

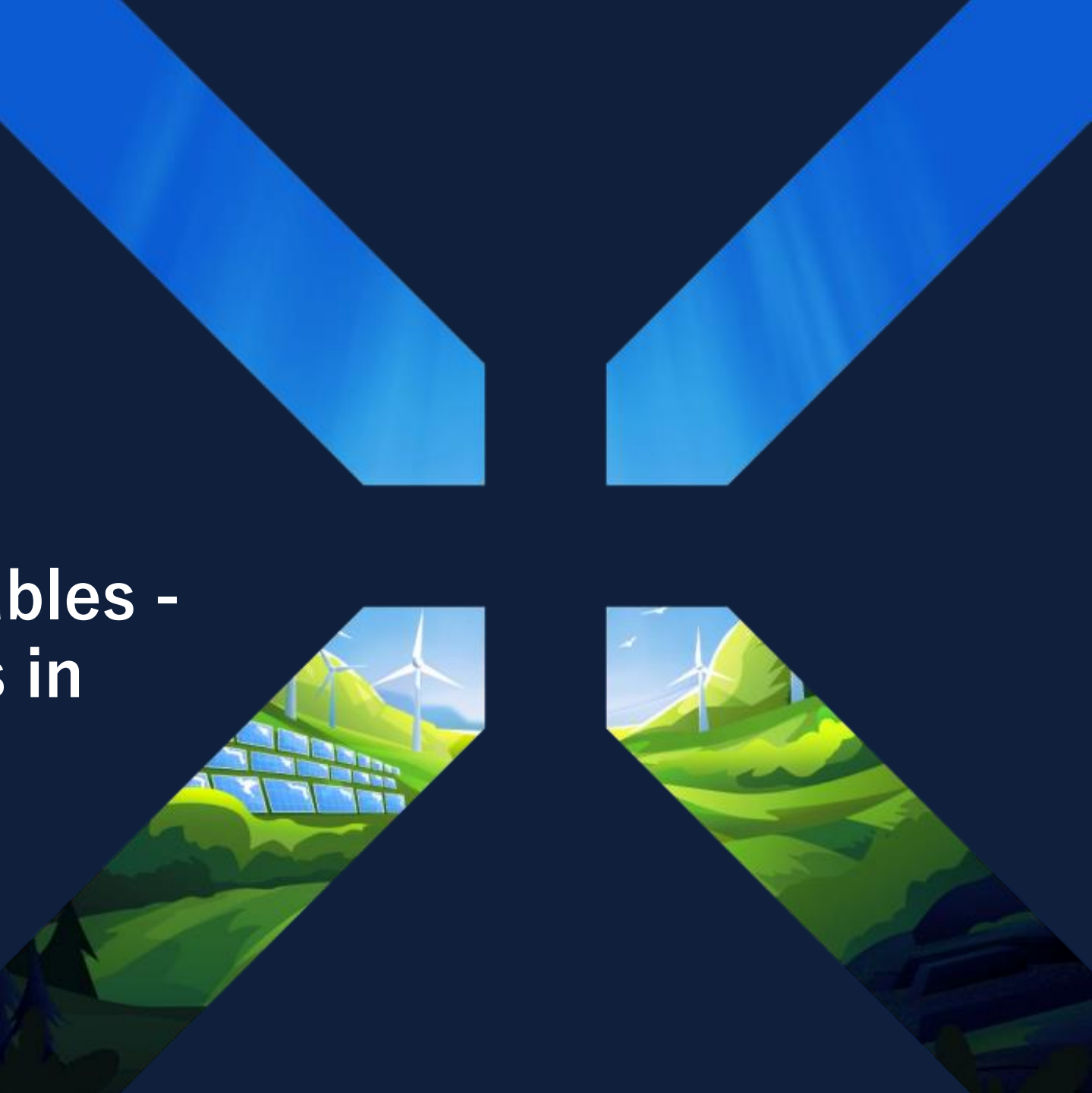
PEXAPARK

PPAs to support renewables - Key Trends and Themes in the Nordic markets

Montel Nordic Energy Day 2023

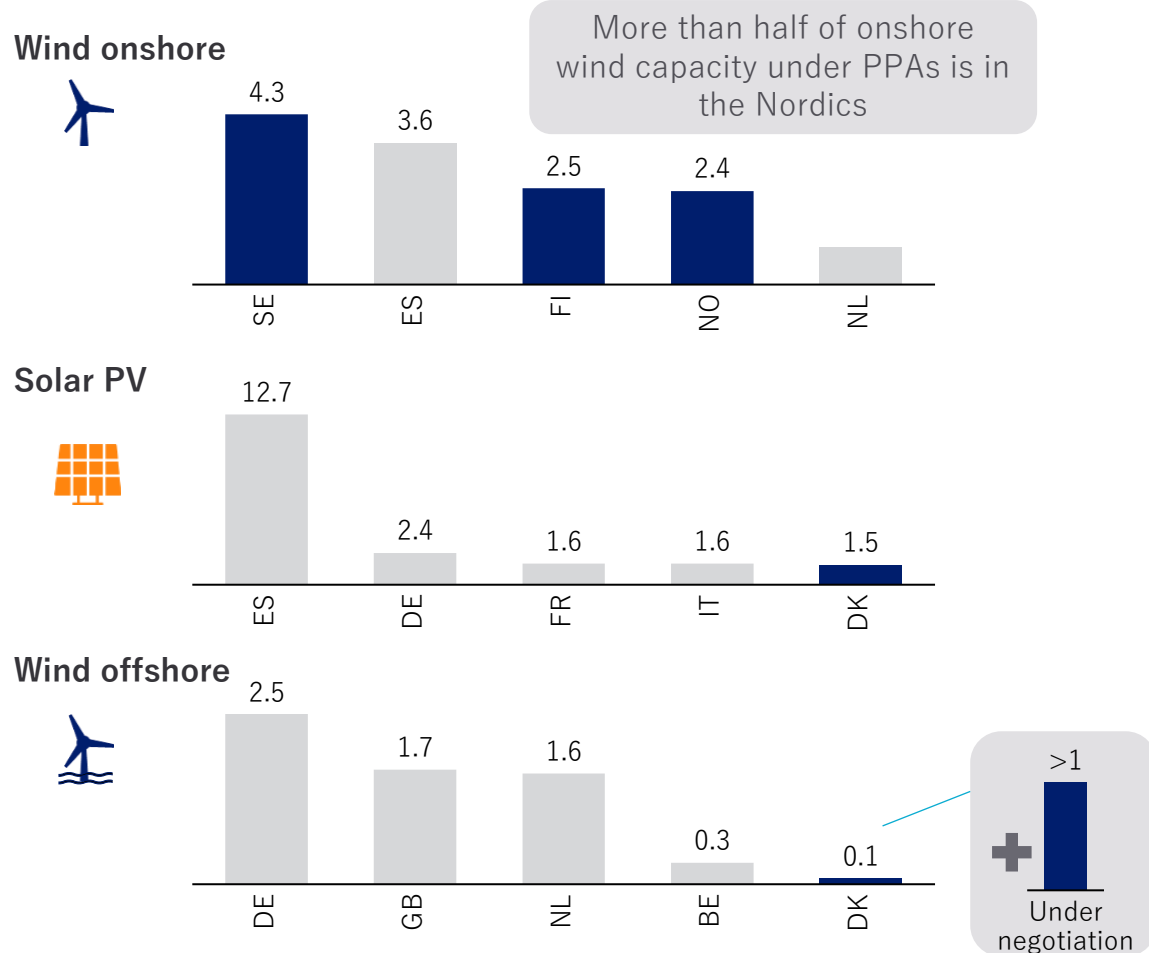
Dominique Hischier, Head of Analysis

