

Power Purchase Agreements and their use in the Nordics



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This publication is also available online in a web-accessible version at:
<https://pub.norden.org/nordicenergyresearch2025-05/>

Acronyms

Acronym	Definition
BESS	Battery Energy Storage System
BRP	Balancing Responsible Party
CfD	Contracts for Difference
CISAF	Clean Industrial Deal State Aid Framework
cPPAs	Corporate Power Purchase Agreements
CSRD	Corporate Sustainability Reporting Directive
EIB	European Investment Bank
EMG	Nordic Energy Market Group
ESRS	European Sustainability Reporting Standards
FVTPL	Fair Value through Profit or Loss
GHG-P	Greenhouse Gas Protocol
GO	Guarantees of Origins
IASB	International Accounting Standards Board
IFRS	International Financial Reporting Standard
LCOE	Levelized Cost of Energy
LME	London Metal Exchange
MiFID	Markets in Financial Instruments Directive
OTC	Over-the-Counter
PtX	Power-to-X
PPAs	Power Purchase Agreements
RED II	Renewable Energy Directive II
RES	Renewable Energy Sources
RFNBO	Renewable Fuels of Non-Biological Origin
SBTi	Science-based Targets initiative
SMEs	Small and Medium Enterprises
VRES	Variable Renewable Energy Sources

1. Foreword

The Nordic energy transition builds on close collaboration between policymakers, industry, and investors to deliver both sustainability and competitiveness. As the region continues to lead in renewable energy deployment, this cooperation must also ensure that the frameworks enabling new investments remain effective, transparent, and future-proof.

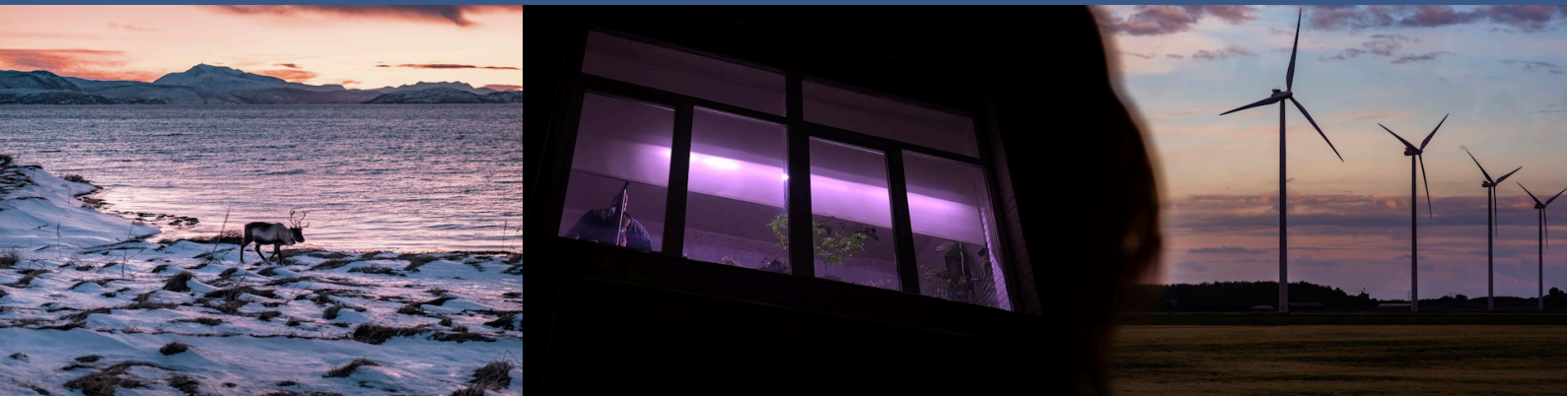
Power Purchase Agreements (PPAs) are a vital instrument in achieving this. They provide long-term price stability for energy producers and consumers alike, helping to make renewable energy projects bankable and accelerating the shift toward a carbon-neutral energy system. By offering predictable revenues and supporting private investment, PPAs encourage innovation and market development

This report offers Nordic governments, market participants, and the wider energy community a comprehensive overview of the PPA market – its current state, challenges, and opportunities. By linking Nordic insights with the EU's new regulatory toolbox, it aims to support a more resilient, transparent, and integrated market that advances the shared vision of a sustainable Nordic region by 2030.

Klaus Skytte

Director of Nordic Energy Research

2. Executive summary



PPAS AND THEIR USE IN THE NORDICS

Power Purchase Agreements (PPAs) has been and is a key driver behind the renewable energy development in the Nordic region. They are a key tool for making projects bankable and they provide predictability for the needed time horizon for consumers and producers of electricity. As subsidy mechanisms change or disappear, PPAs provide the risk mitigation required to secure financing of new RES projects.

PPAs regulate the sale of electricity between buyers and sellers. They are tailor-made and long-term. The most common price structure consists of fixed price for baseload or pay-as-produced volumes. Utility PPAs and Corporate PPAs are the most common PPA types in the Nordics.

The Nordic PPA market is generally not transparent on contracting terms beyond size, duration and contract parties. The market is considered mature but has experienced a slow-down after the energy crisis. Traditional power-intensive industries offtake over half of PPA volumes in the Nordics, while the share of generation technologies in Nordic PPAs varies between country, but onshore wind represents the highest share overall. The typical tenor of the PPAs trends towards shorter durations.

The key stakeholders in PPAs are RES producers, corporate consumers, utilities or traders, and lenders. Lenders have become increasingly aware of the underlying risks in PPAs, leading to stricter requirements to achieve bankability.

EU's regulatory landscape has been shifting to actively encourage and facilitate the use of PPAs, to achieve climate and energy goals. The Electricity Market Design reform package, and specifically Regulation (EU) 2024/1747 Article 19A, launched a toolbox for promoting PPAs. The toolbox addresses topics like general promotion and barrier removal, PPA market platform assessment, guarantee schemes, PPAs in support schemes and other PPA specifications.

CHALLENGES IN NORDIC PPA MARKET

An important part of this report has been to identify challenges in the Nordic PPA market. Through a market survey and by monitoring the recent debates, AFRY has mapped the following PPA-specific challenges:

1. The lack of price transparency in the Nordic market creates challenges in market comparability
2. Price volatility and forecasting risk create challenges for counter-parties seeking to agree on pricing and regulate underlying market risks
3. The large number of bidding areas in the Nordics limit the pool of PPA counterparties due to the basis risk
4. Counterparty risk challenges long term PPAs, and especially if counterparty operates a less mature business model
5. Differences in preferred PPA durations reduce the pool of suppliers and offtakers with aligned interests
6. Certain PPA structures may limit flexibility in underlying assets of PPAs
7. The perceived regulatory risk has increased in recent years, undermining investor confidence
8. Subsidies for RES may reduce the need for hedging or introduce uncertainty and distort price signals for PPAs
9. Financial accounting for PPAs is complex due to the uniqueness of electricity as a commodity and market volatility
10. The discussions around market-based versus location-based scope 2, and the ongoing debate on GOs, create uncertainties
11. There are generally not any major tax issues specific to PPAs in the Nordics, except resource rent tax limiting the supply of PPAs in Norway
12. EU's attempt to promote RES and reach climate targets, has made some regulations complex and challenging for PPAs

STRATEGIES TO OVERCOME THE CHALLENGES

The mapped challenges in the Nordic PPA market are categorized in a framework that both links the challenges to the relevant tools in the EU toolbox, while also defining certain sub-categories, such as:

- PPA-specific challenges requiring policy action to mitigate barriers
- PPA-specific challenges best addressed through market mechanisms
- Systemic issues requiring policy attention to support the PPA market
- Systemic issues that should be managed through market mechanisms

The result of this mapping exercise indicates that the EU toolbox addresses most of Nordic PPA challenges where policy attention is needed.

There are some key features of the Nordic PPA market we should consider, when assessing the current challenges:

- PPAs are means to an end
- The Nordic PPA market has been a success
- PPAs come in many shapes and sizes
- PPAs may not be suited for all types of offtakers

For all the challenges, AFRY indicates strategic considerations and proposes next steps for policymakers in detail, but as more overarching strategic considerations to approach the challenges in the Nordic PPA market, AFRY highlights:

- One size-fits all policies are not suited for the bespoke nature of the PPA market
- Predictability in regulatory framework is key for long term commitments
- The PPA market should remain voluntarily with freedom to customize terms and allow for innovation
- Periodic market imbalances are most effectively solved through market mechanisms

3. Power Purchase Agreements and their use in the Nordics



AN INTRODUCTION TO PPAS

History

The historical development of power-intensive industries in the Nordic countries has been two-sided:

Especially in Iceland and Norway, the development has been deeply intertwined with the region's abundant natural resources, particularly hydropower. Ever since the first hydropower plants were built in the 1900th century, the investment decisions from both the power intensive industry and the power generators were tightly linked.

Finland and Sweden also had hydropower but relied more on fossil fuels when developing the power-intensive industries. Denmark's power intensive industries, not being the core of its economy, also relied on fossil fuel.

The concept of Power Purchase Agreements, as we know it today, is both building on these historical industry agreements and new preferences and dynamics. Historically, PPAs were not determined in a liberalized market, but rather determined with regulated prices and strong political guidelines. Furthermore,

aspects like 'renewable', 'emission-free' or 'green' were not key elements in a PPA. Especially the abundance of hydropower made electricity cheap, which laid the ground for profitable power-intensive industries.

The liberalization of electricity markets in the Nordics, starting with Norway in 1990, laid the ground for commercially based PPAs. The leftovers of strongly political and regulated PPAs, remained for quite some time after 1991, but in recent years all PPAs in the Nordic countries are commercial deals although effected by subsidy schemes and regulations^{[1][1]}.

Key message: Power Purchase Agreements (PPAs) has been and is a key driver behind the renewable energy development in the Nordic region.

New development

During the 1990s and 2000s, the discussion on how to address the climate change issue, really hit the political agenda. The Kyoto Protocol, adopted in 1997, committed countries to reduce greenhouse gas emissions. This created a new era for renewable energy and a potential low-carbon society. With this increased focus and need of more renewable energy and new green industries, the Nordic countries established different support schemes for renewable energy; such as feed-in tariffs in Denmark and Finland, electricity certificate scheme in Sweden and Norway. These support schemes affected the need for price hedging and PPAs in different ways, which made the need for PPAs more urgent in some markets than others.

The new era for onshore wind PPAs started in Sweden and Norway in primo 2010s. Producers and developers of onshore wind had extra revenues from the electricity certificates, but they also had a need for price hedging for financing reasons. Corporate companies, such as the technology companies, had the need of locking in electricity costs and claiming to use renewable energy. This created a good match and the 'Corporate PPA' was born.

Before and after this era, so-called 'Utility PPAs' have been offered from utilities with existing power generation (e.g. hydro). These agreements are not primarily for financing new RES generation, but more generally, a way for producers to hedge their revenues and providing predictability to their stakeholders.

1. Iceland does not have a well-functioning day-ahead market in place, but PPAs are based on commercial decisions also in Iceland. Source: <https://energifaktanorge.no/>

Key message: PPAs regulate the sale of electricity between buyers and sellers. They are tailor-made and long-term.

Key aspects of a PPA

General definition: A Power Purchase Agreement (PPA) is a contractual agreement between two parties, where one party generates electricity (the seller), and the other party agrees to purchase all or parts of that electricity for a specified period (the buyer).

Price: PPAs can be agreed at fixed price or a dynamic market price, or somewhere in between. Fixed-price PPAs are more common in the Nordics. Fixed price PPAs provide revenue certainty for renewable energy projects, facilitate financing and reduce investment risk, and they provide predictability for PPA buyers.

Financing tool: The stable revenue stream, independent of fluctuating electricity market prices, enhances project bankability and attract investors. Lenders will typically require that revenues are hedged sufficiently to cover loan payments for the duration of the debt. Equity investors (especially infrastructure funds) are often reluctant to take on market exposure. Hence, PPAs have been essential for lifting unsubsidised onshore wind and solar PV development in the Nordics as a financing tool.

Long-term horizon: PPAs are typically long-term, often ranging from 5 to 15 years, and define at a very minimum key terms such as the amount of electricity to be supplied, the price, and the delivery schedule.

Non-standardised: PPAs are tailor-made. They vary in their complexity and can be complex legal documents with various clauses related to market events, performance guarantees, termination, curtailment, imbalance charges and more.

ESG and corporate responsibility: PPAs enable consumers to directly source renewable energy, aligning with the consumers' sustainability goals. PPAs are often seen as key tool for bridging renewable energy to corporate responsibility.

Varying use of the term 'PPA': In some contexts, and markets, the term 'PPA' is linked to new power generation only, while in some markets the term is also used for agreements linked to existing power generation as well. The latter is the case in the Nordics.

Key message: PPAs is a key tool for developing new RES and making projects bankable. They provide predictability for the needed time horizon.

Developers and producers' perspective of PPAs

PPAs are a cornerstone for the development of renewable energy projects, providing developers with risk mitigation, and thereby the financial security and investor confidence needed to bring these projects to fruition and contribute to the growth of clean energy.

A developer of new power generation needs to make the project bankable. Power prices are volatile and uncertain, and a full merchant approach is normally not accepted by banks and institutional investors. PPAs with a fixed price reduce the power price risk, which is a key aspect for the developer/producer.

Another desirable aspect of PPAs is the potential time horizon. Forward markets and future contracts are often limited to ten years, but in practice the liquid time horizon is even shorter in these markets. A PPA can be designed to fit the specific project and meet the bank's need in terms of financing.

Consumer's perspective of PPAs

A power consumer, small or large, needs to purchase electricity. There are several routes to market, from simple supply agreements to complex PPAs. PPAs often offer a fixed or pre-determined price for electricity over a longer period of time. This provides budget certainty and acts as a hedge against volatile retail electricity prices. In some scenarios, the electricity purchased through a PPA can be purchased at a lower rate than what would be paid to a traditional utility, e.g. due to the bulk purchasing nature and the direct connection to the development of an asset.

PPAs, with Guarantees of Origin, enable consumers to directly source renewable energy. By switching to renewable energy via a PPA, consumers contribute to reducing greenhouse gas emissions and lowering their scope 2 emissions.

	Route to Market	Price hedging	Long-term horizon	ESG responsibility
Producer's view on PPAs	😊	😊	😊	😊
Consumer's view on PPAs	😊	😊	😊	😊

PPAs and subsidy schemes

PPA arrangements depend on nature of the subsidy mechanisms. As they become more competitive or disappear, the role of PPAs increases.

The joint Norwegian-Swedish electricity certificate scheme is a support scheme for renewable electricity production in both countries. It started as a Swedish schemes in 2003, before it became a joint scheme in 2012. The certificates have had zero value since 2019/20, but still the scheme will not finalize before 2035.

In a certificate scheme, RES projects are fully exposed to power prices and certificate prices are uncertain. Hence, there is a need for an active market in fixed price PPAs to manage price risk.

Finland and Denmark have had different variations of feed-in-tariff schemes. In recent years, the schemes are no longer in place^{[2][1]}.

In feed-in tariff schemes, PPAs are rarely needed, as production is sold to FIT provider at a fixed price for a long-term period.

The differences in subsidy schemes is a key explanation for why Sweden and Norway were front-runners in developing a PPA market in the Nordics.

Key message: As subsidy mechanisms change or disappear, PPAs provide the risk mitigation required to secure financing of new RES projects.

2. Energifaktanorge.no, renewablesfinland.fi and IEA.org.

The need for PPAs under different subsidy schemes.

