA	●	●	●*
PAKISTAN	●	●	●
PHILIPPINES	●	●	●
SINGAPORE	●	●	●
SOUTH KOREA	●	●	●
SRI LANKA	●	●	●
TAIWAN	●	●	●
THAILAND	●	●	●
VIETNAM	●	●**	●**

Source: BloombergNEF

Note: Unless otherwise noted, green denotes available, orange denotes "policy framework in progress," and red indicates unavailable.

** Malaysia's Corporate Green Power Programme (CGPP). As of November 8, 2023, the full 800 MW allocation was exhausted and the application window officially closed. The future of vPPA in Malaysia is therefore now uncertain.*

***Vietnam approved the direct power purchase agreement scheme in March 2025; however, it is still in the process of implementation.*

One of the most common challenges in PPA implementation in APAC markets is the unpredictable and controversial nature of wheeling charges, also known as grid usage fees. These costs often remain opaque, with no or high fixed ceilings, leading to significant price volatility and uncertainty. This unpredictability undermines the business case for clean energy PPAs and limits financial stability for private sector parties, making it difficult for them to plan effectively. There is also a frequent lack of clarity regarding these charges, which are often presented without a standardized formula or clear methodology. This leads to ambiguity regarding the costs that these charges aim to recover and a perceived risk for potential over-recovery or unfair cost allocations, complicating the implementation of PPAs. Examples of grid usage fees posing barriers to corporate offtake are Vietnam's direct power purchase agreement (DPPA) charge and clearing cost charge, as well as Malaysia's system access charges (SACs).

In markets lacking an established open access framework, participation in the PPA market is often restricted by limitations in eligibility criteria. Many regulations limit participation to large-scale projects, or to buyers from specific sectors. Maximum capacity quotas applicable to PPA schemes also cap the PPA market and hinder economies of scale. Additionally, minimum consumption thresholds exclude many small- and medium-sized enterprises and mid-sized consumers, restricting broader market participation and limiting the number of potential buyers. For instance, in Vietnam, eligibility is limited to large consumers with a connection voltage of at least 22 kilovolts (kV) and an electricity consumption requirement that excludes industrial zone grid retailers and small-to-medium electricity consumers.

Several APAC markets lack an established wholesale electricity market, which can further delay corporate uptake. Wholesale electricity markets support the settlement of mismatch between a consumer's load and the electricity generated by the contracted clean energy project, therefore improving the economics of a PPA. This is the case in Malaysia, where, under the current Corporate Renewable Energy Supply Scheme (CRESS), any electricity generated in surplus of the buyer's load at a given time is exported to the grid without compensation, unless it is actively withdrawn by the buyer. In such cases, a nominal sell-back rate may apply. In all other instances, the surplus energy is deemed free to the system.

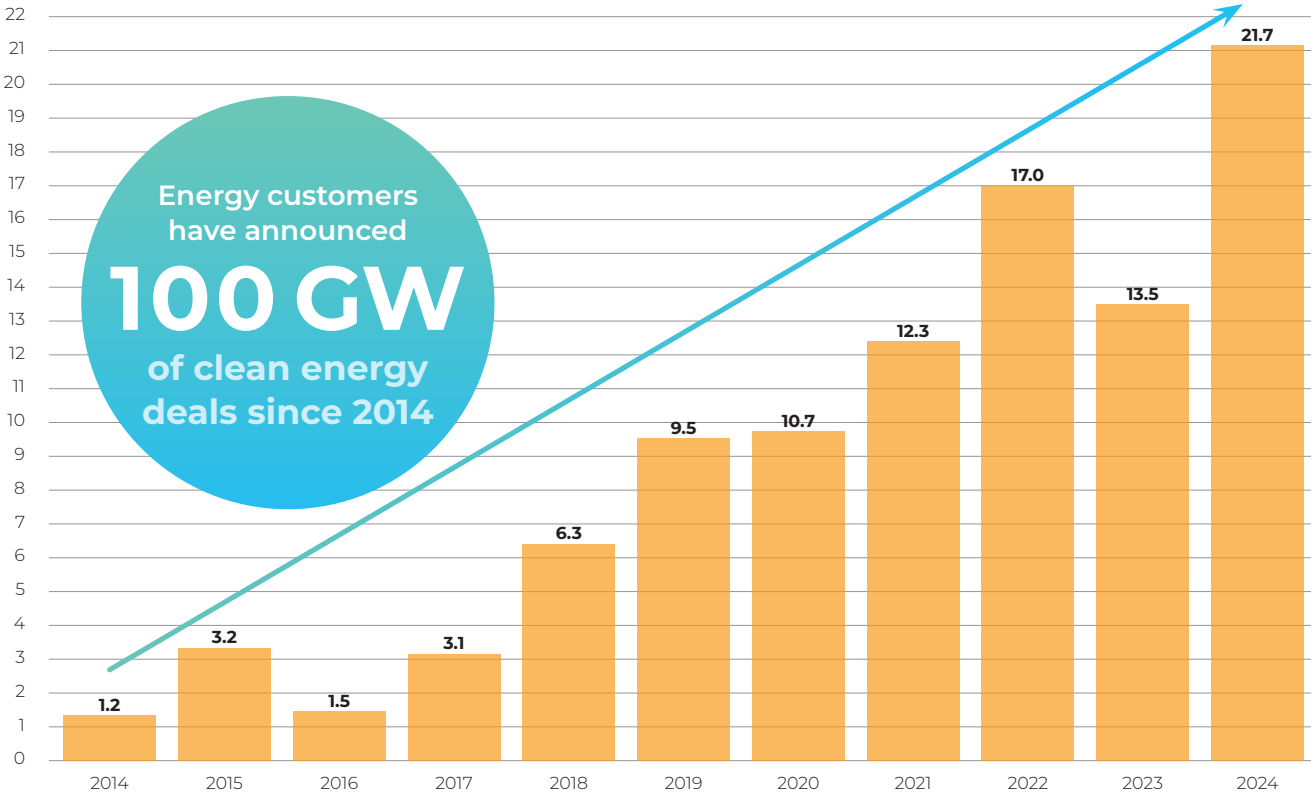
From a business perspective, discrepancies in contract terms present a significant challenge in Asia. Buyers and sellers often have divergent views on key contractual terms such as contract durations, dispute resolution mechanisms, curtailment risk, and delivery structures. These differences can delay deal closures, hindering the progress of PPA agreements.