PEXAPARK

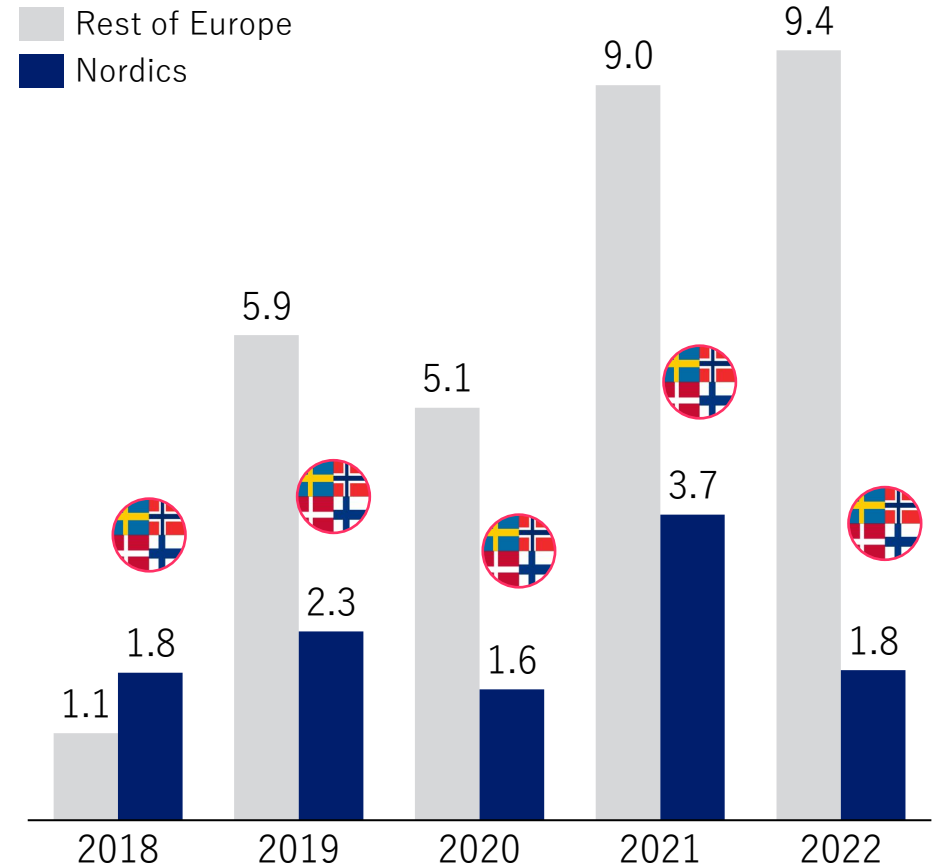


More than half of the European onshore wind capacity under PPA is in the Nordics

Top 5 PPA markets by technology (GW contracted)¹



Evolution of capacity under PPA by market (GW)