All-inclusive Feed-in Tariff	Feed-in Premium	Contract for Difference	Certificate schemes	Merchant
Central buyer at present price - no PPA required		Limited price risk - PPA provides route to market		Full price risk - PPA provides risk mitigation as well as route to market
← Low price risk				High price risk →

Ways of categorizing PPAs

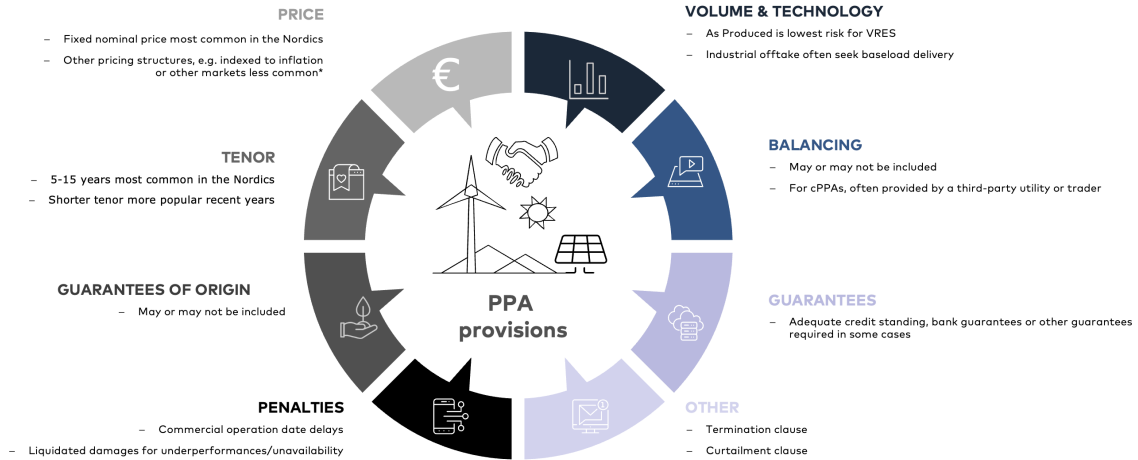
The PPA community has many ways of categorizing the different PPA types. It can be done by delivery, by offtaker, by generation technology, by pricing mechanism, by profile type and so on. Remembering that these may overlap and are being used in a non-structured manner, we focus on three main categories in this chapter; namely utility PPAs, corporate PPAs and financial PPAs.

Key message: PPAs can be categorized in several ways. Many categories have terms and names that overlap and are being used in a non-structured manner.

WAYS OF CATEGORIZING PPAS					
By delivery	By offtaker	By technology	By pricing	By profile	By other dimensions
1. Physical PPAs - Onsite PPAs - Off-site PPAs - Sleeved PPAs 2. Financial PPAs or - Virtual PPAs or - Synthetic PPAs	1. Corporate PPAs 2. Utility PPAs or - Traditional PPAs or - Merchant PPAs	- Wind PPAs - Solar PPAs - Hydropower PPAs - BESS PPAs - Hybrid PPAs	- Fixed price PPAs - Hybrid price PPAs - Floating price PPAs	- Baseload PPAs - As-produced PPAs	- 24/7 PPAs - Multi-buyer PPAs - Long-term PPAs - Medium-term PPAs - Short-term PPAs - Cross-border PPA
↓					
Utility PPAs			Corporate PPAs (cPPA)		Financial PPAs

Key contracting parameters in PPAs

Key message: Key contracting parameters in PPAs regulating the terms of electricity sales



*Except Iceland. Sources: AFRY analysis.

Most common price and volume structures

PRICE STRUCTURE		VOLUME STRUCTURE	
Fixed price	<p>Almost all Nordic PPAs have a fixed price structure for the entire duration of the PPA tenor. The price is typically not indexed or adjusted for inflation.</p> <p>The baseload PPA prices are higher than the as-produced PPAs, reflecting the expected cost of managing baseload profile risk. The premium will depend on, amongst others, agreed hedge level and expected capture ratio.</p> <p>Price levels may be influenced by movements in the forward curve^[3], despite low liquidity and the limited possibility for long term hedging.</p> <p>LCOE of RES generation and breakeven electricity price for offtakers are also relevant markers in the PPA negotiation process.</p>	As-Produced vs Baseload	<p>As-Produced and Baseload are common structures for Nordic PPAs.</p> <p>For RES developers and investors, as-produced gives the lowest risk exposure. However, higher prices for baseload PPAs may make them more appealing.</p> <p>Offtakers have a preference for Baseload PPAs as it is closer to matching their consumption profiles.</p> <p>The large market players with trading competencies and/or diverse portfolios are usually more flexible towards the PPA structure.</p>
Other	<p>Other pricing structures are uncommon in the Nordics, especially in the case of corporate PPAs.</p> <p>Utilities can usually provide more tailor-made structures required by market player (e.g. price floor/ceiling, indexed toward other commodities).</p> <p>Utilities can also provide simple route-to-market into Day Ahead or short-term hedging, although this typically does not qualify as a PPA.</p>	Other	<p>Other volume structures other than pay-as produced or baseload are uncommon.</p> <p>More complex PPA structure can be seen, especially utilities with large portfolios have more flexibility for tailor-made structures.</p>

3. Nasdaq OMX Commodities is the reference market. Price comparison with PPAs is difficult due to low liquidity, especially for longer dated SYS contracts and EPAD contracts (any maturity). More details on this is provided on page 35

PPA VOLUMES

Context

The Nordic PPA market is not transparent in terms of pricing. The parties to a PPA may release information on key contracting terms such as volume, country, technology, and tenure, but information on price level is very rarely disclosed to the market.

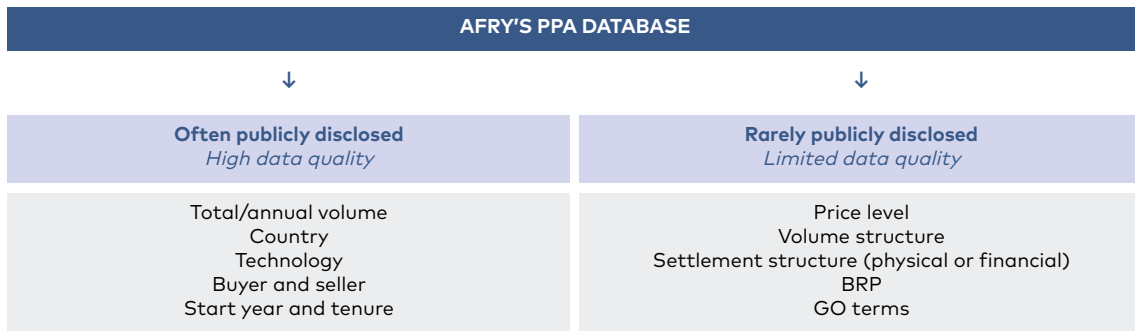
AFRY is constantly monitoring the PPA market in the Nordic countries, resulting in a comprehensive inhouse database of publicly disclosed PPAs in the Nordic market since 2013. AFRY's PPA database contains PPAs for ca. 80 TWh/year and is labelled by the following elements (where publicly disclosed):

- Country
- Technology
- Volume
- Buyer and seller
- Offtake sector
- Type (corporate, utility buyer, utility seller)
- Price
- Signed year and start year
- Tenure
- Balancing responsible party (BRP)
- Guarantees of Origin (GO)

The data quality of the database varies and is highly dependent on what information is publicly disclosed. The database only contain PPAs based on renewable generation.

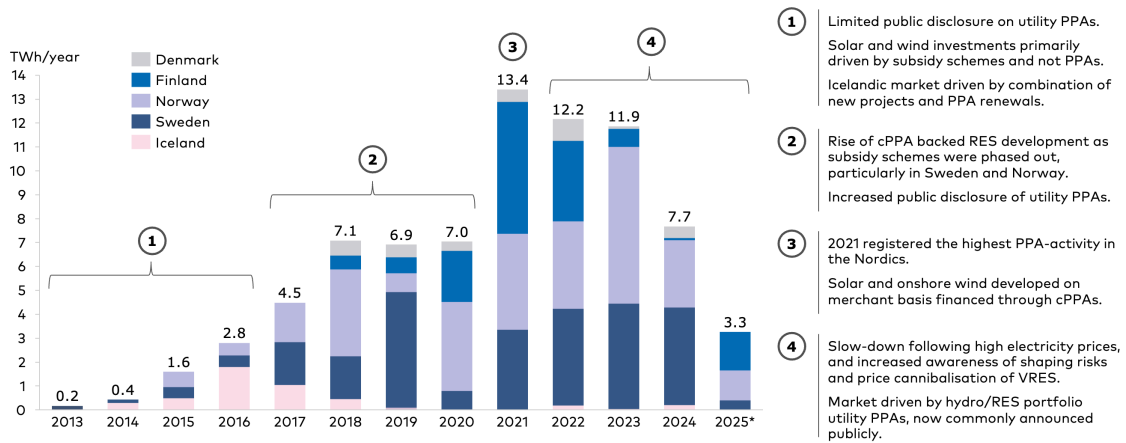
Key message: The Nordic PPA market is generally not transparent on contracting terms beyond size, duration and contract parties.

AFRY's database includes publicly disclosed terms in PPAs



Evolution of PPAs by year and country, TWH/Year

Key message: The Nordic PPA market is considered mature, but has experienced a slow-down post energy crisis mid-2021








*Until end of May 2025

Notes: The graph includes PPA volumes signed for a given year measured in annual delivery. The volumes are based on publicly announced information tracked by AFRY and is non-exhaustive. The physical electricity generated is double counted in some cases, e.g. in the case where a utility buys electricity from RES producer and onsell the same volumes to a corporate offtaker.

Source: AFRY Management Consulting

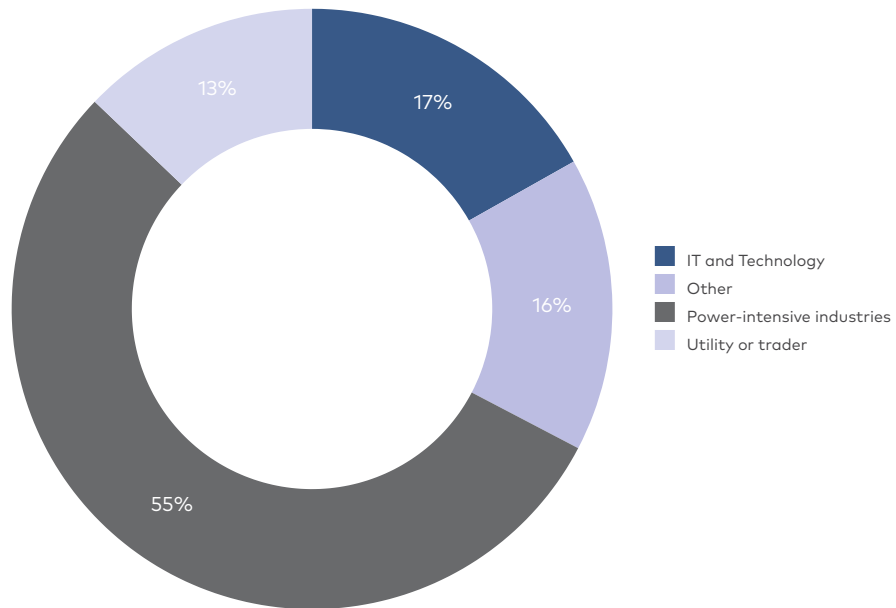
The Nordic countries and PPAs

Key message: The Nordic PPA market is relatively homogenous, but there are country specific differences in how the PPA market has developed

COUNTRY	KEY HIGHLIGHTS
	<p>Norway has a longstanding tradition of PPAs between (hydro) utilities and energy-intensive industries. Historically, these agreements were seldom publicly announced, though transparency has improved in recent years. The mid to late 2010s witnessed a surge in cPPAs between onshore wind developers and corporate offtakers, significantly driving onshore wind development. The need for cPPAs for project funding came because of the price uncertainty of electricity certificates and the need for alternative hedging mechanisms. In the 2020s, the cPPA market has stagnated, primarily due to a pause in the licensing process for onshore wind projects following significant public opposition.</p>
	<p>Over the past decade, Sweden has maintained a robust PPA market, consisting of a blend of utility PPAs and cPPAs. The majority of cPPAs are based on selling electricity from onshore wind assets to large power intensive industries. Similar to Norway, the rise of PPAs correlated with the market exposure of electricity certificates and lack of other hedging mechanisms.</p>
	<p>In recent years, Denmark has seen a significant increase in PPA activity, with these agreements becoming the primary funding mechanism for renewable energy development following the phasing out of subsidies for onshore renewable energy sources in the late 2010s. The majority of PPAs in Denmark are associated with solar PV projects, which have experienced substantial growth since around 2020.</p>
	<p>In Finland, publicly disclosed PPA deals have predominantly been linked to onshore wind power development. New Finnish onshore wind has been developed on a merchant basis since feed-in premiums were phased out in the late 2010s, with PPAs playing a crucial role in driving the buildout. The period from 2020 to 2022 witnessed the highest level of PPA activity, following attractive market outlooks for onshore wind development. Note: the Mankala model, which is unique to Finland, is another way of financing new electricity generation (typically nuclear), and is not considered as a traditional PPA.</p>
	<p>Iceland's power sector differs from its Nordic counterparts due to the historical absence of a power market. Consequently, all industrial electricity offtake is facilitated through PPAs, primarily based on hydropower or geothermal energy. These agreements are typically long-term and exhibit unique characteristics, such as the inclusion of flexibility mechanisms, setting them apart from PPAs in other Nordic countries. Some Icelandic PPAs have indexed pricing, e.g. towards LME's (London Metal Exchange) aluminum price or NordPool</p>

Traditional power-intensive industries offtake over half of PPA volumes in the Nordics

Key message: Share of PPA offtakers in the Nordics 2013-2025 (% of TWh)



Traditional (power intensive industries have been significant buyers of PPAs over the past 10-15 years, playing a crucial role in market development. They represent 55% of the market share. Power intensive industries represent low counterparty risk for sellers and can (in many cases) commit to long term contracts which is attractive for renewable developers.

IT and Technology primarily involves data centers and accounts for approximately 17% of PPA volumes.

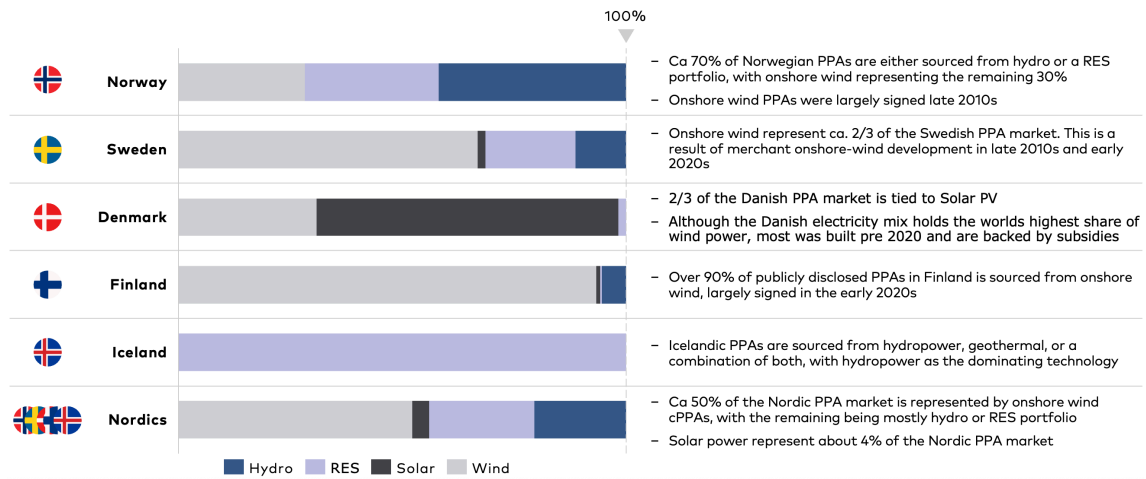
Utilities or traders represent about 13% of the market. Utilities procure PPAs to build their portfolios and may merge these with their own production. The power is ultimately sold to corporate offtakers (separate PPA), to power markets, or a combination.

Other offtakers represent 16% of the volumes, typically characterized by smaller deal sizes.

Source: AFRY Management Consulting.