Negotiating contracts for differences also can be difficult, due to the volatility of inputs such as wholesale electricity market spot prices and PPA charges that in vertically integrated markets are often controlled by a central authority. Unpredictable PPA charges, particularly those without a cap in place, hinder visibility of the final price for buyers. This makes it challenging to benchmark strike prices, especially for first-time buyers.

Financial risks related to currency mismatches, unclear tax treatment, and cost-sharing uncertainties also are significant concerns, particularly in multi-party structures. These financial risks complicate the negotiation process and increase the potential for disputes, further hindering the widespread adoption of PPAs in many APAC markets.

Lessons Learned from PPA Expansion in the United States

PPAs have been the dominant procurement method for large energy customers in the United States for over a decade. Corporate and industrial customers in 2024 surpassed 100 GWs of clean energy procurement since 2014, equivalent to 41% of all clean energy added to the U.S. grid in the same time period. Roughly three-fourths of this volume came from either off-site virtual or physical PPAs, with vPPAs being the most common utility-scale clean energy transaction mechanism.



As of December 2024. Includes publicly announced corporate clean energy procurement through PPAs, green tariffs, tax equity investments, and direct and project ownership in the U.S. from 2014-2024. Excludes on-site generation <20 MW.

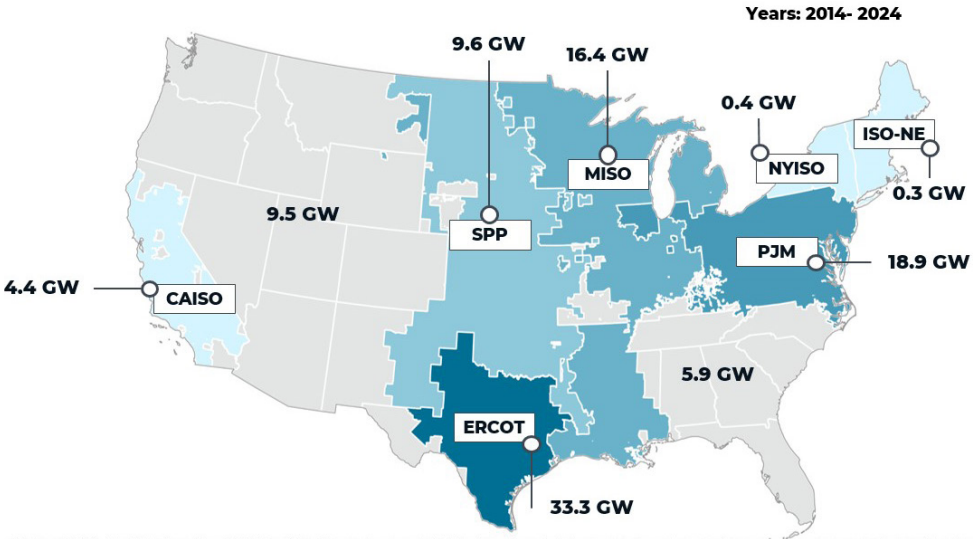
The rise of PPAs emerged from large companies seeking ways to secure clean electricity that is cost competitive, with the first PPAs signed in 2010. U.S. federal financial incentives for wind and solar from investment and production tax credits, competitive and transparent wholesale electricity markets, and the standardization of contract structure and risk management strategies were fundamental to the expansion of PPAs.