Pexapark at a glance

25+ GW

PPAs supported

8500+

Software users

19

Markets covered

100+

Employees

Zurich, London,
Copenhagen, Lviv,
Madrid

Offices

SELECTED CUSTOMERS



Orsted

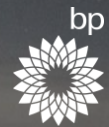
ARDIAN



ABO
WIND



ENCAVIS



CEE
Group

RWE

Vestas

enel

uni
per



PARTNERS

BloombergNEF

FLUENCE

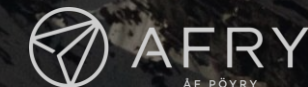
REFINITIV

eex

RE-Source

S&P Global

PEXAPARK



Overview

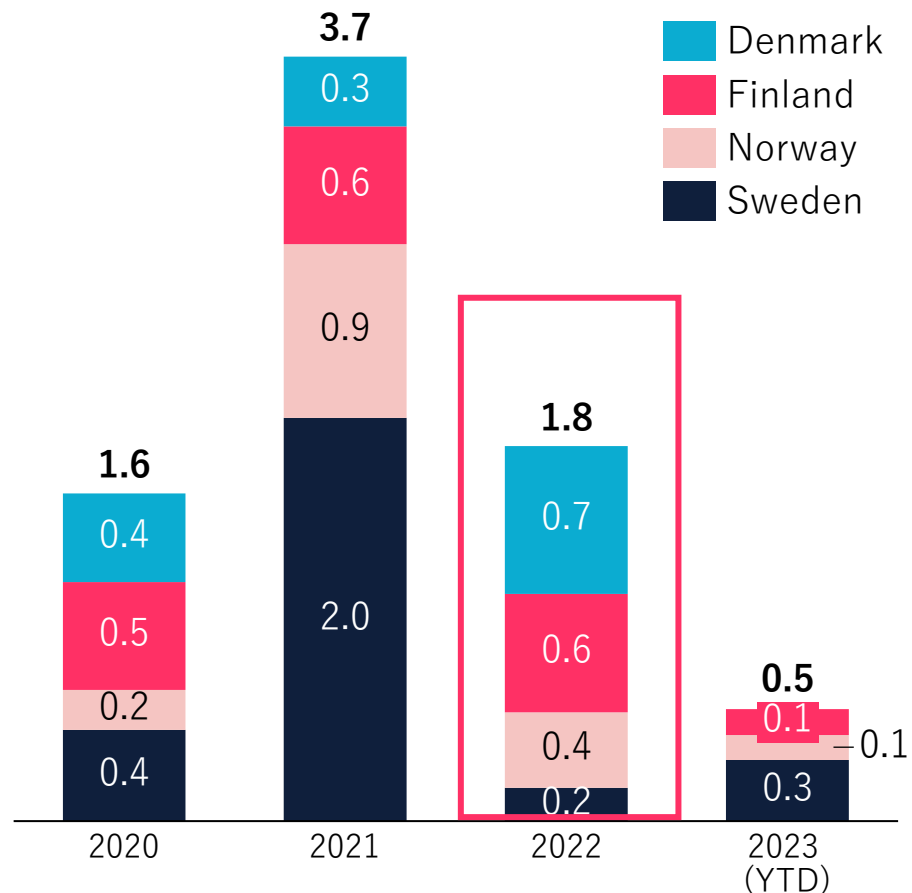
- 1 Nordic PPA markets in 2022
- 2 Key market trends and themes
- 3 Outlook and Q&A





PPA Deals in the Nordics from 2020 to 2023

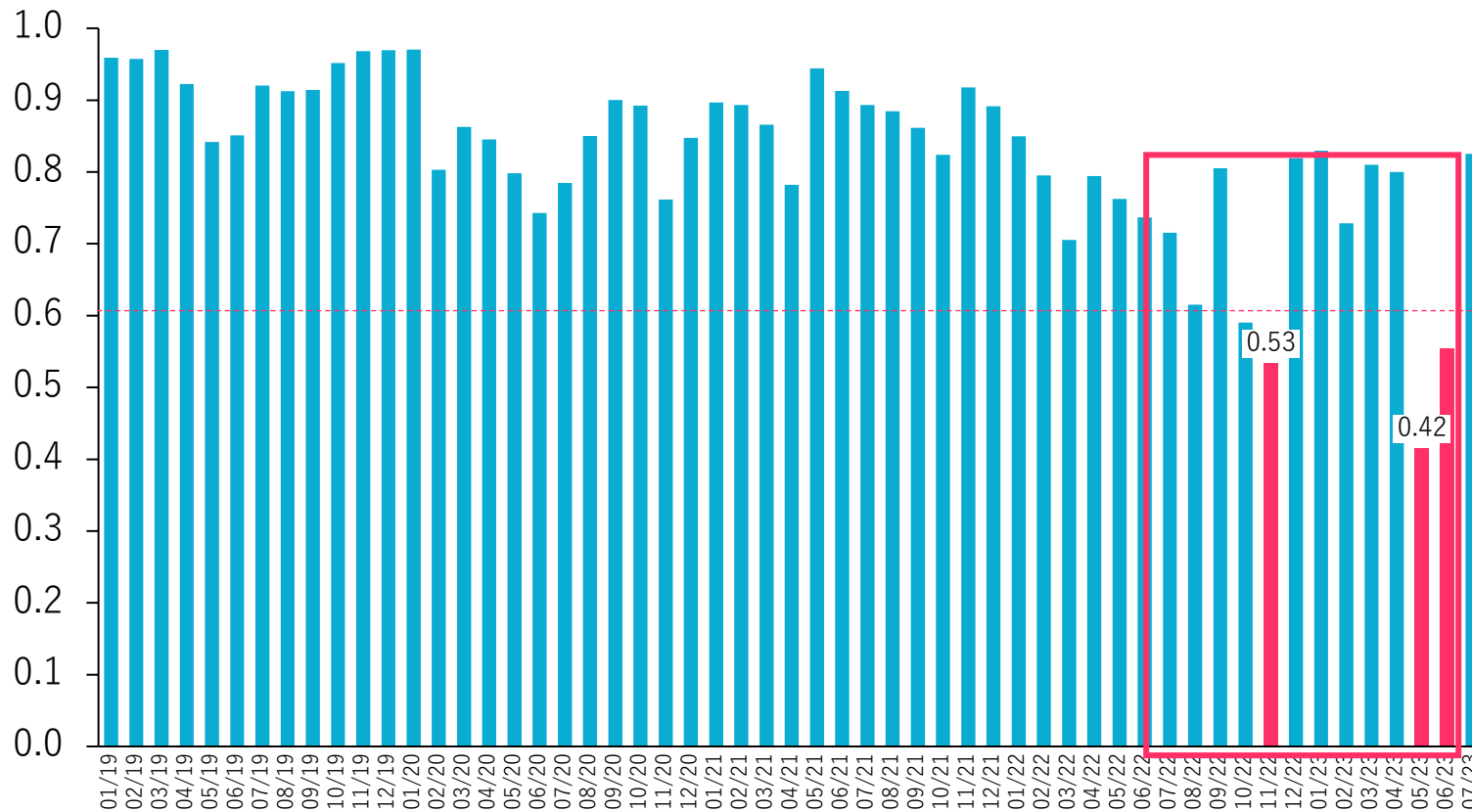
Nordic LT PPA deal capacity by country (GW)¹