Shape of generation technology in Nordic PPAs 2013-2025

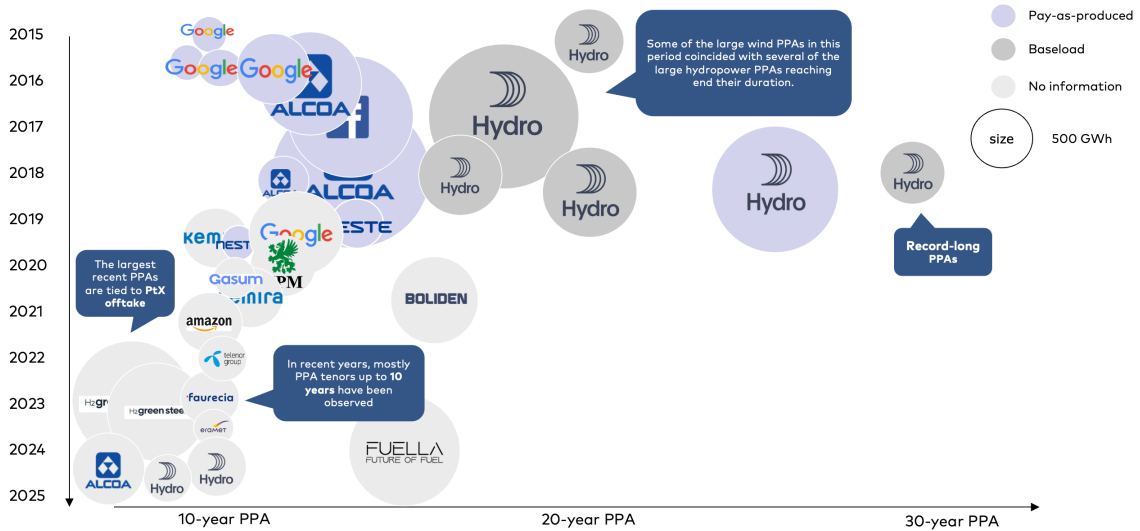
Key message: The share of generation technologies in Nordic PPA varies between country; onshore wind represent the highest share overall.



Notes: RES in this context refers to PPAs sourced from unspecified renewable energy sources – this category often contain a large share of hydro. Source: AFRY Management Consulting.

Durations, sizes and offtakers in last decade

Key message: Various large energy users have opted for PPA procurement in the Nordic markets, tenor trend towards shorter durations.



Note: The illustration is based on an extract of publicly announced PPAs.
Source: AFRY Management Consulting.

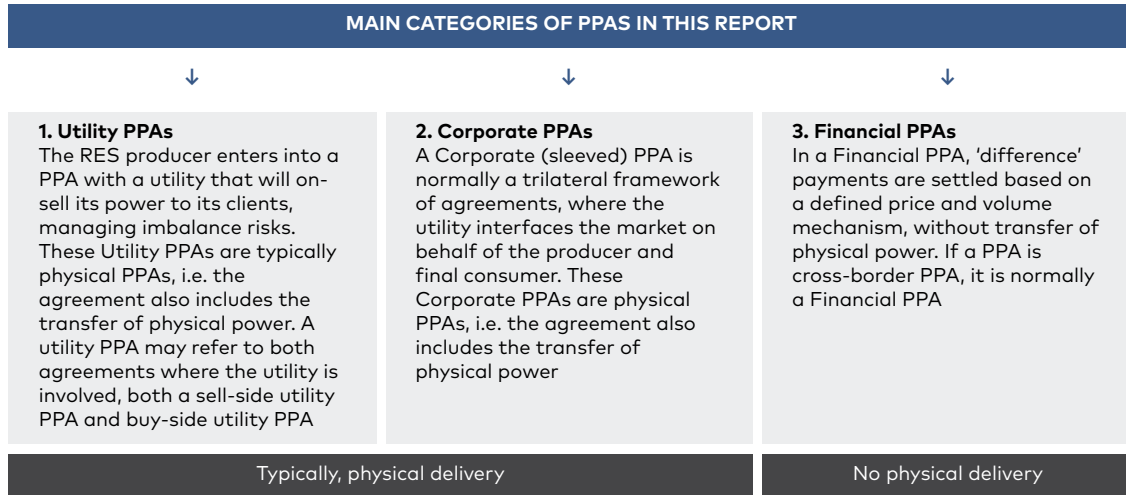
STAKEHOLDERS

Key message: The key stakeholders in PPAs are RES producers, corporate consumers, utilities or traders, and lenders.

STAKEHOLDER	DESCRIPTION	ROLE IN PPA
Producer	Producers or RES developers commit to supplying a predetermined amount of electricity to buyers, often at a fixed price over a specified period. This arrangement provides them with a de-risked cash flow, enabling them to secure financing for the project.	Seller
Corporate consumer	Corporate consumers play a crucial role in driving increase of renewable energy through PPAs. Corporates enter into long-term offtake of green electricity to protect against power market volatility and to secure green electricity for sustainability reporting.	Buyer
Utility or trader	Utilities or traders may assume various roles depending upon the specific type of agreement. These entities can function as either sellers or buyers of PPAs. Alternatively, they may adopt a third-party role, e.g. providing BRP services.	Seller, buyer, service provider
Lender	Lenders often provide the necessary capital for the developing and building RES projects. Their role involves assessing the creditworthiness of RES producer, counterparty risk, the viability of their projects. Lenders offer loans, bonds, or other financial instruments to support project funding.	Project funding

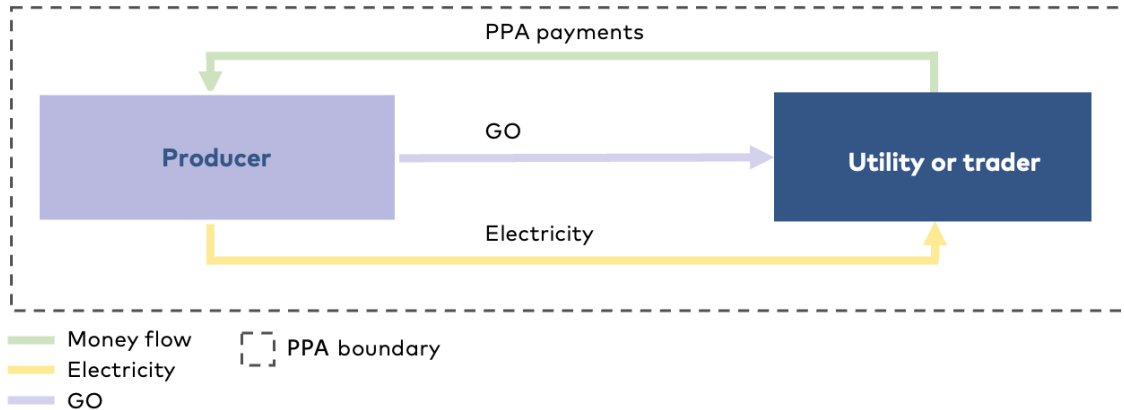
Main PPA categories

Utility PPAs and Corporate PPAs are the most common PPAs in the Nordics, but we will also include Financial PPAs as an important category



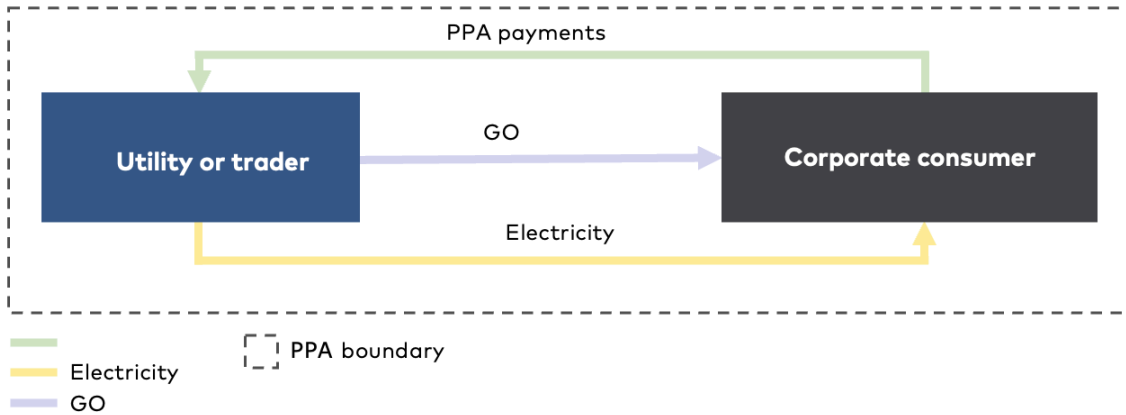
A utility PPA may refer to two sub-categories, Utility-Buyer PPA or Utility-seller PPA, where the utility is involved on either the sell-side or buy-side

Category 1: Utility-Buyer PPA



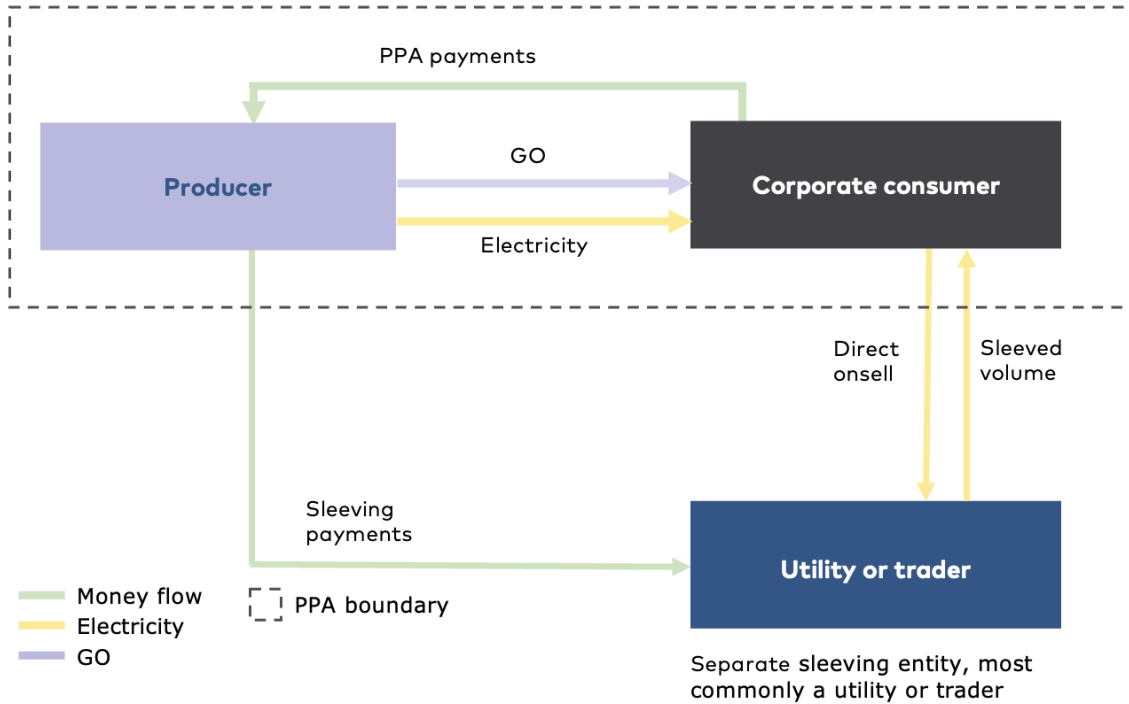
Seller (producer) typically hedges revenues and secures cash flows to achieve funding for developing the project. Electricity and associated GO are transferred to, and paid for by, the buyer (utility or trader). The buyer typically cover balancing services and any other grid-interfacing activities. The buyer will then ultimately either supply end consumers through a utility seller PPA, or resell into the market or to other traders/utilities. Although the electricity produced is, in the end, delivered (directly or indirectly) to end consumers, the on-sale arrangements will not be directly relevant for the Utility-Buyer PPA.

Category 2: Utility-Seller PPA



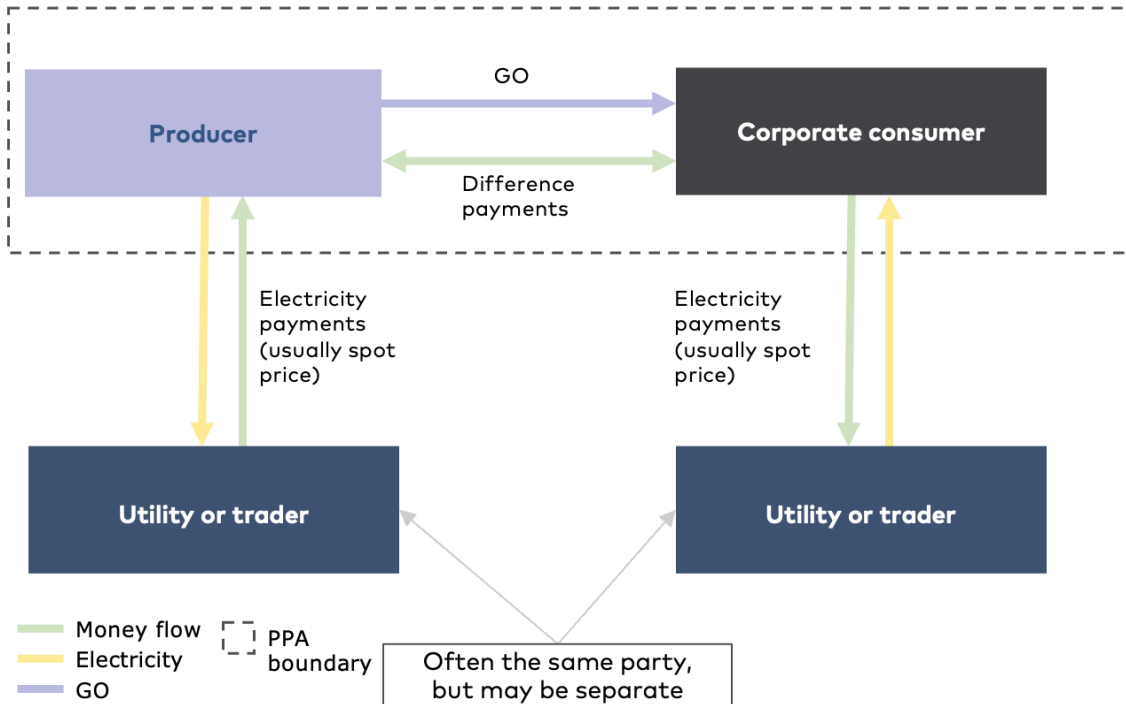
In a utility-seller PPA, the main purpose for the buyer (corporate consumer) is typically to hedge electricity purchase against power market volatility and secure GO if relevant, whereas for the seller the PPA is mainly a hedging instrument. The seller (utility or trader) may source the electricity to be sold either directly from one or more utility-buyer PPAs, the market, own production portfolio (relevant for utilities), or a combination of these. The seller typically manages balancing responsibility and any other grid interfacing activities.

A corporate PPA is a trilateral framework of agreements, where a utility/trader interfaces the market on behalf of the producer and consumer



The exact legal framework may vary case by case, but typically (as illustrated on the left) the producer transfers ownership of electricity to the corporate consumer at the meter, which immediately on-sells the volume to the sleeving entity (utility or trader). The sleeving entity typically manages imbalances and any other grid-interfacing activities. The utility 'sleeves' this volume back to the corporate consumer through the grid, potentially shaping the profile by topping up to meet the agreed volumes, or selling the excess volumes to the market. GOs are often retained and redeemed by the corporate consumer. The cost of the sleeving service is typically paid for by the producer, but may be indirectly covered the corporate consumer as part of the PPA price. Corporate PPAs are sometimes referred to as sleeved PPAs.

In a Financial PPA, 'difference' payments are settled based on a defined price and volume mechanism, with separate handling of physical electricity



In a financial PPA, the producer and corporate consumer agree to settle difference payments based on a defined price and volume mechanism. Each PPA party will typically need to set up a separate physical route to market for its electricity sale and purchase, but this is outside the scope of the Financial PPA, though the terms of such physical route-to-market and/or the subsidy scheme may influence the structure and pricing terms of the Financial PPA. Financial PPAs are commonly used as a tool for enabling cross price area PPAs.

Lenders play an important role in PPAS and set specific requirements to provide project funding

RES development is capital-intensive, and in merchant markets without government-backed subsidies, lenders are often crucial to project funding. The funding typically comes from long-term debt provided by senior lenders or equity investors, which can often exhibit debt-like characteristics. Project cash flows are essential for repaying this debt, necessitating that projects must demonstrate a balanced risk profile for the cash flows through contractual arrangements. Long-term fixed or minimum price PPAs are particularly attractive risk mitigation tools as they help protect project revenues. Lender requirements vary based on the level or structure of equity investment in a project, wider market practices, the lender's risk appetite, or specific project factors such as RES technology and geography. Despite these variations, there are common risks and considerations that PPAs must address to achieve bankability, and lenders have become increasingly aware of the underlying shaping risks in PPAs.