By 2024, nearly 240 corporate buyers had transacted for a utility-scale clean energy project via a PPA or utility green tariff in the United States. Solar accounted for 65% of the transacted capacity, and wind represented 27% of this capacity. Buyers also are increasingly seeking to procure clean firm energy, and 1.5 GW of nuclear and 1.7 GW of battery storage were contracted in 2024.

Market liberalization in the 1990s was integral to the enablement of PPAs, with electricity industry restructuring that was initiated in 1996 and guidelines for the establishment of regional transmission organizations (RTOs) and independent system operators (ISOs) to operate wholesale electricity markets issued in 1999. Since then, many utilities have either voluntarily or been state-mandated to participate in and/or form a wholesale electricity market.

The wholesale electricity markets and transmission networks operated by seven different RTOs/ISOs represent two-thirds of U.S. electricity grid demand but account for over 80% of corporate utility-scale contracted clean energy capacity. Wholesale electricity pricing in the United States is determined through least-cost dispatch and settled at the node, taking into consideration location and transmission constraints. Due to differing geographies and economics, the wholesale market, PPA, and REC pricing can vary widely across the different markets, with the Electric Reliability Council of Texas (ERCOT) generally having the most financially attractive market dynamics for PPAs.

CONTRACTED CAPACITY BY ISO/RTO REGION



Source: CEBA Deal Tracker. The CEBA Deal Tracker represents publicly announced clean energy procurement by corporate customers through PPAs, green tariffs, bilateral deals with utilities, tax equity investments, and direct project ownership in the U.S. since 2014.

In Q1 2025, average PPA prices were at U.S. $57.04/MWh for solar and $64.22/MWh for wind generation projects, while average wholesale electricity market prices were roughly $37/MWh in 2024.

The U.S. Southeast and much of the West are divided into vertically integrated markets run by public or investor-owned utilities, and PPAs are not available. Clean energy procurement has instead been spurred by customers and utilities working together to create utility green tariffs, which are voluntary utility programs that allow eligible customers to buy both the electricity and associated EACs from clean energy projects through an independent tariff or as an adjustment on a customer's electricity bill.

Common issues identified by corporations in APAC such as high grid usage costs, complex accounting frameworks, and no settlement framework for selling surplus energy are currently not barriers to corporate offtake in the United States. This is due to U.S. regulations requiring the independent, transparent, and efficient management of wholesale electricity markets; fair and nondiscriminatory grid usage; establishment of clear accounting rules for PPAs; and transparent stakeholder processes that enable industry consultation.

GRID USAGE COSTS AND THE SETTLEMENT OF SURPLUS ELECTRICITY FOR PHYSICAL PPAs

In the United States, a buyer entering into a physical PPA pays transmission and distribution charges to grid owners to cover the delivery of electricity from the PPA project. These grid usage charges (also known as wheeling charges) are universal and are not differentiated for customers entering into a PPA, providing fair and transparent rates while still ensuring transmission owners can recover their costs. Transmission charges are determined by RTOs/ISOs through an Open Access Transmission Tariff, based on the revenue requirement of each transmission owner within the RTO. The transmission tariff is regulated and approved by the Federal Energy Regulatory Commission (FERC), with the exception of tariffs within ERCOT which is regulated by the Public Utility Commission of Texas. Customers are generally charged a dollar per kilowatt-month or dollar per megawatt-hour rate based on their peak demand. Fees from congestion, transmission losses, and ancillary services are also added to the bill, pursuant to the tariff. If the operations being powered are connected at the distribution level, a buyer will also receive distribution charges from the local utility.

Across all RTOs/ISOs, market participants can sell surplus clean electricity to the wholesale market. The surplus electricity is not sold at a fixed price but rather priced at the node in five-minute increments, taking into account transmission losses and congestion. Offtakers do not automatically receive the revenue from this surplus; it must be agreed on and specified in the PPA contract.

The development of settlement rules for grid usage charges are transparent and open to stakeholder consultation, whether through state or federal rate filing procedures.[6] In an RTO, buyers can sit on committees or working groups involved in changing market rules and tariffs. Buyers and sellers can review these tariffs and monthly pricing results to estimate grid usage charges for their PPAs.