- 2022 activity by market:
 - ▷ Stark drop in **Swedish onshore PPA deal activity** on the back of dropping capture rates and a slow-down in investment
 - ▷ **Norwegian market** affected by regulatory uncertainty, with little new renewable capacity currently under construction
 - ▷ **Denmark and Finland** relatively steady activity
- Utility PPA market activity has decreased substantially as a result of the energy crisis and market volatility
- Market normalising on the back of lower volatility and price levels

Capture risks increasing – Example of Finnish onshore capture factors

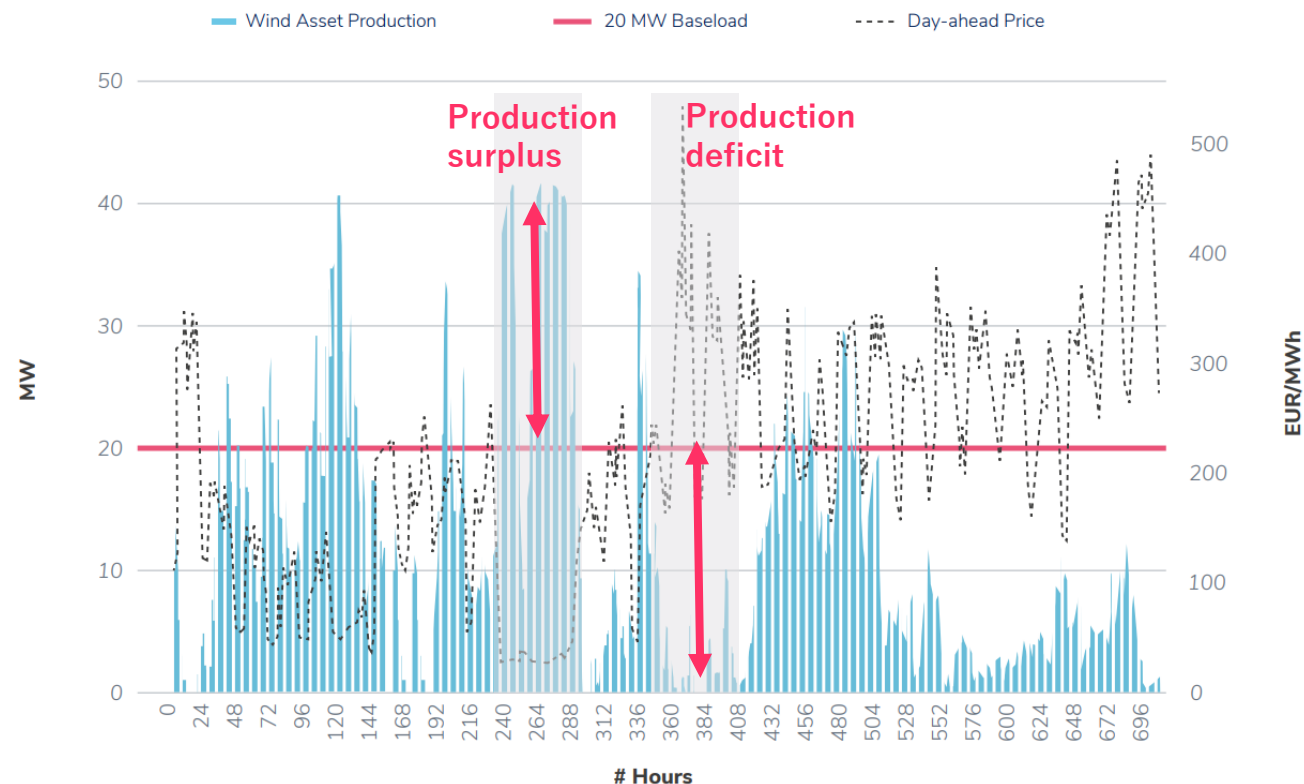
Historic capture factors wind onshore, Finland Jan 2019-July 2023



- Period of **low capture factors** and high volatility in capture factors
- Price capture for wind onshore decreasing as more gets built (Cannibalization)
- Lower capture rates mean higher price spread between hours with and without the wind production
- Capture Factors eventually translate into PPA pricing