Key message: Lenders have become increasingly aware of the underlying risks in PPAs, leading to stricter requirements to achieve bankability

KEY PPA CONSIDERATIONS FOR LENDERS IN THE NORDIC RENEWABLES MARKET			
Secure cash flows	Sufficient duration	Counterparty risk	Termination clause
Predictable and de-risked revenue streams on appropriately sized volumes to limit exposure to volatile power markets. In cases of profile or shape risk, it is particularly important to understand downside risk.	Lenders typically seek long-term PPAs that align with the duration of the debt.	Lenders will assess the credit worthiness of the PPA counterparty to confirm reliability. This may involve requirements of credit support for the counterparty, e.g. bank or parent company guarantee, or other forms of guarantees.	Lenders will want to see predictable and future-proof termination clauses that regulate the termination payment on default or early exit.
↓			
In recent years, there has been increasing awareness on the importance of profile and shape risk in PPAs following examples of high shaping cost leading to loan defaults and subsequent bankruptcy. The underlying risk mechanism is described in pricing theory chapter.			

PRICING THEORY

A theoretical approach to PPA reference pricing

The term around pricing in Nordic PPAs is typically confidential and there is limited publicly available information on settled PPA prices. Therefore, it is also challenging to establish good benchmarks for a fair PPA price. In addition, a fair PPA price can vary significantly on case-by-case basis as it is dependent on a wide set of contracting terms such as duration, volume structure, credit guarantees, etc. Also, other products and services such as Guarantees of Origins and balancing fees can be incorporated in the PPA price.

However, from a theoretical perspective, the reference price of a PPA can be established based on the expected future power price for the contracted volumes over the duration of the contract. Projecting power prices is inherently challenging due to market volatility, regulatory changes, and other unpredictable factors. At a high level, there are two established methodologies for power price projection.

1. **Financial methods:** based on power forward markets
2. **Fundamental methods:** bottom-up power market models

Further, the reference price for a PPA is dependent on the volume structure in the relevant PPA.

For a **baseload PPA**, the reference price is the baseload electricity price, which is the time-weighted average price. This represents the expected price at which an offtaker would buy electricity in the market.

For a **pay-as-produced PPA**, the reference price is the relevant capture price given by the generation-weighted average price for the relevant generation technology. This price reflects what the seller would achieve with full market exposure.

Key message: Key elements of PPA pricing are power price projection methodology and volume structure in PPAs.

FACT BOX

For **baseload PPAs**, the reference price is given by the time weighted average power price for the duration of the contract

$$TWA = \frac{\sum_t^{\text{total hours}} \text{Spot}_t}{\text{total hours}}$$

For **as-produced PPAs** the reference price is given by the generation weighted average power price over the duration of the contract (also referred to as capture price)

$$GWA = \frac{\sum_t^{\text{total hours}} (\text{Spot}_t \times \text{Generation}_t)}{\sum_t^{\text{total hours}} \text{Generation}_t}$$





Where t is hour, Spot_t is the power price in hour t , Generation_t is the generation in hour t for the contracted asset(s), and *total hours* is the total hours over the contracted period.

Source: AFRY Management Consulting.

Financial methods





The financial methods are based on inputs from the forward markets; the forward curve and its historical volatility. In the Nordic market this would typically be based on information from Nasdaq OMX Commodities' derivatives market. Financial methods have a short-term probability-based approach. Market prices should theoretically reflect all known information to the market participants. Therefore, forward market prices can be seen as the market participants' best guess on how the relevant market price will develop.

Key message: There are two common ways of analyzing the value of PPAs: financial and fundamental methods

	Low computational requirement and low complexity with market prices being the only input needed. Can be updated daily.
	Well suited to provide probability based curves (P10-P90).
	It has no view beyond the end of the forward curve (ca. 2-3 years), see next page for further details.
	Probabilities have no view on step changes.

Fundamental methods

The fundamental methods are based on bottom-up models aiming to analyze how all assets (producers, consumers, interconnectors, etc.) in the power system interact. Fundamental models optimize the dispatch of all plants in the system to simulate price formation in the power market and are based on demand and supply principals. Fundamental methods have a long-term scenario-based approach. Scenarios could be based on different demand and supply scenarios.

	Comprehensive modeling with potential to include all aspects of the energy system.
	Can consider any known or likely changes in the future.
	Computationally complex and projections are typically updated on quarterly to annual basis.
	Difficult to generate probability-based curves as it is time consuming to run a big model and input probability distributions (e.g. of gas, carbon, demand etc.) and their cross-correlation.

Decline in volumes on power futures in the Nordics

The figure below presents traded derivatives volumes for Nordic power contracts traded on Nasdaq OMX Commodities (NOC), exchange and over-the-counter (OTC), between 2008 and 2024.

The traded volume hit a 25-year low in 2022 as record high and volatile prices caused a surge in margin requirements. Volumes have been falling throughout the period, with 2016, 2020, 2023 and 2024 being the only years with year-on-year growth.

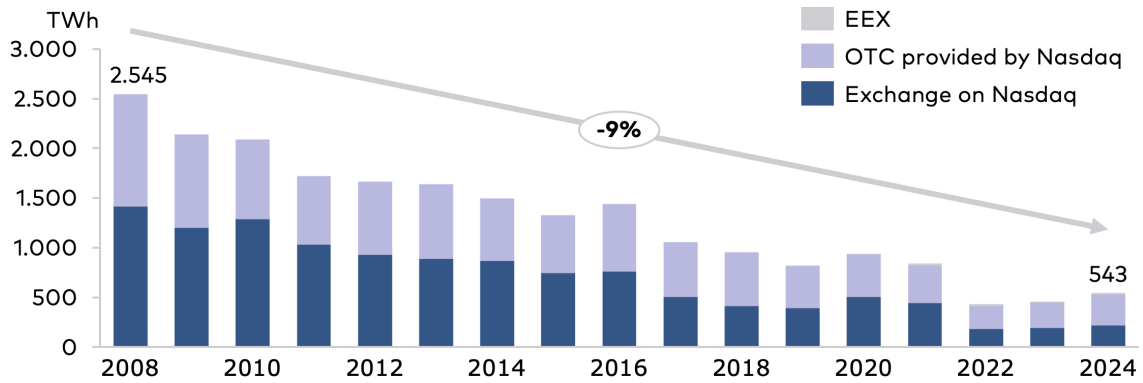
This decrease can be attributed to several reasons:

- A stricter EU regulation, the introduction of the Markets in Financial Instruments Directive (MiFID) in 2007, that has increased the costs of trading for market participants
- The system price is less relevant for market participants when the price differences between areas increase
- Regulatory and tax changes have also changed the market participants hedging needs in some Nordic countries
- Margin calls have increased significantly, making exchange-based trading less favorable

The graph below presents aggregated volumes of Nordic electricity futures traded for two months of 2025. Contracts with shorter time to maturity, i.e. month and quarter, have higher liquidity, whereas contracts with several years to maturity are rarely traded.

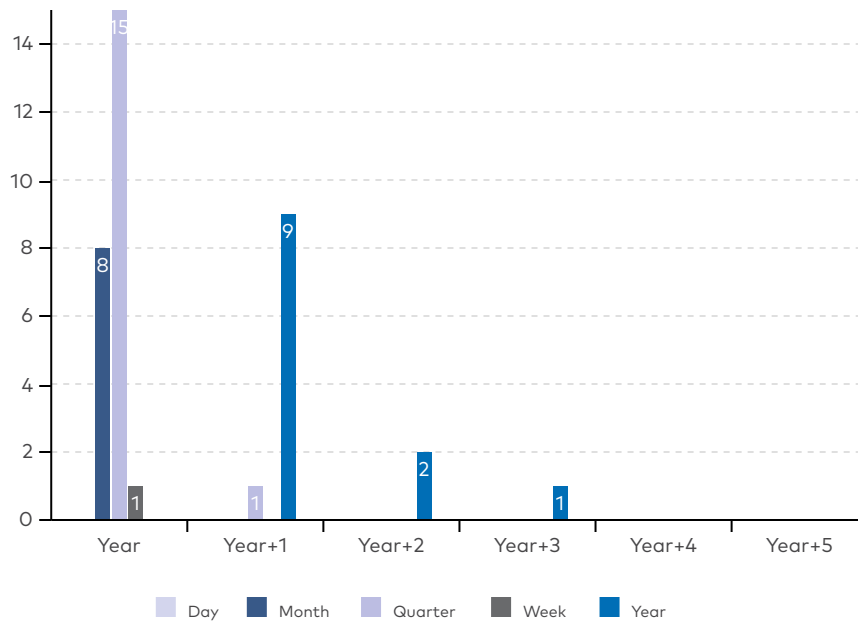
Key message: Traded and cleared volumes have been falling dramatically since 2008 power futures markets, limiting the feasibility of financial methods

Nordic power derivatives volumes, 2008-2024 (TWh)



Nordic electricity futures for system price

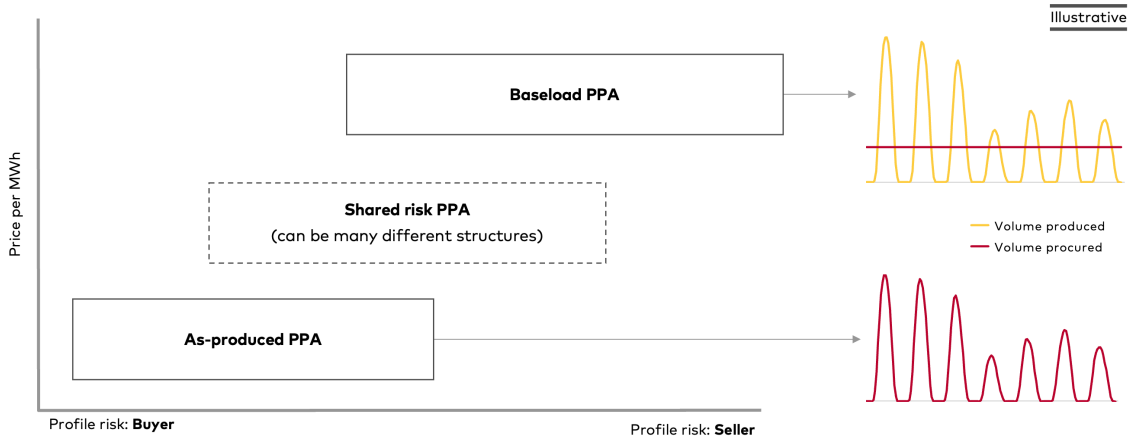
TWh – Trading period March-April 2025 on Nasdaq OMX Commodities



Source: Nasdaq OMX Commodities; EEX.

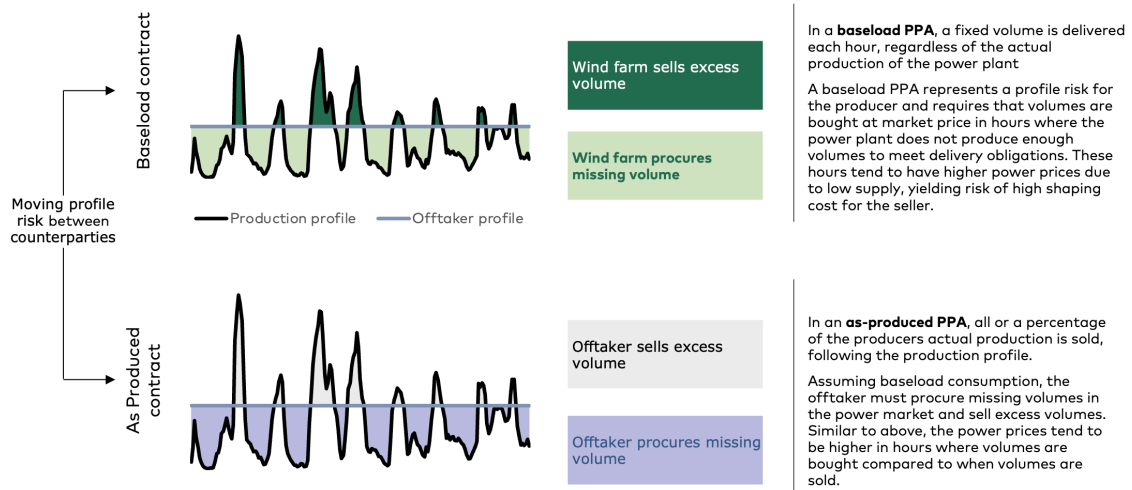
The profile risk

The profile risk refers to the mismatch in generation and consumption profiles; allocation of profile risk affects the price level of the PPA.



The profile risk of a PPA contract cannot be removed, it can only be moved between the parties; moving risk has a value effect.

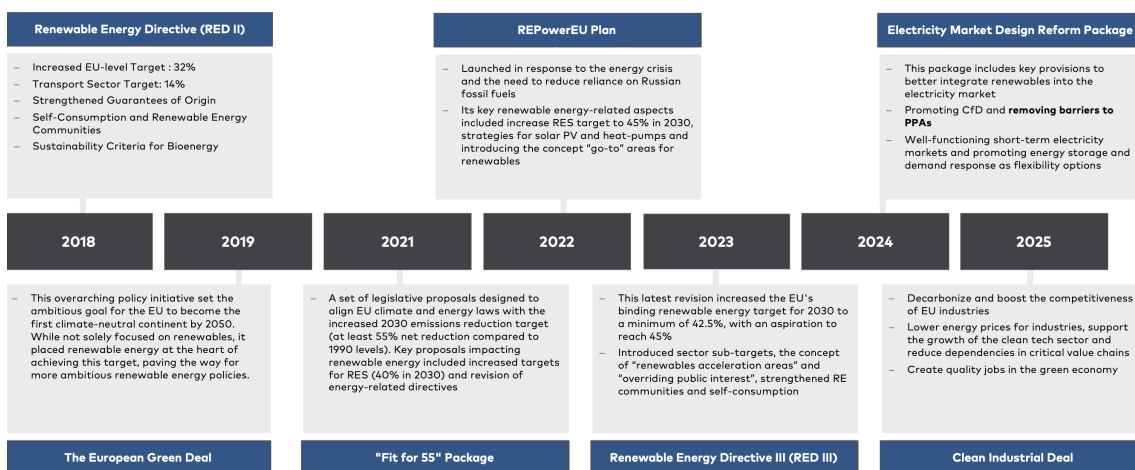
Illustrative example of profile risk and shaping cost between a variable RES producer and a baseload consumer



*In this example, a production profile from a generic wind farm is used.

REGULATORY REVIEW

Key message: EU's major regulatory and policy packages for renewable energy indicate increasing ambitions and EU's commitment to a renewable energy future



Source: european-union.europa.eu, fornybarnorge.no and energiforetagen.se

The regulation of PPAs within the EU is evolving, with a strong emphasis on promoting their use to support the growth of renewable energy sources.

PPAs has been a key commercial tool for the roll out of new renewable energy capacity in the last decades. The EU has become more and more aware of the PPA as a tool for supporting their energy and climate goals, especially during and after the energy crisis in 2021-2022 where electricity prices sky-rocketed.

There are several aspects for why the EU are actively encouraging PPAs and seeking to remove barriers for PPAs:

- PPAs provide long-term **revenue stability** for renewable energy producers and **cost stability** for renewable energy consumers
- They are a **prerequisite for financing decisions** and are seen as a **long-term guarantee and risk tool** for investors, banks and lenders
- PPAs are adjustable by nature. They can easily be designed to fit different

purposes, needs and preferences

- PPAs have a **proven track-record** and the PPA market is mature. PPAs have materialized in the free market. They have **not required heavy support** and/or regulation from the authorities
- PPAs provide **a clearer link to the renewable energy source**, making them in many circumstances a more transparent tool for credible claims of renewable energy

The regulation of Power Purchase Agreements (PPAs) in the EU has seen significant changes in recent years, primarily driven by the Electricity Market Design reform package adopted in 2024, which includes Directive (EU) 2024/1711 and Regulation (EU) 2024/1747. These build upon the foundations laid by the Renewable Energy Directive II (RED II) (2018) and aim to further promote and facilitate the uptake of PPAs as important instruments for the energy transition. The major changes in EU regulation of PPAs in recent years reflect a stronger political will to unlock their potential as a key driver for renewable energy deployment.