HOW COMPANIES ACCOUNT FOR PPAs IN THE UNITED STATES

Energy buyers largely want to avoid triggering derivative accounting because of the complexity, potential financial reporting impact, and earnings volatility from fair value measurement. Therefore, regulators should consider how they can make accounting frameworks flexible and clear. Energy buyers in the United States can avoid derivative accounting or are able to hedge against their volatility due to established clear criteria for derivatives and accounting instruments. Publicly held companies adhere to the U.S. Generally Accepted Accounting Standards (GAAP), overseen by the Federal Accounting Standards Board (FASB).

Under GAAP, a contract triggers derivative accounting if it has these four characteristics, according to (ASC) 815-10-15-83:

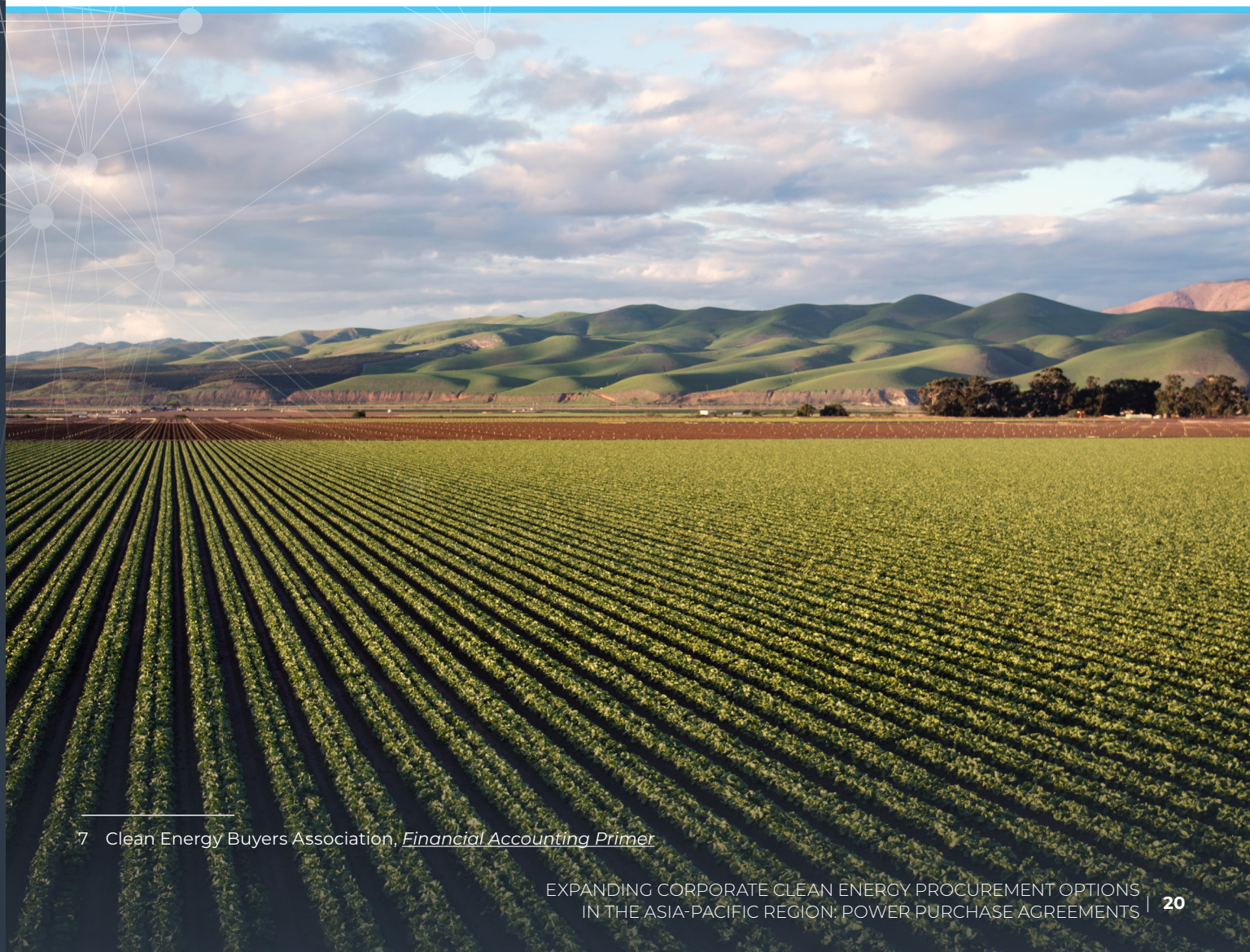
- one or more underlying variables, such as a specified price or rate of an asset, that determine the settlement amount;
- one or more notional amounts and/or payment provisions;
- no initial net investment or smaller initial net investment that would be otherwise required for other types of contracts; and
- a net settlement is possible.