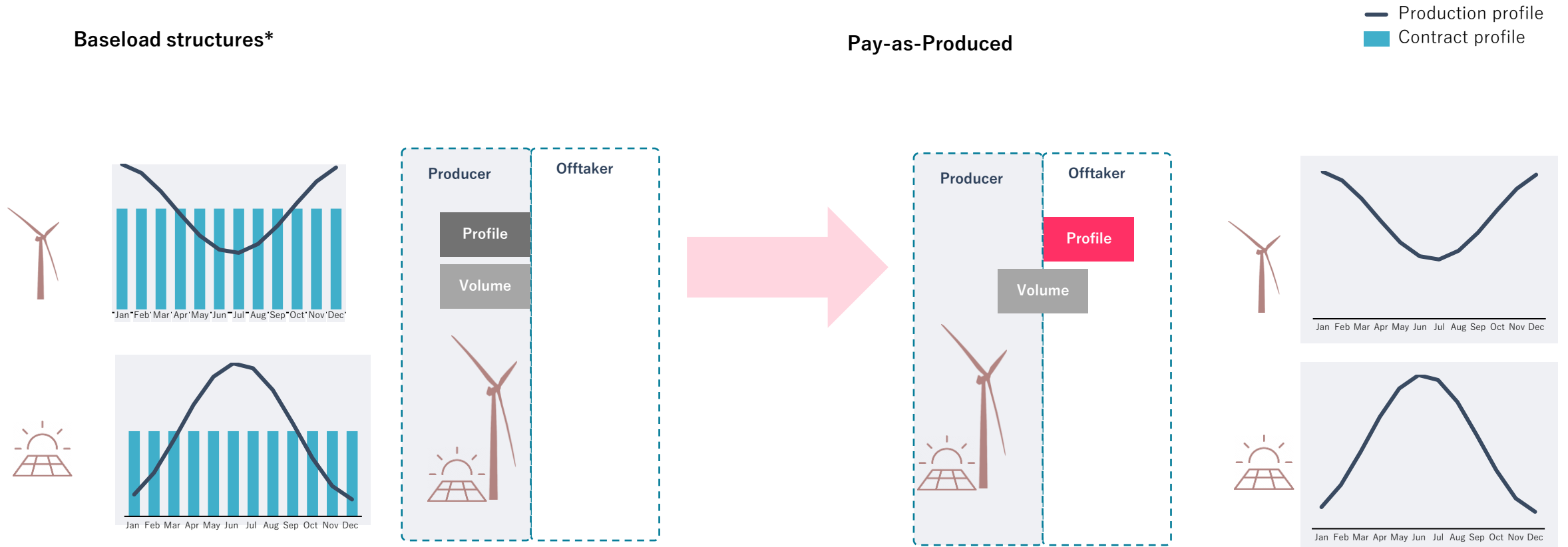
Risk associated with baseload PPAs have increased last year as a result of volatility and decreasing capture factors

20MW Baseload hedge for 50MW onshore wind asset, Finland, November 2022



- Increasing **cannibalization** in the Nordics combined with **a lack of flexibility** and the **price lift** during the energy crisis stressed the economics of many wind projects operating under Baseload hedges
- Projects had to buy volumes during times of high market prices while producing more than the requirement during times of low prices.
- Underperforming assets seeking to terminate or **renegotiate agreements** (e.g. reducing the hedge ratio); or **buying back volumes**
- Similar challenges in other price zones

Bankability has shifted from baseload to pay-as-produced PPA's, and allocation of profile risk a key challenge



Overview

1 Nordic PPA markets in 2022

2 Key market trends and themes

3 Outlook and Q&A



Emerging themes across the PPA markets in the Nordics

1

New buyers entering the market with different profile risk appetite



2

Hybrid PPAs / storage to mitigate capture risk



3

Need for PPA Price & risk transparency



Emerging themes across the PPA markets in the Nordics

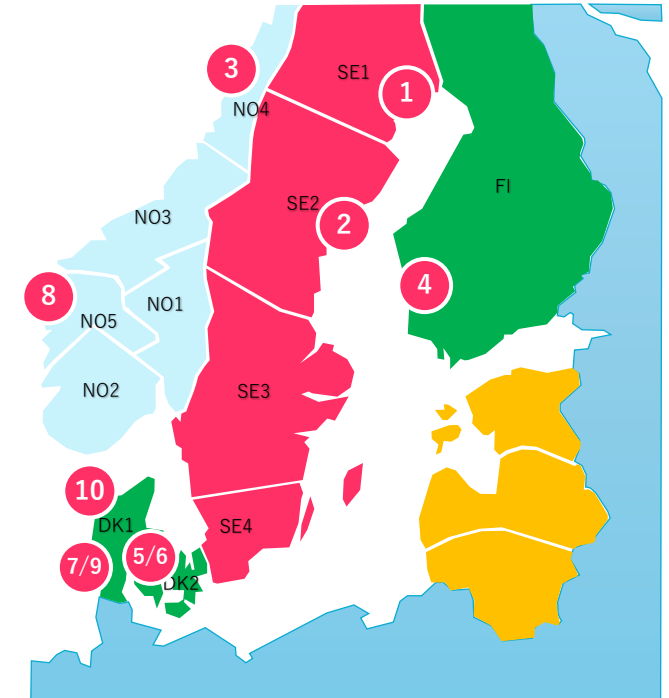
1

New buyers entering the market with different profile risk appetite



#	Project	Electrolyser Capacity	Country	Status	Planned COD
1	H2 Green Steel	800 MW	Sweden	Financing secured	2025
2	FlagshipONE	70 MW	Sweden	Financing secured	2025
3	Glomfjord	20 MW	Norway	Financing secured	2025
4	Harjavalta	20 MW	Finland	Financing secured	2024
5	HySynergy Phase I	20 MW	Denmark	Financing secured	2023
6	HySynergy Phase II	300 MW	Denmark	Announced	2025
7	Esbjerg	1 GW	Denmark	Announced	2026
8	Holmaneset	300 MW	Norway	Announced	2027
9	Host PtX Esbjerg	1 GW	Denmark	Announced	2029
10	Megaton	2 GW	Denmark	Announced	2030