EU's focus has shifted towards actively promoting PPAs, removing barriers, providing support mechanisms like guarantees for reducing counterparty risks, investigating if transparency could be improved through public market platforms, investigating if standardised PPA templates could improve complexity and in general, ensuring a more stable and predictable market environment for PPAs. The latest Electricity Market Design reform package underlines this direction and provides a clear regulatory push for increased PPA activity across the EU.

Key message: EU's regulatory landscape has been shifting to actively encourage and facilitate the use of PPAs, to achieve climate and energy goals

Sources: Directive (EU) 2024/1711 and Regulation (EU) 2024/1747

EU's toolbox for promoting PPA

1. **Promotion and barrier removal:** Member States shall promote the uptake of PPAs by removing unjustified barriers and discriminatory procedures to ensure price predictability and achieve decarbonization and renewable energy targets, while maintaining competitive and liquid electricity markets and cross-border trade
2. **PPA market platform assessment:** The European Commission will assess the feasibility of voluntary EU-level PPA market platforms, considering their interaction with existing platforms and the potential for demand pooling
3. **Guarantee schemes:** Member States shall ensure, in a coordinated manner, that instruments like market-priced guarantee schemes are in place, to reduce financial risks associated to offtake, payment default in PPAs. These guarantees should be accessible for creditworthy customers that face entry barriers. These instruments could be state-backed guarantees at market price, private guarantees or demand-pooling, in accordance with EU law. Members states may categorize customers that are targeted in a non-discriminatory manner
4. **Limitations on state guarantees:** State-backed PPA guarantees must avoid reducing market liquidity and cannot support fossil fuel generation, with the option to focus solely on new renewable energy (if the relevant PPA market is not mature)
5. **PPAs in support schemes:** Renewable energy support schemes should allow projects to sell part of their electricity through PPAs or other market-based arrangements, provided it doesn't negatively impact competition
6. **PPAs and the design of support schemes:** Member States should use evaluation criteria in support scheme design to incentivize bidders to facilitate PPA access for customers facing entry barriers, without harming competition
7. **PPAs specifications:** PPAs shall specify the bidding zone of delivery and responsibility for cross-zonal transmission rights in case of bidding zone changes
8. **Termination:** PPAs shall outline exit terms and conditions in accordance with EU competition law
9. **Respecting existing PPAs:** When designing measures affecting PPAs, Member States must respect legitimate expectations and consider the impact on current and future PPAs
10. **Market assessment and guidance:** The Commission will periodically assess barriers and transparency in PPA markets and may issue guidance on removing obstacles

Key message: The Electricity Market Design reform package, and specifically Regulation (EU) 2024/1747 Article 19A, launched a toolbox for promoting PPAs

Source: <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32024R1747>

4. Challenges in the Nordic PPA market

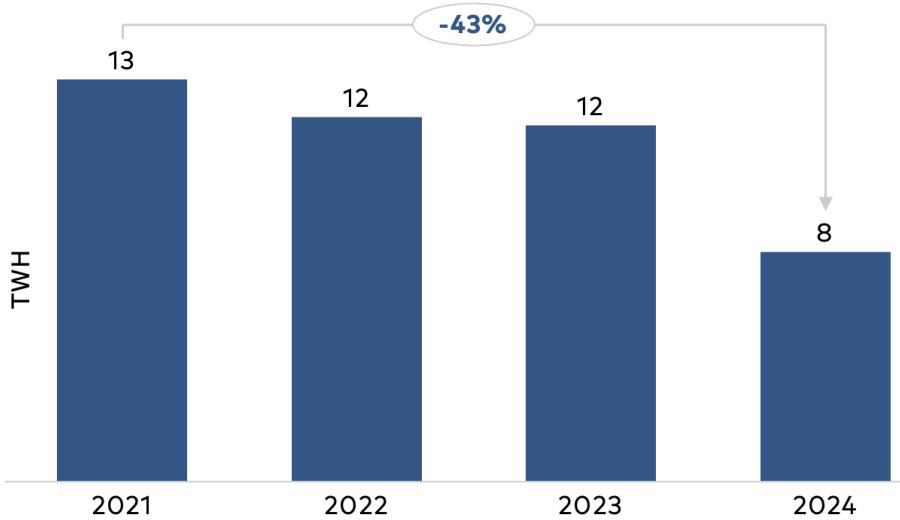


INTRODUCTION

Decreasing trend in the Nordic PPA market

The Nordic PPA market has decreased 43% from 2021 to 2024, according to AFRY's database.. Many factors impact the PPA market, but increased uncertainty and delays in RES development following the energy crisis is generally considered a major driver for the decline. The size of the Nordic PPA market is dependent on the activity in the broader economy, the general development of RES and more PPA-specific challenges.

Key message: The size of the Nordic PPA market is dependent on the general activity in the economy, the development in the RES sector and more PPA-specific challenges

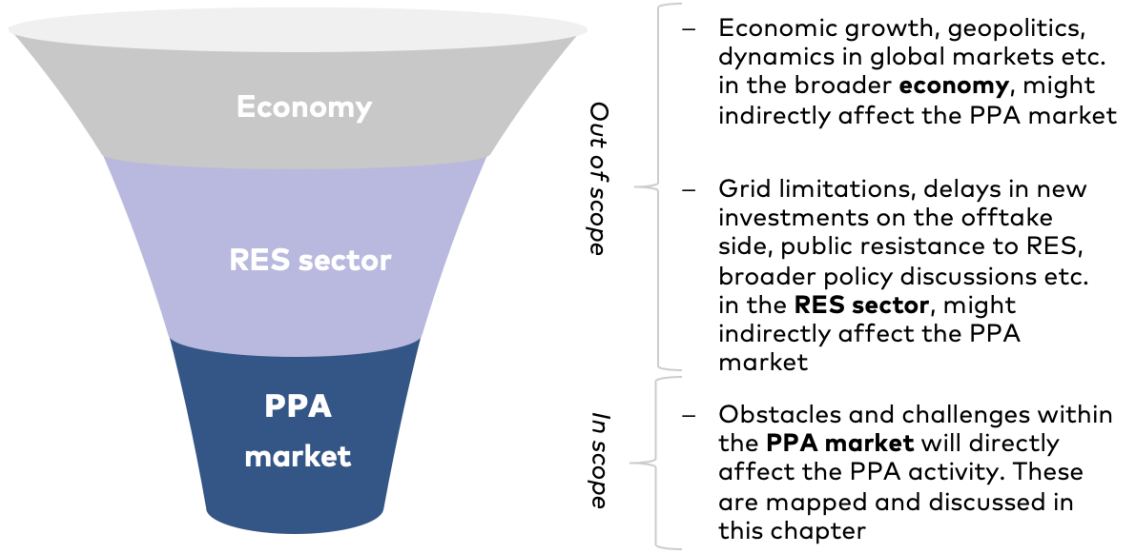


Source: AFRY Management Consulting.

A variety of challenges might affect the PPA activity

In this chapter, the goal is to identify and describe challenges specific to PPAs. The mapped challenges primarily relate to the period following the decision to pursue a PPA, i.e. from the planning and negotiation stage and during the PPA tenor. While there are numerous other obstacles in the broader economy and in the RES sector, affecting the rollout of new RES and as a consequence, the volume of PPAs, however these are not PPA specific, and therefore not within scope of this study.

Key message: The challenges in the Nordic PPA market are mapped via a market survey, by monitoring debates and by using AFRY's internal capabilities.



Source: AFRY Management Consulting.

Sources of information for the mapping of challenges

MARKET SURVEY	MONITORING DEBATES	AFRY'S PPA NETWORK AND PPA INSIGHT
<p>The primary source of information has been survey responses from interest organizations and market participants across all Nordic countries. The survey included 40 questions covering a range of topics related to both regulatory and market matters. 22 respondents participated in the survey:</p> <ul style="list-style-type: none"> ● Geography: 7 respondents from Norway, 5 from Denmark, 4 from Sweden, 3 from Finland and 3 from Iceland ● Market players (19) and interest organizations (3) ● Role in market: Buyer (5), seller (9), both seller and buyer (7) and other role (1) <p>While the survey is not statistically representative of the Nordic PPA market, it offers a strong indication of market participants' perspectives on the Nordic PPA market between May and June 2025. A large share of the major PPA sellers and buyers, was part of the survey.</p>	<p>Between March 2025 and September 2025, the project team consistently tracked and documented various current discussions related to PPAs and associated subjects.</p> <p>Additionally, the team reviewed news coverage from the past two years in relevant media outlets to gain further insight into the latest debates.</p>	<p>AFRY Management Consulting operates 28 offices across five continents, with consultants worldwide possessing experience and expertise in the field of PPA.</p> <p>Our global PPA Network convenes monthly to exchange knowledge, share experiences, and discuss data sources.</p> <p>The project team has engaged multiple experts from the broader PPA network to identify and address Nordic-specific challenges encountered during the project.</p> <p>AFRY Management Consulting brings GWs of experience from various PPA projects, including transaction support, market analysis, and strategic advisory. Through these projects, we have also identified and incorporated relevant challenges and viewpoints.</p>

Challenges in the Nordic PPA market

MARKET

- 1. Price transparency:** The lack of price transparency in the Nordic market creates challenges in market comparability.
- 2. Price volatility and forecasting risk:** Creates challenges for counter-parties seeking to agree on pricing and regulate underlying market risks.
- 3. Bidding areas and basis risk:** The large number of bidding areas in the Nordics limit the pool of PPA counterparties and basis risk has increased for cross price area PPAs following high price area differences in recent years.
- 4. Counterparty risk:** Inherently challenging long term PPAs, and especially if counterparty operates a less mature business model.
- 5. Contract duration:** Differences in preferred PPA durations reduce the pool of suppliers and offtakers with aligned interests.
- 6. Flexibility:** Certain PPA structures may limit flexibility of underlying assets in PPAs.

Key message: 12 challenges in the Nordic PPA market have been identified. They are split into market challenges and challenges related to policy and regulation.

POLICY AND REGULATION

- 7. Changes in regulatory landscape:** The perceived regulatory risk has increased in recent years, undermining investor confidence.
- 8. Uncertainty in RES subsidies:** Subsidies for RES may reduce the need for hedging or introduce uncertainty and distort price signals for PPAs.
- 9. Accounting treatment:** Accounting for PPAs is complex due to the uniqueness of electricity as a commodity and market volatility.
- 10. Environmental reporting:** The discussions around market-based versus location-based scope 2, and the ongoing debate on GOs, create uncertainties.
- 11. Tax:** There are generally not any major tax issues specific to PPAs in the Nordics, except resource rent tax limiting the supply of PPAs in Norway.
- 12. EU regulation:** EU's attempt to promote RES and reach climate targets, has made some regulations complex and challenging for PPAs.

Notes: The listed challenges on this page are limited to certain types of PPAs or geographies. See further details on the following pages.

MARKET

1. Price transparency

There is a lack of price transparency and standardized reference points across countries, which hinders market comparability and reduces confidence for players in the PPA market. This challenge is particularly acute for isolated systems like Iceland's, where bespoke bilateral PPAs dominate and there is limited visibility into broader Nordic or EU-level price formation. Without standardized products or reference indices, it's difficult to benchmark PPA prices or assess the competitiveness of different market options.

Key message: The lack of price transparency and benchmarking options in the Nordic PPA market creates challenges in market comparability.

Four complicating factors for price benchmarking in PPAs

1. Low liquidity in futures market	Limited liquidity in financial forwards market in the Nordics, particularly at price area level.
2. PPAs are not standardized contracts	PPAs are negotiated bilaterally and price is rarely disclosed to the public. Even if prices were disclosed, long term PPAs are not standardized contracts but rather complex and often tailor-made and negotiated to regulate the relevant risks to the specific situation. Comparing the price of two PPAs is therefore in many cases comparing apples to oranges.
3. No marketplace for PPAs	While there are examples of PPA market platforms in Europe ^{[4][1]} , there is no platform that is commonly used in the Nordics providing PPA reference prices (the closest equivalent is baseload contracts on futures markets). The variety in the shape and form of PPAs makes it challenging to establish a common market platform for price comparison.
4. Uncertainty around price projections	Forecasting power price is inherently challenging and forecasts may differ significantly between specialized providers.

4. Examples of platforms: LevelTen Energy, Renewable Exchange, Zeigo, Sanza, and Pexapark.

CASE STUDY: Price transparency naturally forms in markets of homogenous goods

An example is the so-called 'Vestre-avtaler' in Norway. In 2023, a standardized 3-, 5, and 7-year fixed-price PPA for commercial offtakers was launched to increase availability of fixed price contracts for SMEs. These are commonly referred to as 'Vestre-avtaler'.

Under these contracts, hydro and onshore wind can use contract price instead of spot price in resource rent tax calculation (see challenge 11).

The contracts are typically sold to commercial offtakers via electricity retailers, and prices are standardized and transparent on the retailers website.

2. Price volatility and forecasting risk

In the absence of transparent PPA price benchmarks, counterparties must establish a common view of the value of future deliveries. The two key value drivers are baseload electricity price outlook and future price cannibalisation.

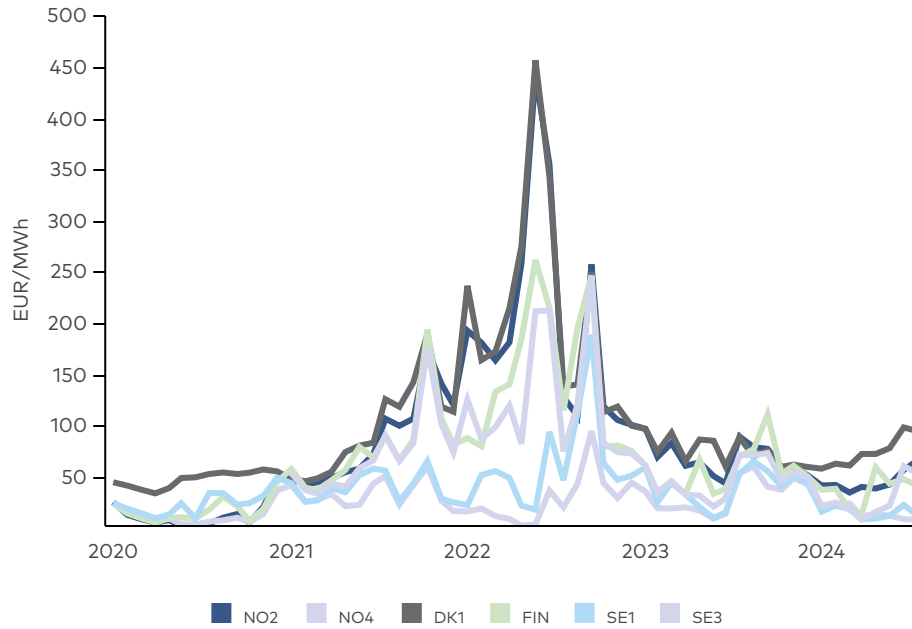
Baseload electricity price outlook

Forecasting power prices and pricing the future market risk is inherently difficult due to the inherent complexity of the power market and, as recent years have demonstrated, its susceptibility to unpredictable market distortions.

While there are several providers of long-term electricity price forecasts, there is no 'commonly agreed future outlook', hence price negotiations can be challenging.

Key message: Price volatility and forecasting risk create challenges for counter-parties seeking to agree on pricing and regulate underlying market risks.