6 For example, see PJM's manual on market settlement operations.

Since vPPAs have some of these characteristics, the notional amount or payment provision, which is the value of the total electricity produced, is a lynchpin to not trigger derivative accounting. If the vPPA does not include a minimum volume guaranteed, or clauses implying a de facto minimum, including a set percentage of capacity, then the electricity production is not known in advance of operational and weather-related uncertainties, and the vPPA is therefore not seen as a derivative.

Physical PPAs may be at risk of embedded derivatives (ASC) 815-15-25-1, due to foreign currency denomination or EAC purchases. However, FASB introduced specific exemptions for these cases. A company's foreign currency denomination can be exempt if it is not a financial instrument, utilizes the local currency, and the use of foreign currency is directly related to the revenues or cost of the physical PPA. The EAC component to a contract is not a derivative if there is no underlying or notional amount, no initial investment is required, or if the contract can be net settled.[7]

If the PPA meets derivative rules, then companies must assess whether they can qualify for market-to-market (fair value) or hedge accounting treatment, which reduces earning volatility. FASB established a standard that provides companies with an option to report assets and liabilities at fair value, making it easier for PPAs to qualify as cash flow hedges for forecasted energy purchases.



7 Clean Energy Buyers Association, *Financial Accounting Primer*

PPA Mechanisms and Potential Improvements for Select APAC Markets

VIETNAM

Vietnam's Decree 57/2025/NĐ-CP went into effect in March 2025, providing a comprehensive framework for direct power purchase agreements (DPPAs) in the country. The framework offers two primary structures: a physical DPPA and a virtual DPPA. The physical DPPA involves a direct connection between a renewable energy generator and a large consumer through a dedicated or private grid. The virtual DPPA operates through the national grid, and the payment to the renewable energy generator is determined based on the difference between the committed contract price and the Vietnam Wholesale Electricity Market (VWEM). To improve Vietnam's PPA frameworks, policymakers and regulators should:

- expand participant eligibility criteria,
- add a cap for increases to the difference clearing cost charge, and
- remove the ceiling price for the physical DPPA.

KEY CONSIDERATIONS FOR WELL-DESIGNED PPAs

SCALABLE AND ACCESSIBLE PROVISIONS

Broad Customer Eligibility	The Ministry of Industry and Trade (MOIT) has no established quota for the virtual DPPA but should expand eligibility criteria beyond large consumers (e.g., manufacturing, electric vehicle charging for virtual DPPA) that have a connection voltage of ≥22 kV and an electricity consumption threshold of 200,000 kWh/month to include industrial zone grid retailers and small to medium electricity consumers.

TRANSPARENT AND COMPETITIVE MARKET RULES AND PRICING

Competitive and Cost-Reflective Power Generation	All renewable energy projects, under physical and virtual DPPAs, that comply with development regulations should be granted nondiscriminatory access to the grid.
Transparent Electricity and Wholesale Market Prices	Vietnam Electricity (EVN) and MOIT should release five years of historical wholesale electricity market data, to enhance project transparency, predictability, and market participant confidence.
Fair, Transparent, and Predictable Charges	MOIT should increase the transparency of the cost of clearing differences, so the calculation method is clear for developers and offtakers to forecast future annual costs. A cap for increases to the difference clearing cost charge should be established, to improve the competitive and fair pricing of DPPAs, since under the clearing cost charge, vPPA customers are paying a fee tied to existing power plants.

CLARITY AND FLEXIBILITY TO TRANSACT

Clarity on Accounting Framework	There is currently no clear guidance on the accounting framework for DPPA transactions. However, efforts are underway to clarify value added tax (VAT) treatment and mitigate transfer pricing risks.
Settlement Mechanisms to Support Uptake and Financial Viability	Under the physical DPPA, renewable energy generators can sell surplus electricity back to the grid; however, the selling price is capped, limiting the potential economic return from the project. This cap is in accordance with the frame tariff ceiling, approved by MOIT on an annual basis. To support uptake and the financial viability of the DPPA, MOIT should remove the ceiling tariff.