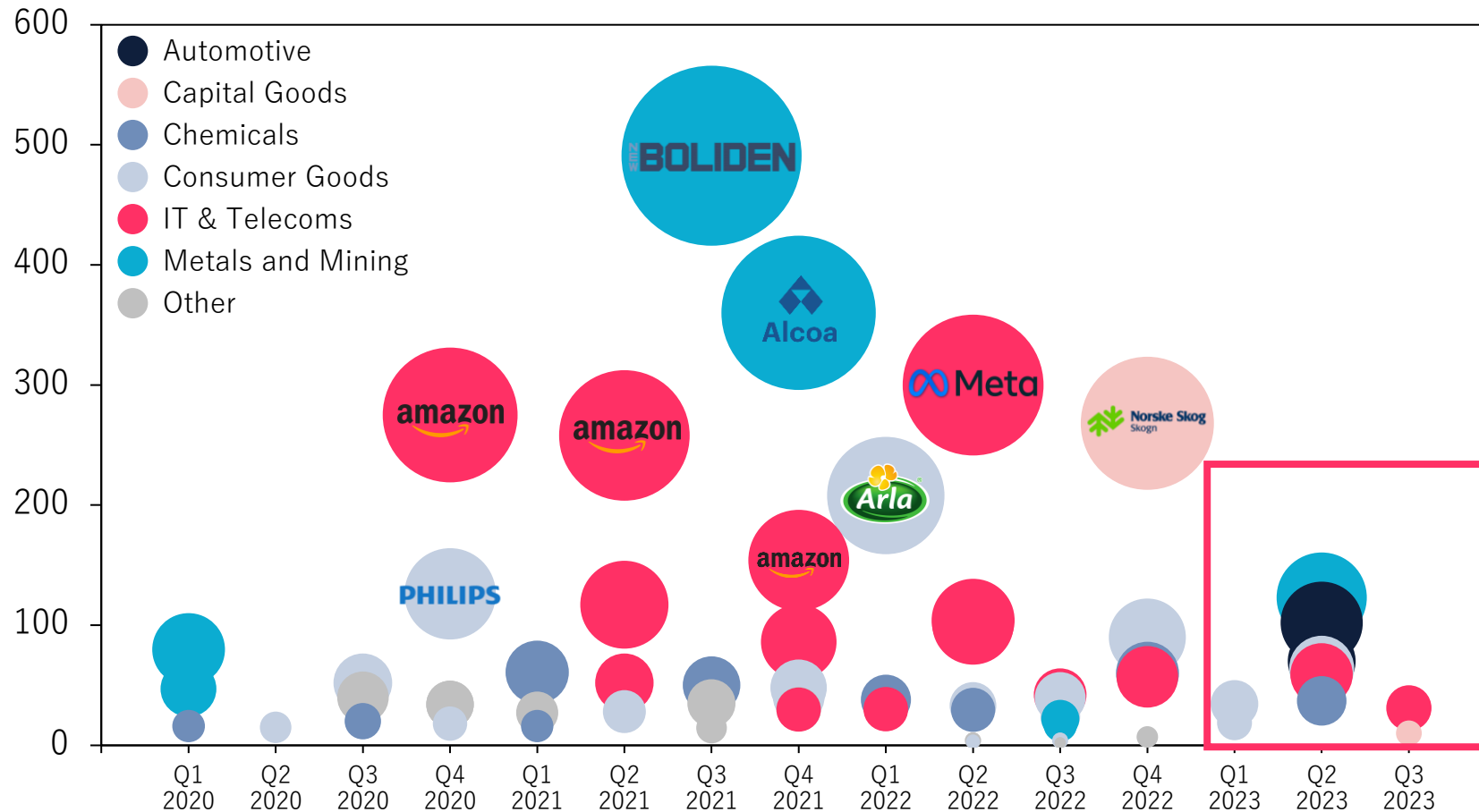
Financing secured: ~900 MW
Announced: 4.6 GW



Many new corporate entrants, and higher Nordic PPA activity for smaller deal volumes



PPA size (MW)



- Energy crisis as an accelerator for corporate PPAs: Strong motivation to enter into PPAs as a long-term price hedge, hand in hand with the desire to procure green electricity
- First movers IT, metals & mining industries
- Many new mid-sized corporate entrants, multi-buyer deals