Monthly electricity price in selected bidding areas



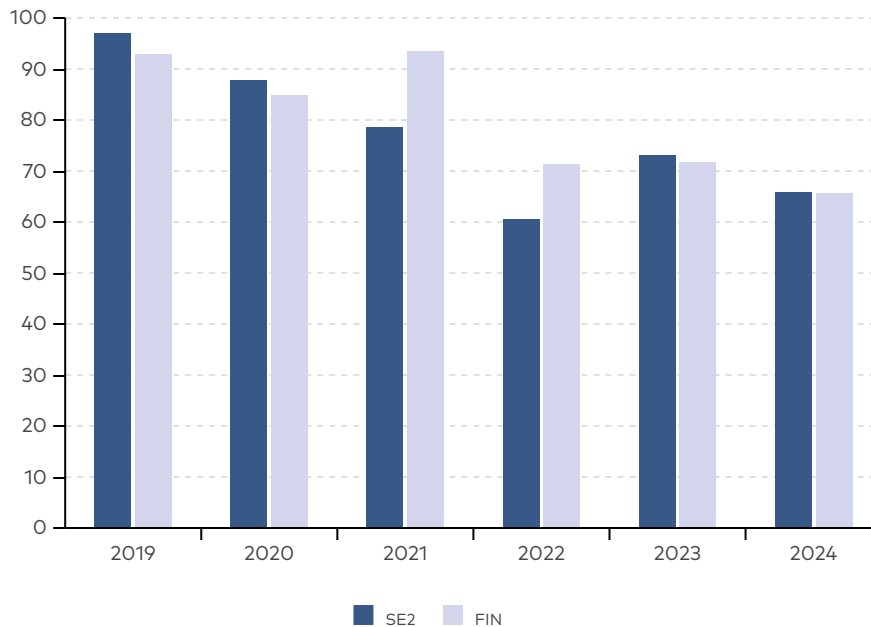
Source: Entso-E, Nord Pool

Future price cannibalisation

The value of intermittent deliveries depend on the expected capture rate of the volumes produced. This is driven by the penetration of the intermittent generation technology as well as the ability of the system to absorb short term oversupply.

The counterparties may have very different expectations of the build-out of intermittent generation over the duration of the PPA, which may complicate price negotiations for as-produced PPAs.

Capture rates for onshore wind in selected areas (%)



Capture rate is defined as the capture price divided by wholesale electricity price. The capture price is the price that a given producer is able to capture in the wholesale electricity market.

Source: Entso-E, Nord Pool

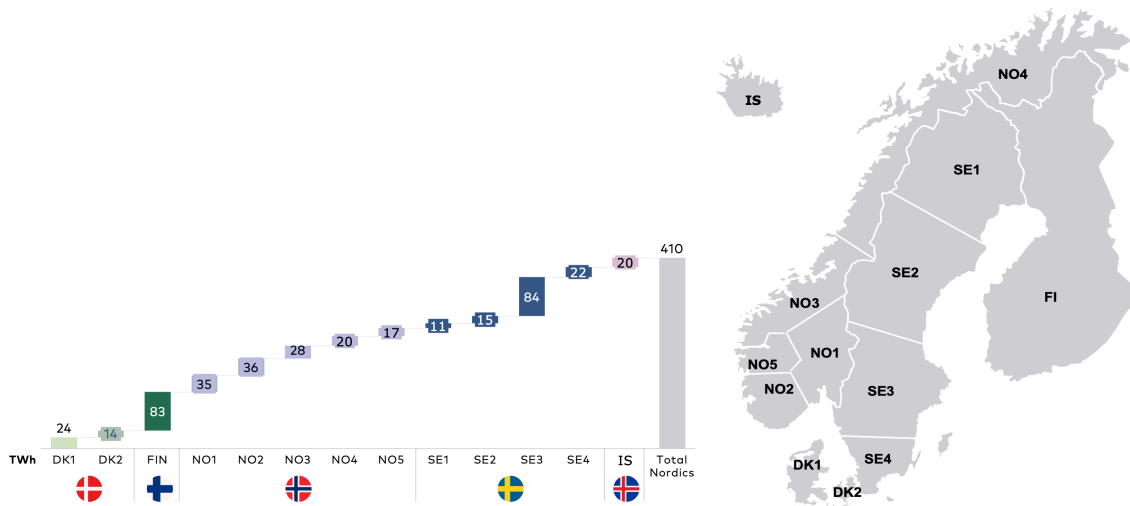
3. Bidding areas and basis risk

There are 12 bidding areas in the Nordic region plus Iceland

The large number of bidding areas in the Nordics, reduce the size of each separate area/market. This increase the challenge of finding counterparties within the same area. Although it is possible to enter into PPAs for two counterparties in separate bidding areas, this introduces a basis risk caused by the price area differences which has increased significantly as shown below.

Key message: The large number of bidding areas in the Nordics limit the pool of PPA counterparties.

Electricity consumption per price area in the Nordics 2024 (TWh)



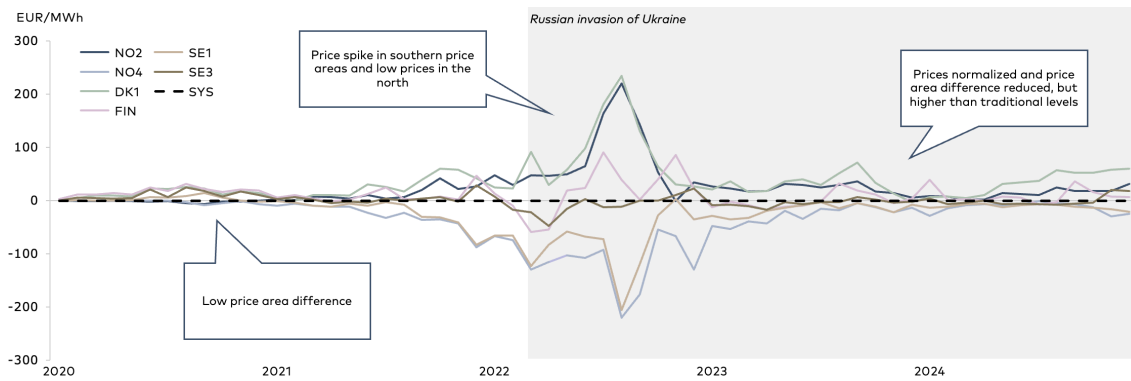
Source: Danish Energy Agency, Finnish Energy Authority, NVE, Swedenergy

Bidding areas and basis risk cont

Basis risk is the risk that there will be a difference in electricity price between two bidding areas and is inherent to financial PPAs where counterparties are located in different bidding areas. The basis risk has increased significantly in recent years, especially in the between north and south in the Nordics. There is generally a lack of instruments to hedge long term basis risk in the Nordics.

Key message: The basis risk has increased for cross price area PPAs following high price area differences in recent years.

Monthly wholesale electricity price difference to system price for selected bidding areas



Notes: Basis risk is not relevant on Iceland because it is an isolated island system.
Source: Nord Pool.

4. Counterparty risk

Counterparty risk is inherent to PPAs

In any PPA, there is an inherent risk that one of the parties involved will default or fail to fulfill their contractual obligations as defined in the PPA without having the financial strength to compensate the opposing party. When financing renewable investments, lenders are particularly aware of and diligent in assessing counterparty credit risk prior to granting loans, since they ultimately carry the cost of defaulted payments. A lack of mechanisms to manage counterparty credit risk can limit the size of the market, as only top-rated entities can participate

When deciding on how to manage the counterparty risk in a PPA, the parties agree on a credit guarantee setup. This process is different from deal to deal and can not be streamlined. In contrast, clearing services in standardized contracts, e.g. futures on exchanges, standardised OTC contracts, may simplify the process. Though, these types of services are challenging when contracts are non-standardized, e.g. bespoke PPAs

Key message: Inherently challenging long term PPAs, and especially if counterparty operates a less mature business model.

There are limited guarantee schemes available

In Norway, Eksfin offers an insurance product (Eksfin Power Guarantee Scheme) to mitigate counterparty credit risk in the form of credit guarantees. However, based on the survey results, these guarantees are rarely utilized due to high costs and

specific requirements that limit their applicability, see fact box below

Currently, there are no similar products available in other Nordic countries, although the European Investment Bank (EIB) is piloting a comparable solution with €500m funding.

Source: EIB, <https://www.eksfin.no/no/produkter/kraftgaranti/>

FACT BOX: Eksfin's Power Guarantee Scheme in Norway

Purpose: Cover the risk of an offtaker defaulting payment obligations under a PPA

Eligibility: Specific Norwegian industry: wood processing, chemicals, and metals

Duration: PPAs in 7-25 year range

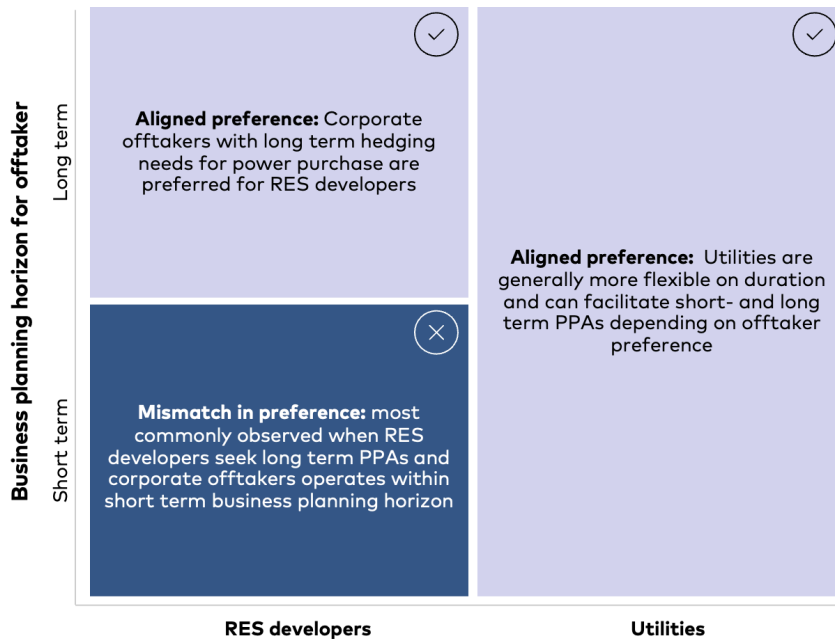
Volume requirement: Offtakers with 10GWh p.a. consumption and PPA volume of at least 35GWh total PPA volume over contract duration

5. Contract duration

RES developers usually aim for a minimum 10-year term to ensure stable cash flows aligned with long-term debt obligations. **Utilities** tend to be more flexible but may have specific board directives regarding hedging duration and volume that they must comply with. **Corporate offtakers'** hedging needs vary widely, influenced by both their internal policies and mechanisms in related upstream or downstream markets. Some companies have a board mandate on business planning horizon limited to 1-3 years, while others may have decades long horizon

Key message: Differences in preferred PPA durations reduce the pool of suppliers and offtakers with aligned interests.

Duration mismatch is most common between RES developers and corporate offtakers with short term business planning horizon



6. Barriers to flexibility

Flexibility in this context refers to market participants deviating from planned or intended production or consumption schedule in response to a system need. This can be long- or short-term deviations and the flexibility can be triggered explicitly (activation of products/services) or implicitly (in response to price signals).

The dynamics of balancing supply and demand differ between the mainland Nordic region and Iceland, yet PPAs are generally not a barrier for most volumes:

Mainland Nordics: The majority of supply and demand balancing is carried out on the wholesale electricity market, operating under marginal pricing principles. PPA volumes are typically nominated in the day-ahead auction and contribute to price formation, although some bids may be submitted at minimum price levels

Iceland: Most balancing of supply and demand is managed bilaterally through PPAs between producers and industrial consumers. Flexibility options are typically included in the PPAs where consumers or producers curtail depending on system needs (mostly in response to hydrological conditions)

The impact of PPAs on ancillary services depends on the PPA's design and incentive structure. In some cases, incentive mechanisms may limit the flexibility of one or both parties. In rarer instances, specific contractual clauses may explicitly restrict activities such as participation in ancillary services.

Key message: Certain PPA structures may limit flexibility in underlying assets of PPAs.

CASE STUDY: Example of PPAs limiting flexibility

Consider a physical PPA between a wind farm and a corporate offtaker:

Volume structure: as Produced

Price: €40/MWh fixed price

In this arrangement, the wind farm is paid a fixed price for all energy produced, with settlement based on metered output. Consequently, the producer is incentivised to maximise generation regardless of spot market prices, typically bidding at the minimum price in the day-ahead market. Moreover, it is disincentivised from offering downward regulation in ancillary services (such as aFRR down or mFRR down).

If a sufficiently large share of production volumes in the system operates under such incentives, the result can be persistent oversupply, leading to frequent negative price events in the market and increased system services cost for the TSO.

POLICY AND REGULATION

7. Changes in regulatory landscape

Given the long-term nature of PPAs, it is crucial to ensure predictability in regulations that impact the PPAs market directly or indirectly. This includes market design reforms, tax policies, accounting standards, and sustainability reporting obligations, etc.

The Nordic market has traditionally been known for its stable and transparent regulatory framework with low regulatory uncertainty and strong investor confidence.

In recent years, particularly following the energy crisis, there have been several examples of state interventions and regulatory shifts that have impacted the PPA market. As such, the perceived regulatory uncertainty is increased among market participants in the Nordics and has – to some extent – impacted investor confidence and willingness to commit to long term agreements.

Key message: the perceived regulatory risk has increased in recent years, undermining investor confidence.

Examples of changes in the regulatory landscape

Windfall taxes	In response to the energy crisis, there were significant push to reallocate the extraordinary revenues collected by power producers. As such, wind fall taxes in various designs were implemented in all Nordic countries except Iceland.
RES subsidies	Ongoing changes in RES subsidy amounts and design create uncertainty, affecting electricity price forecasts and potentially reducing PPA demand. Further details on these challenges follow on the next page.
Changes to bidding areas	Bidding areas are under regular review and are changed when deemed necessary. While there are clear benefits to optimize borders of bidding areas to reduce congestion and equalize prices across areas, it also represent a significant market risk for PPA players and affect hurdle rates.

8. Uncertainty in RES subsidies

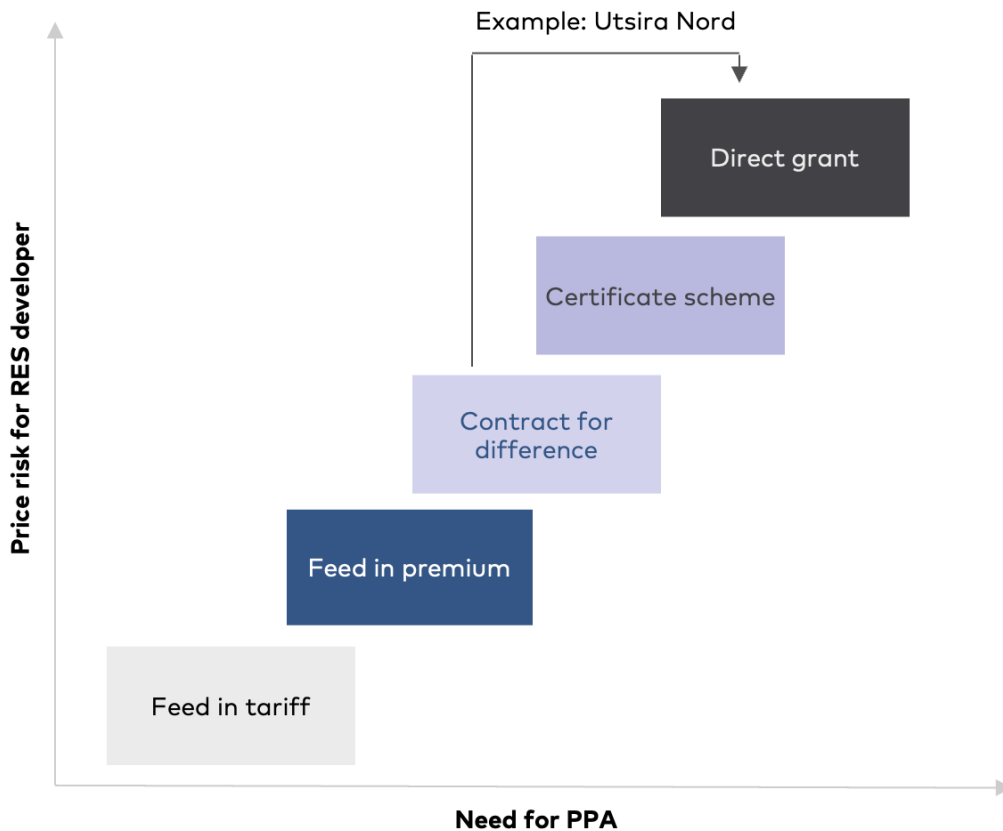
One of the main reasons why PPAs has been and is a key driver behind the RES development in the Nordic region is a subsidy free environment. Some subsidy schemes tend to reduce the price risk, which again reduces the need for hedging tools like PPAs.