MALAYSIA

Malaysia offers two PPA structures for companies seeking to procure renewable energy: a physical PPA, known as the Corporate Renewable Energy Supply Scheme (CRESS), and a virtual PPA, known as the Corporate Green Power Program (CGPP). While the CGPP was a successful initiative, it has been fully subscribed since November 2023, and there are currently no public plans to continue or expand the program. The CRESS, which officially launched in September 2024 through the publication of the CRESS Guidelines, is a positive step in opening the market for corporate clean energy buyers, but uptake has been slow. To improve Malaysia's PPA frameworks, policymakers and regulators should:

- reduce high system access charges,
- improve cost predictability and transparency, and
- establish a sell-back mechanism for surplus energy.

KEY CONSIDERATIONS FOR WELL-DESIGNED PPAs

SCALABLE AND ACCESSIBLE PROVISIONS

Quota/Cap-Free PPA Programs	CRESS is currently open and quota-free. This allows for continued program stability and corporate offtake, and policymakers should maintain this rule. The Ministry of Energy Transition and Water Transformation (PETRA) and ST (Energy Commission) should consider reopening or expanding CGPP beyond the 800 MW quota, to meet demand from mid-tier buyers and provide vPPA flexibility.
Broad Customer Eligibility	PETRA and ST have incorporated industry feedback and made CRESS open to both new and existing registered high- and medium-voltage electricity consumers in Peninsular Malaysia, allowing existing consumers to participate without the requirement to increase their electricity supply load. Policymakers may consider allowing aggregation of demand across supply chains or corporate groups to accelerate demand in the future.

KEY CONSIDERATIONS FOR WELL-DESIGNED PPAs

TRANSPARENT AND COMPETITIVE MARKET RULES AND PRICING

Competitive and Cost-Reflective Power Generation	CRESS allows large consumers to directly procure renewable energy from power producers through third-party access at a negotiated price, leveraging Malaysia's Peninsular Electricity Supply Network, which is managed by Tenaga Nasional Berhad (TNB).
Fair, Transparent, and Predictable Charges	PETRA and ST should reduce system access charges (SACs), improve their cost predictability, and publish detailed calculation methodology for these charges in alignment with regional best practices. The SACs have been a source of concern for corporations since CRESS began. As of March 2025, SAC rates are 25 sen per kWh (or 58 USD per MWh) for firm output projects, and 45 sen per kWh (or 104 USD per MWh) for non-firm output projects i.e., solar only. SAC rates can also be revised every three years by up to 15%, exposing buyers to significant risk that SACs may more than double over a 21-year PPA term. Greater transparency in the pricing methodology of SACs can be achieved by disclosing underlying cost components such as capital expenditure, operation and maintenance, power losses, and ancillary services. Australia, Philippines, and Taiwan can serve as regional references where grid access costs are based on a cost-plus model and broken down and reviewed publicly. Fixing or improving the stability of the SAC over the lifetime of the CRESS offtake term (21 years) is also essential to provide the cost predictability needed by buyers and financiers.

CLARITY AND FLEXIBILITY TO TRANSACT

Settlement Mechanisms to Support Uptake and Financial Viability	PETRA and ST should introduce a regulated sell-back mechanism for surplus renewable electricity to improve project bankability and system integration. Under CRESS, surplus energy production can only be sold at 8 sen per kWh (or 8.48 USD per MWh) when the buyer withdraws. In all other instances, it is deemed as free energy to the system. The absence of a sell-back mechanism adds costs and is likely to result in the undersizing of projects as well as a reduction in flexibility, because companies must have a stable load to participate in CRESS. Although limited to on-site systems (≤100 kW), the Philippines' net billing scheme provides a fair regional benchmark for transparent avoided-cost pricing. Surplus energy is compensated for by the utility's blended generation cost and is supported by a transparent methodology that discloses grid cost components. ST should also streamline the multi-contract CRESS participation model by publishing standardized contract templates for all parties and adopting globally recognized digital onboarding tools, such as those used in Australia's National Electricity Market or the I-REC registry. This would reduce transaction time, legal costs, and onboarding complexity for buyers and sellers.

SOUTH KOREA

In South Korea, the Electric Utility Act and the Enforcement Decree of the Electric Utility Act allow consumers to procure electricity through an off-site PPA via:

- the Korea Electric Power Corporation (KEPCO) grid under the third-party PPA program;
- a direct PPA involving a licensed clean energy supplier; or
- an onsite PPA, where the clean energy generator is directly connected to the consumer without using KEPCO's grid.

Since 2021, vPPAs also have been an available procurement pathway. However, vPPAs come with significant restrictions in South Korea and are not universally considered a true type of vPPA; a vPPA in South Korea is closer to a simple EAC purchase agreement without a contract for differences.

To improve Korea's PPA frameworks, policymakers and regulators should:

- enable multi-buyer to multi-developer contracts,
- disclose calculation methods for wheeling charges,
- establish a two-way settlement framework, and
- develop clear accounting guidelines.