Emerging themes across the PPA markets in the Nordics

1

New buyers entering the market with different profile risk appetite



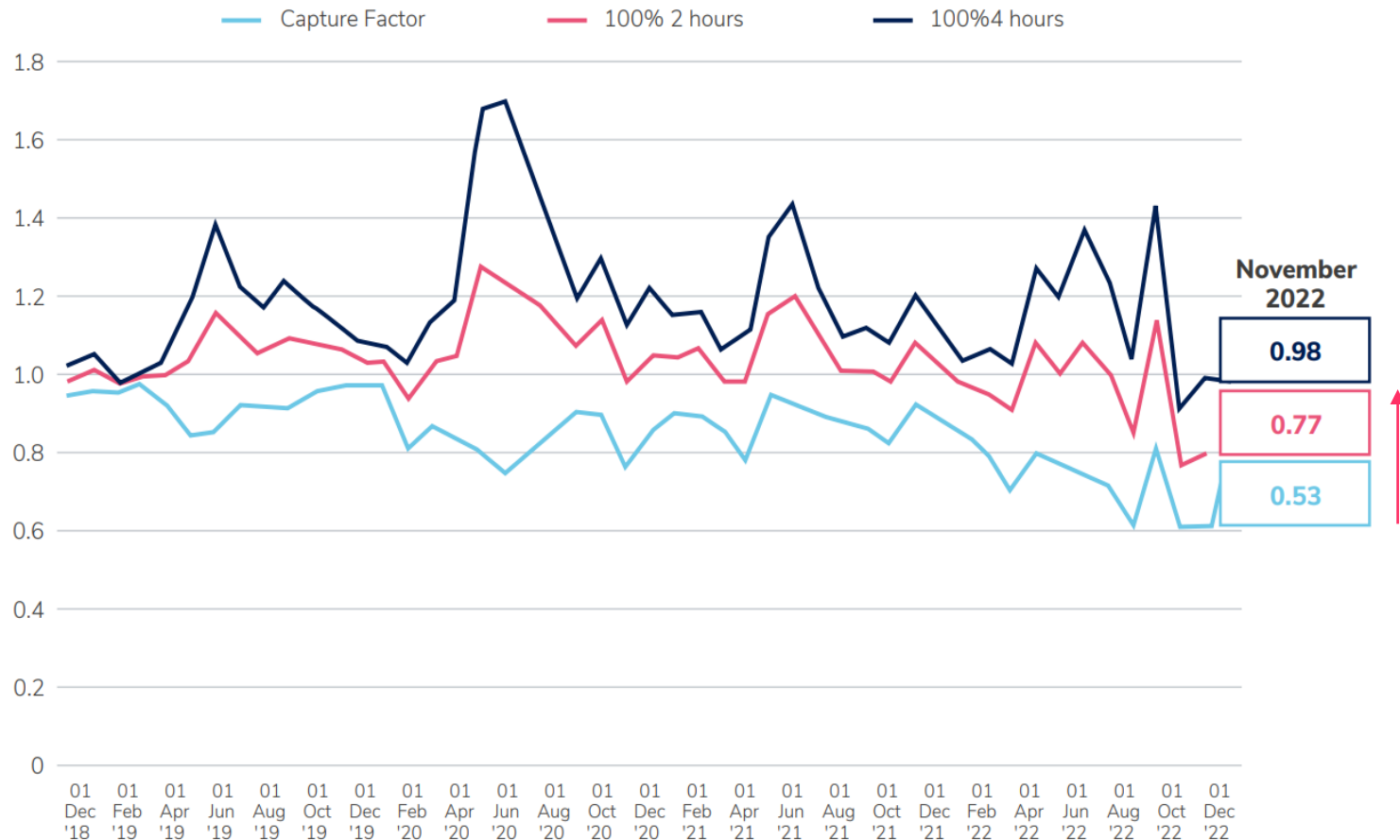
2

Hybrid PPAs / storage to mitigate capture risk



Co-located energy storage can have meaningful impacts to the project's capture rates

Finnish onshore wind capture rates vs. hybrid capture rates (2018-2022)



- Our analysis has shown that the addition of an energy storage asset (100% of AC nameplate with 2 hours of duration) can have meaningful impacts to the performance of a wind asset operating in the Nordics
- Increase in capture factor in November 2022 from 0.53 to 0.77 (2-hour battery), and even to 0.98 (4-hour battery)
- For complete investment case, revenue stack needs to be considered (wholesale arbitrage, ancillary services, imbalance reductions)