RES subsidies can range from feed-in-tariffs, CfDs, certificate schemes or variations in between. Especially feed-in-tariffs and CfDs reduce the need for hedging, thus the need for PPAs. Certificate systems on the other hand, may go hand-in-hand with PPAs. The Swedish-Norwegian El-certificate scheme played an important role in deploying onshore wind in Sweden and Norway, increasing the revenues for new projects and making them more profitable. The scheme did not directly support PPAs, but when prices collapsed in the late 2010s, the role of PPAs became more important due to a larger need for revenue certainty from investors.

When governments discuss the need for subsidising RES, they often discuss several different alternative schemes. The final choice of subsidy scheme highly affect the need for a PPA. As an example, in the offshore wind auction for Utsira Nord in Norway, the government first indicated a CfD support mechanism, but ended up with an upfront, direct grant mechanism. Suddenly, the market participants who were in the process of bidding for Utsira Nord needed to change their strategy towards a setup where PPAs played a crucial role for price hedging.

Key message: Subsidies for RES may reduce the need for hedging or introduce uncertainty and distort price signals for PPAs.

Illustrative: The Utsira Nord offshore wind case



9. Accounting treatment

The complexity in accounting treatment of PPAs is a barrier for PPA players. For SMEs, national accounting standards apply, and for large groups and listed companies, International Financial Reporting Standard (IFRS) apply. These are generally not designed in a way which accommodates the characteristics of electricity as a commodity. In some cases, the accounting treatment can lead to an artificial volatility in the financial reporting (not necessarily reflecting underlying revenues and costs) which may be difficult to explain to boards and owners. At a high level, accounting standards differentiate between physical and financial PPAs, the latter of which is considered the most challenging.

Key message: Accounting for PPAs is complex due to the uniqueness of electricity as a commodity and market volatility.

Challenges under IFRS	Description	Relevant for
1. Identifying correct accounting treatment	Identifying the correct accounting treatment for PPAs can in some cases be tricky as the purpose of the agreement and surrounding context must be assessed. Electricity is a unique type of commodity that can not be stored directly, and there can be significant volatility in both volume delivered and the underlying market price. The bespoke nature of PPA design further adds to the complexity, and the relevant accounting treatment may vary significantly from case to case. Generally, physical PPAs are considered 'easier' than financial PPAs as financial PPAs often qualify as derivatives under IFRS 9.	Both sellers and offtakers, but particularly offtakers
2. PPAs classified as financial derivatives	Under IFRS 9, financial derivatives are subject to Fair Value through Profit or Loss (FVTPL) accounting, meaning changes in their fair value must be reported in the income statement, leading to potential volatility. The volatile nature of electricity prices causes significant swings in reported earnings and complicates financial planning and reporting. Additionally, accurately measuring fair value is difficult due to complexity in forecasting the electricity market.	Mostly financial PPAs, but also some physical PPAs (e.g. if 'own-use' exemptions does not apply)
3. 'Own use' exemptions	The own use exemption under IFRS 9 can simplify accounting for buyers of physical PPAs but can be difficult to apply due to restrictive criteria. For example if there is the need to sell excess electricity due to volume deviations (i.e. net cash settlement), the own use exemption may not apply.	Offtakers of physical PPAs
4. Hedge accounting	Applying hedge accounting reduce volatility in the income statement, but it there are restrictive requirements to qualify. PPAs often involve volume risks in addition to market price risks, which can complicate the application of hedge accounting.	Mostly financial PPAs, but also physical PPAs (e.g. if 'own-use' exemptions does not apply)
5. Lease accounting	In some cases, PPAs may be considered leases under IFRS 16 with the associated challenges. This is however less common. If the offtaker obtain all of the economic benefits generated by the asset and has the right to control how the asset is used, lease accounting may apply. The former criteria is often fulfilled in (physical) as produced PPAs, but the latter is rarely fulfilled.	Offtakers of physical PPAs

10. Environmental reporting

Background

A key driver for the demand of PPAs, has been the need for corporates to claim the renewable attributes for environmental reporting purposes. The Greenhouse Gas Protocol is the most important standard for environmental reporting globally.

Environmental reporting is often divided into scope 1, 2 and 3. Scope 2 refers to indirect emissions from the generation of purchased electricity and is the relevant scope when discussing PPAs.

In Europe, The EU Commission adopted in 2023 the European Sustainability Reporting Standards (ESRS) for use by all companies subject to the Corporate Sustainability Reporting Directive (CSRD). The ESRS, following the principle of GHG-P, state that undertakings shall apply location-based and market-based methods and provide information on the share and types of contractual instruments (e.g. Renewable PPA, unbundled GOs, etc.). All Nordic countries have incorporated CSRD directly as EU members, or via their EEA obligations (Iceland and Norway).

Key message: The discussions around market-based versus location-based scope 2, and the ongoing debate on GOs, create uncertainties

FACT BOX

Scope 2 emissions should be reported using two methods, according to the Greenhouse Gas Protocol (GHG-P):

Location-based: Based on the average emissions intensity from the generation in the grid, where the electricity is consumed

Market-based: Based on emissions from electricity generation that the company has purposefully chosen through contractual instruments, e.g. Guarantees of Origin in Europe

Source: Corporate Sustainability Reporting Directive, The Greenhouse gas Protocol and AIB.org

Challenges and discussions

One important discussion with regards to PPAs in the Nordics, especially in Norway and Iceland, is the need for including GOs or not. Some power intensive industries have not included GOs in their PPAs and focused their scope-2 reporting mainly on a location-based method. This again has led to a discussion on so-called double-counting, if the given renewable energy is claimed twice – both by the PPA buyer and by the buyer of the unbundled GOs. This was the case when AIB banned Icelandic GOs in 2023, and similar tendencies have been discussed in Norway, where the GO system has been a never-ending debate. The CSRD/ESRS has made reporting standards clearer but has still not removed the issue with double counting.

Another important challenge, is the risk of changes in EU regulation, national regulation or changes in reporting criteria from important market initiatives like RE100, Science-based targets initiative (SBTi) or the Greenhouse Gas Protocol. There are several examples of these risks and challenges which can be barriers for PPAs:

Method: If location-based methods are more valuable than market-based methods, a PPA with GOs might be redundant.

Additionality: If a PPA linked to new RES is defined to be more attractive than a PPA linked to existing RES, it might reduce the value of the latter.

Temporal correlation: If more granular reporting (e.g. 24/7) is requested, it could change the PPA market.

Geographical correlation: If local PPAs are more valuable than long-distance PPAs, this could affect the PPA market.

11. Tax risk

Resource rent tax in Norway

Hydro and onshore wind power are subject to resource rent taxation in Norway. The resource rent tax is applied to 'extraordinary' profits after corporate income tax. As of August 2025, the effective tax rate for resource rent is 45% and 25% for hydro and onshore wind respectively.

In most cases, the resource rent tax is calculated based on the day-ahead spot prices, regardless of the producers achieved price through a fixed price agreement. However, for volumes delivered on certain PPAs (see conditions below), the producer may use the achieved contract price as basis for the resource rent tax calculation. This gives increased predictability and as a result, increasing hedging capabilities with respect to the eligible PPAs.

Key message: There are generally not any major tax issues specific to PPAs in the Nordics, except resource rent tax limiting the supply of PPAs in Norway

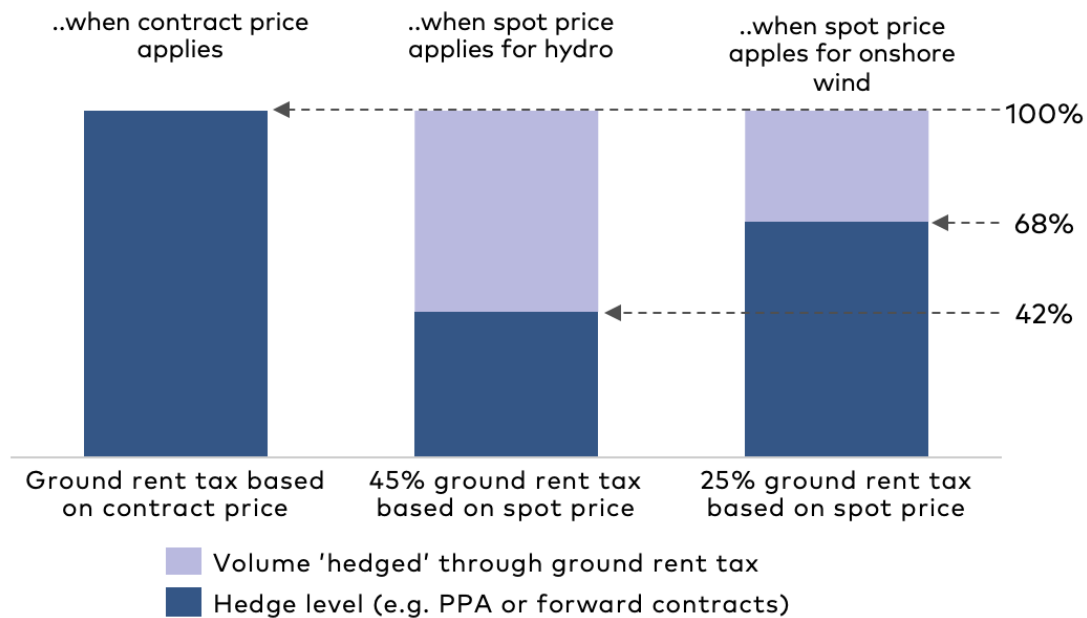
RELEVANT CONDITIONS WHERE ACHIEVED CONTRACT PRICE CAN BE USED	
Hydro power	Onshore wind
New PPAs with duration of minimum 3 years, where the total power delivery is at least 150 GWh during the contract term and the power is consumed in certain power intensive industries.	New PPAs with duration of minimum 3 years, where the PPA is entered into in the period 2024–2030 with the purpose of hedging production from new onshore wind power plant projects established in the same period.
PPAs with duration of 3, 5 or 7 years that are entered into on certain statutory, standardised terms, and with a cap on the premium added by any intermediary distributors (commonly referred to as 'Vestre-avtale').	

Source: Norwegian Tax Law (skatteloven) §18-3.

Resource rent tax may reduce PPA supply

Since resource rent tax is usually linked to spot market prices, hydro and onshore wind producers must take this into account when entering long-term fixed priced PPAs. If producers over-hedge, the tax can pose a considerable downside risk. As such, the resource rent tax affects the extent to which they are willing to hedge their production. The hedge level that minimize volatility in earnings after tax for producers is reduced depending on resource rent tax level as illustrated below:

The hedge level minimizing volatility in earnings after tax..



Source: Norwegian Tax Law (skatteloven) §18-3.

12. EU regulation

Good intentions, complex regulations

In general, the EU has been promoting PPAs as a key tool in several regulations in recent years. Intuitively, this is a positive trend for the PPA market. Even with these obviously positive intentions, some of the regulations have ended up as quite complex and unclear. This again adds uncertainty and complexity to the PPA negotiations, which might cause delays or a full stop to the agreement.

In the survey responses, market participants did not point out one single EU-regulation as a key challenge for the PPA market, but more the general challenge of adding layers of complexity without following up with a clearly defined framework. The latter creates uncertainty and delays in negotiations.

This tendency is also one of the essential discussions of the Draghi Report, which was published in 2024. The report provides a diagnosis of Europe's declining competitiveness and proposes a new economic strategy. Critically, the report links industrial competitiveness directly to decarbonization, advocating for a joint plan to ensure the energy transition is a source of strength, not a burden. As a side note,

the Draghi report also explicitly highlights the PPA as a key tool.

Key message: EU's attempt to promote RES and reach climate targets, has made some regulations complex and challenging for PPAs

Examples of regulations which creates complexity

RFNBO rules: The EU's Delegated Act for Renewable Fuels of Non-Biological Origin outlines how such fuels (e.g. green hydrogen) can be defined as renewable. The PPA is an essential tool in these rules, but it must be structured to meet strict criteria on additionality, as well as temporal and geographical correlation. The challenge is two-sided, both as these rules adds layers of new structures to the PPA (complexity), but also that the rules have not been clear and defined (uncertainty).

CISAF: The EU's Clean Industrial Deal State Aid Framework is a new set of rules designed to streamline state aid for the green transition. It aims to make it easier for Member States to support clean energy, industrial decarbonization, and clean technology. While CISAF is intended to accelerate the clean energy transition, it could complicate the PPA market. It can create market distortions by favoring subsidised projects, introduce complexity in combining different funding mechanisms, and incentivise businesses to pursue government aid over market-based solutions like PPAs, potentially slowing the growth of the PPA market.

CASE STUDY: Uncertainty surrounds Swedish hydrogen producers over RFNBO PPA requirements

EU regulations mandate that hydrogen producers must secure PPAs with renewable energy plants no older than three years to have their production recognized as green. An exemption applies to companies operating in bidding zones where renewable energy accounts for more than 90% of the supply. However, the rules remain unclear about whether hydrogen producers in areas with high renewable energy output—such as northern Sweden’s SE1 and SE2 zones—are required to purchase Guarantees of Origin (GOs) to confirm their use of renewable energy. To avoid double counting, either the hydrogen producer must obtain and cancel the GOs, or the power producer must do so. This ambiguity has sparked debate, with some hydrogen producers contending that GOs are not necessary for RFNBO compliance.

Source: european-union.europa.eu, fornybarnorge.no and energiforetagen.se

5. Strategies to overcome the challenges



INTRODUCTION

Key features of the Nordic PPA market to consider

PPAs are a means to an end	The Nordic PPA market has been a success	PPAs comes in many shapes and sizes	PPAs may not be suited for all types of offtakers
<p>PPAs are a strategic tool for market players to achieve specific objectives (i.e. financing tool, price hedge or sustainability objectives).</p> <p>Policymakers should focus on enabling PPAs as a tool to support broader goals (RES targets, decarbonization targets, economic growth, etc.), rather than merely increasing their quantity.</p>	<p>The Nordic PPA market has demonstrated strong growth and maturity, driven by market mechanisms.</p> <p>Low regulatory risk perception has been a critical success factor. This has resulted in substantial penetration of subsidy free renewable energy.</p>	<p>PPAs are tailor-made to suit the specific needs of buyers and sellers, including variations in project size, contract duration, and pricing structures.</p> <p>The bespoke nature of PPAs makes standardization and direct comparison difficult, but it allows for flexibility and innovation in contract design to mitigate market risks.</p>	<p>Not all offtakers have the creditworthiness, risk appetite, planning horizon or operational capacity to effectively engage in PPAs.</p> <p>Smaller or less experienced offtakers may face challenges related to contract complexity, long-term commitments, and risk management requirements.</p>

PPAS VERSUS OTHER CONTRACT TYPES

When investigating PPAs and challenges in the PPA market, it is highly important to understand what PPAs are and what characterizes them. PPA's have a set of pros and cons, but if you try to improve one negative set you might lose some positive sets. As an example, PPAs can not be both homogeneous and flexible.