KEY CONSIDERATIONS FOR WELL-DESIGNED PPAs

SCALABLE AND ACCESSIBLE PROVISIONS

Quota/Cap-Free PPA Programs	The Ministry of Trade, Industry and Energy (MOTIE) should maintain the cap-free feature of the current PPA programs.
Broad Customer Eligibility	As of August 2025, the PPA framework continues to restrict consumers below 300 kW and generators below 1 MW from participating in third-party PPAs, effectively blocking market entry for smaller-scale participants. A regulatory amendment in July 2025 enabled small-scale generation facilities to sign direct PPAs; however, this is currently limited to small- and medium-sized enterprises within industrial complexes. Policymakers should build on this positive development and expand it to the entire market. To foster broader participation, policymakers should reconsider the 1 MW generation threshold for third-party PPAs and ease demand-side criteria that restrict small consumers.

KEY CONSIDERATIONS FOR WELL-DESIGNED PPAs

TRANSPARENT AND COMPETITIVE MARKET RULES AND PRICING

Transparent Electricity and Wholesale Market Prices	South Korea's vPPA scheme should allow financial settlement based on the wholesale electricity market price, and the Korea Power Exchange (KPX) should be improved and become more transparent. A shift from the current cost-based pricing model to a market-based bidding system is also essential to provide reliable price signals for vPPAs. In addition, the settlement adjustment factor should be publicly disclosed and standardized to build market trust and support broader vPPA adoption.
Fair, Transparent, and Predictable Charges	MOTIE should enhance transparency in wheeling charges by disclosing calculation methods and cost structures, ensuring fair and predictable pricing. Independent operation of transmission and distribution networks is also critical to promote grid neutrality and trust, and establishing regionally differentiated grid fees could incentivize distributed energy deployment and improve grid efficiency.
Competitive and Cost Reflective Power Generation	Due to grid saturation, the Korean government designated 205 substations as congestion-managed zones starting in September 2024, restricting new grid connections until the end of 2031. This presents a significant barrier to new renewable energy deployment. Korea should reconsider these access restrictions and accelerate grid infrastructure upgrades in affected regions.

CLARITY AND FLEXIBILITY TO TRANSACT

Exclusive EAC Ownership	Clear mechanisms are needed on the K-RE100 platform to ensure EACs are from new renewable electricity capacity added to the grid that would otherwise not have been added without the vPPA transaction.
Clarity on Accounting Framework	Clear and timely accounting standards should be developed to provide buyers guidelines on how they may avoid derivative treatment and hedge against risk. Currently, vPPAs may be subject to derivative accounting under International Financial Reporting Standards (IFRS) 9 standards. If classified as derivatives, vPPA contracts must be measured at fair value, which can introduce significant earnings volatility, creating challenges for financial planning and risk management.
Settlement Mechanisms to Support Uptake and Financial Viability	A two-way contract for difference should be enabled to provide price stability and encourage greater investment in clean energy by reducing risk and improving bankability. Without a two-way settlement, buyers cannot hedge against market price volatility. South Korea's current PPA framework also excludes multi-buyer to multi-developer contracts. To align with international best practices and promote wider market participation, regulators should allow contract structures that enable collective procurement from multiple buyers and pooling generation from multiple producers.

JAPAN

In Japan, PPAs offer companies a structured way to procure clean energy, with two primary types available: physical and virtual PPAs. These agreements were an increasingly popular option from 2022 to late 2024 as retail electricity tariffs increased due to rising fuel costs and geopolitical issues and companies sought to secure high impact EACs from new clean energy projects.

Improving transparency is a key consideration for further improvements to PPA frameworks in Japan. To improve Japan's PPA frameworks, policymakers and regulators should:

- provide corporate buyers with market participant access to trade electricity on the wholesale market,
- standardize wheeling and grid-related charges for PPAs and clean energy technologies, and
- ensure exclusive EAC ownership and enable free and flexible trade of EACs.

KEY CONSIDERATIONS FOR WELL-DESIGNED PPAs

SCALABLE AND ACCESSIBLE PROVISIONS

Quota/Cap-Free PPA Programs	There is no formal cap on the number or size of PPAs or vPPAs. Supply is instead constrained by grid-connection queues and Feed-in-Tariff/Feed-in-Premium (FIT/FIP) auction quotas for large projects. The Ministry of Economy, Trade, and Industry (METI) can unlock additional volume by publishing transparent and granular interconnection capacity maps and streamlining the FIT-to-FIP conversion process.
Broad Customer Eligibility	Since the involvement of a licensed electricity retailer is required for a physical PPA in Japan, METI should allow corporate buyers to become market participants of the wholesale electricity market, the Japan Electric Power Exchange (JEPX). This would allow buyers to trade electricity without a retailer or generation license and enable flexibility in managing their energy costs.