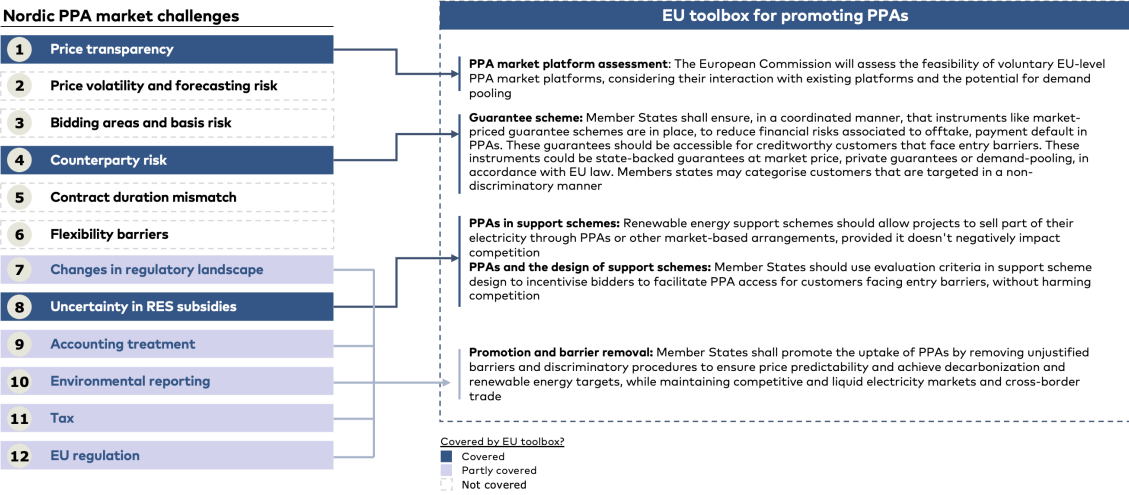
Key message: PPAs are suited for certain market segments and have a set of pros and cons. Other contract types have other characteristics

	PPAs	Non-standard OTC* contracts	Standard OTC contracts	Standard exchange contracts
Horizon	Long-term	Short to medium term	Short to medium term	Short to medium term
Price transparency	Poor	To a certain degree	To a certain degree	Good
Flexible terms	Flexible	Flexible	Non-flexible	Non-flexible
Homogeneous	No	No	To a certain degree	Yes
Bankability	Suitable	Suitable, to a small degree	Not suitable	Not suitable
Tradeable	No	Yes, but to a small degree	Yes, to a certain degree	Yes
Clearing services	No	No	Yes	Yes

*Over-the-counter

EU TOOLBOX

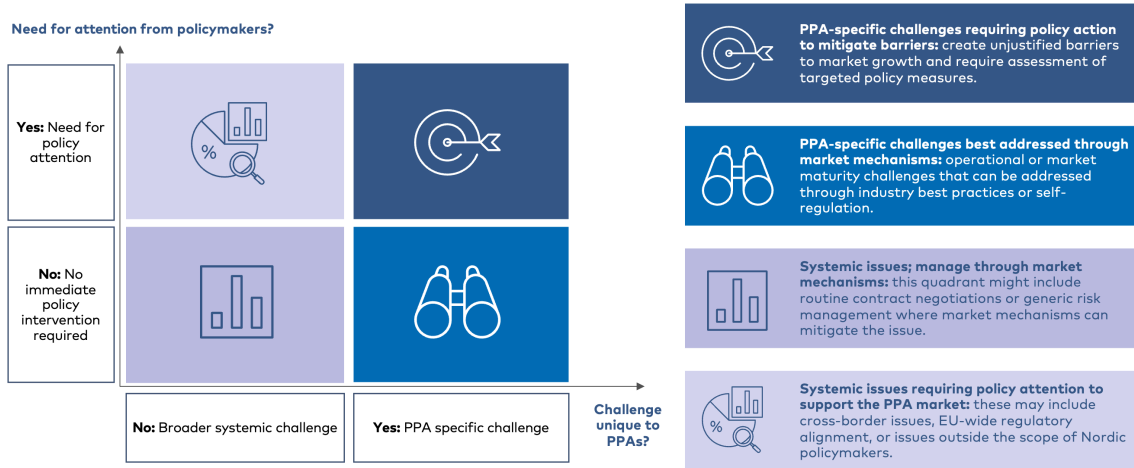
EU's toolbox for promoting PPAs cover or partly cover several of the challenges in the Nordic PPA market. When we compare the mapped PPA challenges to EU's toolbox for promoting PPAs, we see that the toolbox cover or partly cover several of the challenges in the Nordic PPA market.



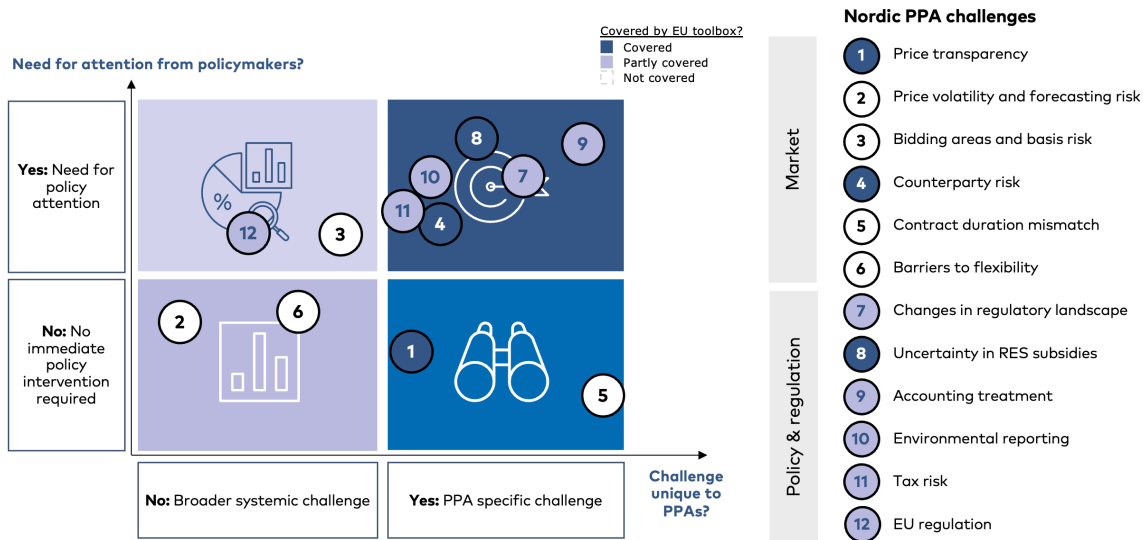
Source: Regulation (EU) 2024/1747

FRAMEWORK

We have developed a prioritisation framework for strategic consideration of the specific challenges in the Nordic PPA market.



The mapping exercise indicates the EU toolbox addresses most of Nordic PPA challenges where policy attention is needed.



STRATEGIC CONSIDERATIONS AND NEXT STEPS



PPA-specific challenges requiring policy action to mitigate barriers

Challenge	Strategic consideration for policymakers	Proposed next steps	Relevant for
4 Counterparty risk	<p>Credit guarantees should be available at market rate for credit worthy PPA players: Market participants highlight counterparty risk as one of the main barriers in the Nordic PPA market. For Nordic policymakers, the focus should be on creating an environment that facilitates market-based guarantee schemes for PPAs. This involves ensuring that there are no unnecessary regulatory or structural barriers preventing creditworthy offtakers from accessing guarantees on commercial terms. At the same time, policymakers should generally avoid interventions that could distort the credit market, such as subsidies or artificial support mechanisms. If an offtaker is deemed non-creditworthy by the market, or if the cost of securing a credit guarantee becomes decisive, this outcome should be respected as a reflection of market realities rather than corrected through policy intervention.</p> <p>Demand pooling, i.e. pooling of counterparty risk, is inherently challenging when contracts are non-standardized, e.g. bespoke PPAs</p>	Investigate whether credit guarantees are sufficiently available for all credit worthy PPA players in the Nordics. If not, take active steps to facilitate market guarantee schemes as envisioned by the EU toolbox, and leverage lessons learned from existing schemes (Eksfin, EIB pilot, etc.)	
8 Uncertainty in RES subsidies	<p>Subsidies affect the PPA market: Subsidies and subsidy design directly influence the PPA market and impact investment strategies of market players. The implications of subsidy schemes on the PPA market should be thoroughly assessed in design phase. Once a scheme is established, changes to the scheme increase perceived risks among market players and undermine investor confidence.</p> <p>Direct grant design triggers need for PPAs: Subsidy schemes based on direct grant are more effective in facilitating PPAs and enables PPA players to innovate on revenue. A subsidy design which transfer risk from state to market players might be beneficial for the state</p>	Ensure impact on PPAs are properly considered in subsidy design.	

PPA-specific challenges requiring policy action to mitigate barriers

Challenge	Strategic consideration for policymakers	Proposed next steps	Relevant for
7 Changes in regulatory landscape	<p>The perceived risk increases fast and is slowly removed: Nordic countries are generally renowned for stability in regulatory conditions, but the perceived risk has increased recently, especially in Norway. This create hesitation to long-term PPA commitment and risk premiums increase.</p>	Assess measures and ways to promote predictability and investor trust in regulation, tax, and reporting requirements	
9 Accounting treatment	<p>These challenges are not explicitly covered in the EU toolbox, but it emphasizes the importance of removing unjustified barriers and discriminatory procedures to PPAs.</p> <p>Electricity is a different type of commodity: Electricity cannot be stored directly, unlike other goods. IFRS have taken steps* in removing hurdles in accounting treatment of RES PPAs. Simplifications in accounting treatment of PPAs may increase attractiveness to innovate on PPAs.</p>	Evaluate whether simplification in national accounting rules is needed to align accounting rules with the characteristics of electricity purchase	
10 Environmental reporting	<p>The key question is whether there are any unnecessary barriers or hurdles related to these challenges.</p> <p>Clarification on scope 2 reporting requirement is needed: For many offtakers, environmental attributes are essential when purchasing electricity through PPAs. The environmental attributes are used in scope 2 reporting. However, the guidelines on scope 2 reporting is not sufficiently clear and is open to interpretation.</p>	Promote common and consistent guidelines for scope 2 reporting in accordance with CSRD and global standards	
11 Tax risk	<p>The current tax scheme in Norway is biased: The Norwegian resource rent taxation favour certain PPAs and selected industries and limit cross-border PPAs. The scheme restricts the supply of PPAs by limiting the pool of potential offtakers for hydro and onshore wind.</p>	Evaluate if the existing tax scheme is biased and investigate methods to establish a fairer tax for all participants in the PPA market	

*The International Accounting Standards Board (IASB) has issued targeted amendments to IFRS 9 and IFRS 7 for 'nature-dependent electricity contracts' (PPAs supplied by intermittent renewables) 1) clarify the application of the 'own-use' requirements, 2) permitting hedge accounting if these contracts are used as hedging instruments, and 3) adding new disclosure requirements to enable investors to understand the effect of these contracts on a company's financial performance and cash flows.



PPA-specific challenges best addressed through market mechanisms

Challenge	Strategic consideration for policymakers	Proposed next steps	Relevant for
<p>1 Price transparency</p>	<p>Mandating full public disclosure of PPA terms could expose sensitive business information, potentially discouraging market participation: On a general basis, price transparency is desirable in any market and is important for market efficiency. However, in a market with non-homogenous goods (e.g. the PPA market), it is challenging to achieve price transparency.</p> <p>Standardized PPAs would provide price transparency, but hinders innovation: Price transparency would naturally form when the goods sold are homogenous (e.g. 'Vestretavtaler' in Norway). Without those conditions, price transparency is not realistic in practice. Enforcing standardization could impact the flexibility that allows PPAs to innovate and adapt to market conditions.</p> <p>A market platform may be worth investigating: A voluntary platform to report aggregated PPA terms, such as an overview of agreements, demand pooling, or reporting interest in PPAs, could provide valuable market insights without compromising flexibility and commercial confidentiality. There are however examples of PPA market platforms in Europe with varying degrees of adoption, suggesting the market is ready to provide this solution if there is sufficient demand for it*</p>	<p>Await European Commission evaluation of the feasibility of an EU level market platform.</p> <p>The PPA market itself is not homogenous enough to facilitate price transparency. However, improving related benchmarking options, such as the futures market or 'Vestretavtaler', would provide useful reference points for negotiating PPA prices.</p>	
<p>5 Contract duration mismatch</p>	<p>Offtakers have different business planning horizons: The lack of long-term offtakers is a challenge for RES developers in certain Nordic price areas. In some cases, this reflects a limitation of PPAs as a tool, particularly when the business planning horizon of an offtaker is shorter than the typical duration of a cPPA.</p> <p>The key question is whether factors related to policy and regulation are limiting offtakers' appetite for long-term PPAs.</p>	<p>No obvious policy or regulatory barriers related to this challenge</p>	

* Examples of platforms: LevelTen Energy, Renewable Exchange, Zeigo, Sanza, and Pexapark





Systemic issues that should be managed through market mechanisms

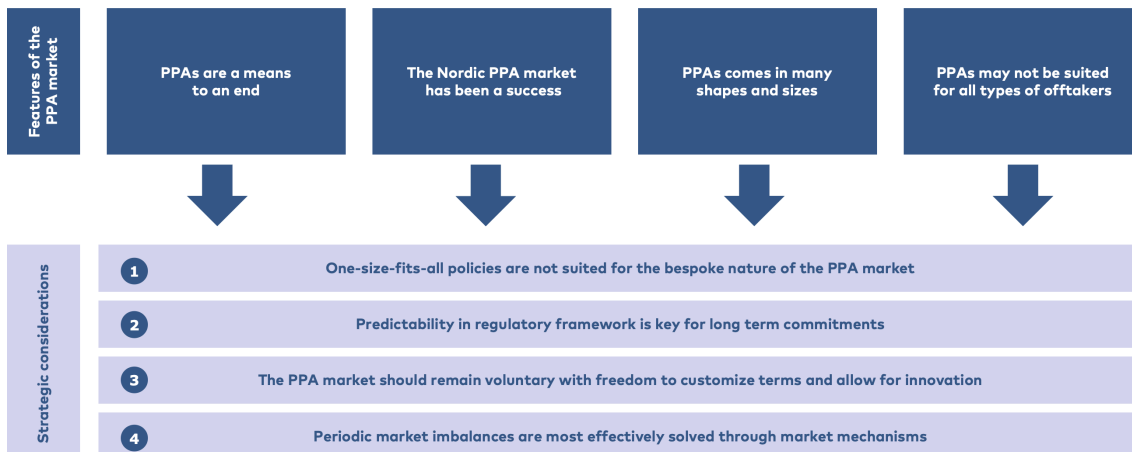
Challenge	Strategic consideration for policymakers	Proposed next steps	Relevant for
<p>2 Price volatility and forecasting risk</p>	<p>Market dynamics are constantly changing, PPAs need to adapt: Over the past few years, the number of hours with negative prices has increased, capture rates are declining, balancing prices are increasingly volatile. The complexity of the market dynamics makes forecasting price trends and market shifts difficult. These factors complicate price and risk sharing negotiations in the PPA market. However, this does not necessarily imply that regulatory intervention is required. Instead, market participants need to adjust to the evolving market conditions.</p> <p>To facilitate this adaptation, it is crucial that PPAs remain voluntary and open for innovation. Policymakers should focus on eliminating obstacles to innovation, such as those related to financial reporting and ensuring fair market access for all technologies.</p>	<p>Allow PPAs to adapt to market conditions, not tampering with market mechanisms and market signals to promote PPAs</p>	
<p>6 Barriers to flexibility</p>	<p>Barriers to flexibility for assets under a PPA are not related to policy or regulation: There are generally no policy or regulatory barriers in the Nordics limiting the flexibility of assets under PPAs, it has rather been the design of PPAs limiting flexibility (for some PPAs). If there is value in flexibility, there is also an incentive for market players to develop PPAs in a direction that could better facilitate the flexibility, whether explicit or implicit flexibility.</p>		



Systemic issues requiring policy attention to support the PPA market

Challenge	Strategic consideration for policymakers	Proposed next steps	Relevant for
<p>3 Bidding areas and basis risk</p>	<p>Bidding zone reviews affect the PPA market: The granularity in Nordic bidding areas largely reflect the physical realities of the transmission grid and provides more locationally accurate price signals. At the same time, having many and small bidding areas is generally negative for hedging opportunities, including PPAs.</p> <p>The constant risk of changes to bidding areas from regular bidding zone reviews increase the risk perception among PPA players and may create hesitation for long term PPA commitments. However, this can be mitigated in PPAs with renegotiation clauses.</p> <p>Strengthening the transmission grid is urgent: There is a need for managing the increased basis risk in the Nordics. Establishing clear and efficient processes to accelerate the strengthening of the transmission system could mitigate these risks and enable a more stable PPA market.</p>	<p>Consider impact on the hedging markets in general, when reviewing bidding zone structures</p> <p>Strengthen transmission capacity between bidding areas, especially between north and south</p>	
<p>12 EU regulation</p>	<p>Implementation of new EU regulation affect the PPA market: EU regards PPAs as a key tool for promoting new RES. Certain EU regulations such as RFNBOs and CISAF have however added new layers of complexity and uncertainty to PPAs. While intentions are good, the complexity and uncertainty is challenging for market players to navigate.</p>	<p>Pursue harmonized implementation across the Nordics and clarify uncertainties</p>	

OVERARCHING STRATEGIC CONSIDERATIONS



About this publication

Power Purchase Agreements and their use in the Nordics

Kathrine Stene Bakke, Lars Ragnar Solberg, Fredrik Pettersen

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