TRANSPARENT AND COMPETITIVE MARKET RULES AND PRICING

Competitive and Cost-Reflective Power Generation	Japan is transitioning from FIT to market-based pricing supported by a FIP. However, the cost of generation for solar and other clean energy technologies continues to be a major hurdle to PPA economics, due to high development costs linked to land, grid, and supply chain challenges. METI could consider allocating or redirecting funds collected through green transformation (GX) bonds to support renewable energy development.
Transparent Electricity and Wholesale Market Prices	JEPX has grown more transparent, with about 35% of national demand traded as of September 2023. However, a large portion of electricity is still sold through opaque bilateral channels. To support PPA planning and economics, regulators should boost JEPX liquidity by requiring more generator participation and expand forward markets to enable long-term price hedging. Strengthened oversight is also needed to curb market distortion risks, including the risk that JEPX prices are higher than regulated prices, and protect fair competition.

TRANSPARENT AND COMPETITIVE MARKET RULES AND PRICING

Fair, Transparent, and Predictable Charges	Japan has several cost-adders that increase the total cost for buyers. Policymakers should consider exempting corporate clean energy buyers whose electricity consumption is covered via a PPA from the national renewable energy surcharge that funds the FIT program, to eliminate double payment issues. Regulators should also standardize wheeling and grid-related charges, such as capacity contribution charges and generation-side wheeling charges, to improve cost predictability and support broader corporate adoption. Though values may differ between regional networks, METI should consider standardizing PPA charges, including defining kW-based charges and kWh-based charges, as well as specific surcharges. Policymakers should also standardize how wheeling charges apply to renewable energy and battery energy storage systems (BESS) and introduce guidelines for how the generation-side wheeling charge applies to charging and discharging for BESS. Introducing transparent curtailment rules and compensation for curtailment would also further de-risk long-term PPAs and enhance market trust.

CLARITY AND FLEXIBILITY TO TRANSACT

Exclusive EAC Ownership	Japan should expand direct EAC transfer rights to all FIP projects and continue consolidating certificate systems under the tracked Non-Fossil Certificate program. Policymakers should include the right for corporations to freely trade EACs among other corporations and to the market; this would help companies manage the risk of over-procuring EACs. METI should enforce clear rules that guarantee corporate buyers retain sole environmental claims when purchasing EACs through PPAs, to avoid a situation in which the EACs are also counted or claimed by the utility or the government through the FIT system. Publishing unified guidance aligned with global standards such as RE100 and the Greenhouse Gas Protocol would strengthen credibility and facilitate international recognition.
Clarity on Accounting Framework	Japanese authorities should issue clear guidance on financial reporting treatment, particularly for derivative and lease accounting under IFRS. Promoting physical delivery structures or enabling hedge accounting for vPPAs can help mitigate income volatility concerns. Sharing best practices from early adopters will boost corporate confidence and reduce hesitation among financial departments.

CONCLUSION

The clean energy transition is an opportunity for economic growth across the Asia-Pacific region. Companies are looking to expand as well as invest in existing business in countries that provide access to clean energy generation sources. To attract a wide network of businesses that have varied requirements and portfolios, a diverse menu of clean energy procurement options is needed, including physical and virtual power purchase agreements, utility green tariffs, and unbundled EACs. Partnering with energy buyers and offering diverse procurement options would enable countries to demonstrate their leadership in clean energy policy.

Corporate power purchase agreements are market-driven models that accelerate a country's energy transition by leveraging private capital while aligning with corporate decarbonization goals. Developing successful off-site PPA mechanisms can be complex, but existing replicable frameworks and key guiding principles can help. For a physical PPA, policymakers should ensure nondiscriminatory third-party access to the grid, fair and transparent grid charges, and the ability to sell back surplus power. For a vPPA, policymakers should ensure the ability of a two-way settlement framework, a competitive wholesale electricity market, and market-based pricing system that reflects the true cost of clean energy generation.

Corporate demand for clean energy will continue to rise in APAC. The region's economies are well positioned to attract private investment for clean energy to support their own national decarbonization targets. To fully unlock this opportunity and help clean energy buyers and sellers make confident decisions to procure, regulators will need to ensure market rules enabling PPAs are fair, transparent, and clear. Collaborating with relevant stakeholders, including clean energy buyers, early and often on the key design principles and best practices discussed in this report is crucial to ensure the development of well-designed PPAs.

CEBA
Clean Energy Buyers Association

Asia
Clean Energy
Coalition