Emerging themes across the PPA markets in the Nordics

1

New buyers entering the market with different profile risk appetite



2

Hybrid PPAs / storage to mitigate capture risk



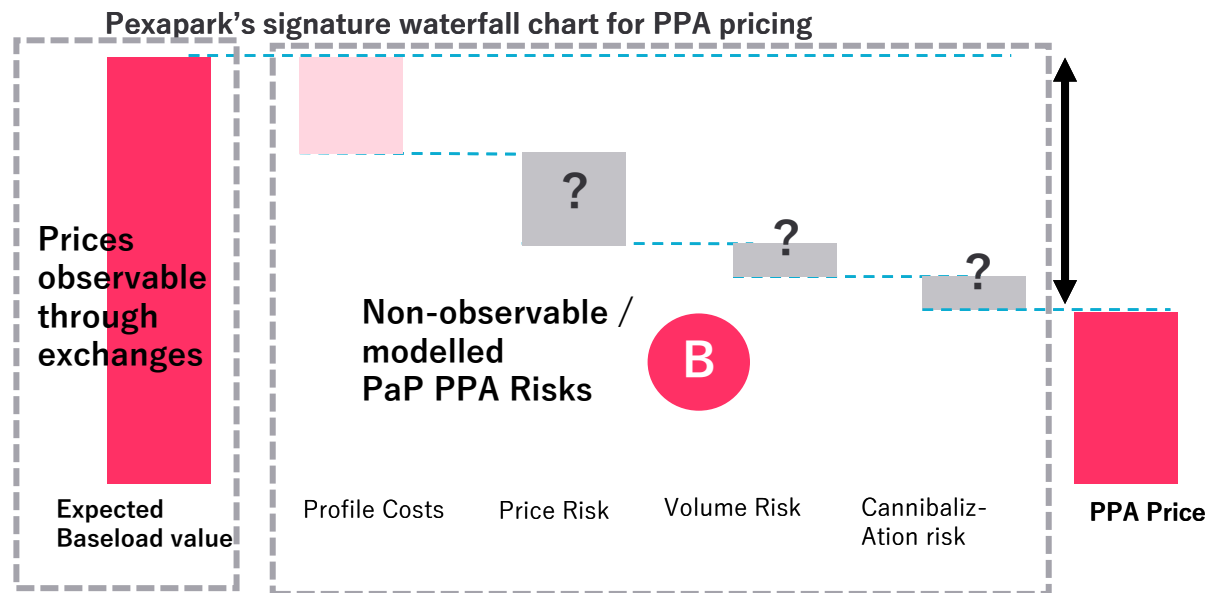
3

Need for PPA Price & risk transparency

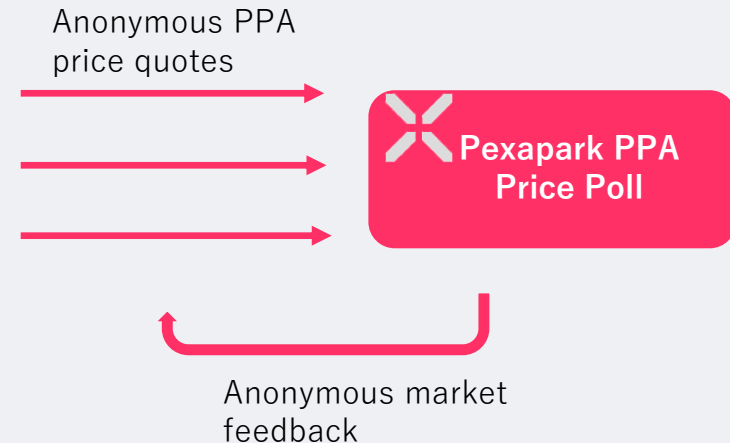


Two key ingredients to unlock the next chapter of growth in the Nordic PPA markets

A Create understanding around underlying value and risk components of PPA pricing



B Understand how the market values pay-as-produced PPA risks

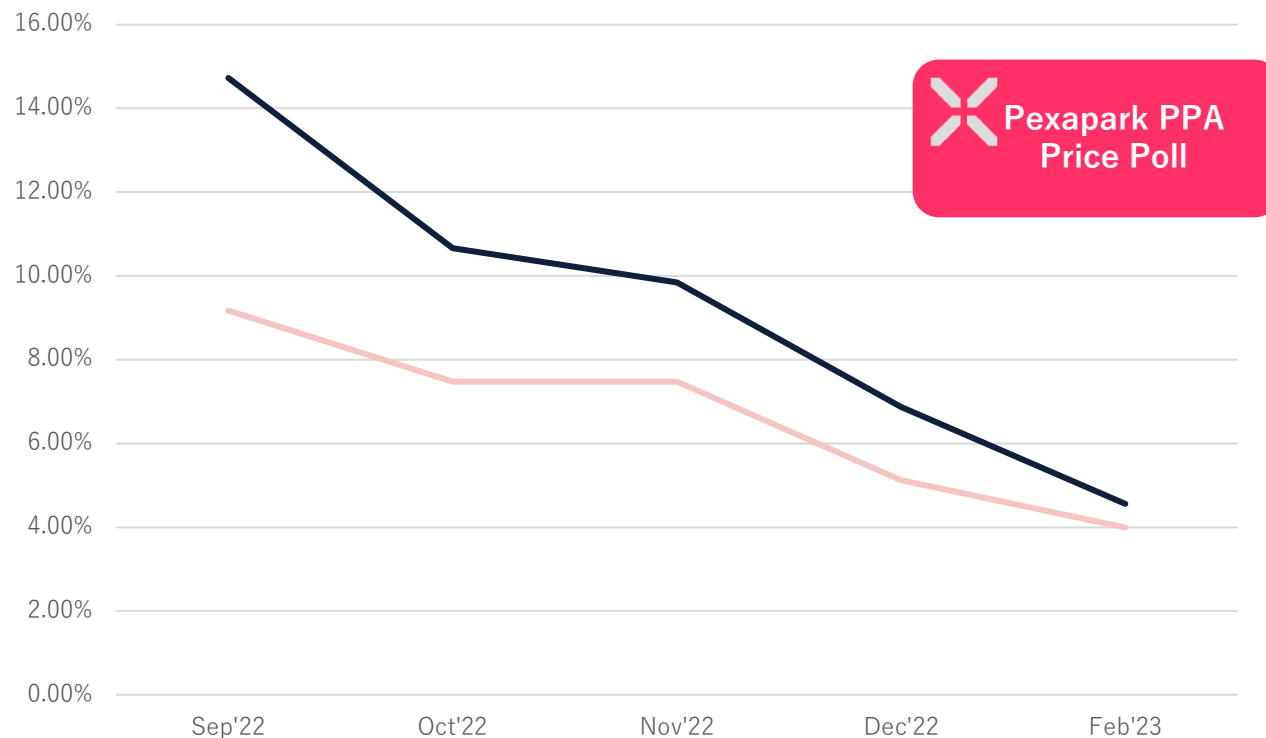


Transparency creates market opportunities

- Lowering transaction costs & more efficient negotiation
- Benchmarking of positions allows easier risk management & ability to hold more risks
- Increasing confidence
- Unlocking number of transactions

Pexapark's PPA Price Poll allows to track market shifts

Evolution of German PPA price consensus (Standard deviation / Average of PPA prices)



- PPA price transparency deteriorated as a result of 2022 energy crisis, with the range of price quotations strongly diverging for a given product
- Decreasing scattering of PPA market quotes since last September, indicating improving pricing consensus

Overview

- 1 Nordic PPA markets in 2022
- 2 Key market trends and themes

3 Outlook and Q&A





「 Questions? 」

Your Presenter today



Dominique Hischier

Head of Analysis

- Joined Pexapark in March 2022 to build the company's Analysis & Research department
- >7 years of experience in advancing the global energy transition in a variety of roles, including management consulting, international organisations, power trading and academia
- Holds a Master's Degree in Energy Science & Technology from ETH Zurich





Get in touch!

Dominique Hischier

Head of Analysis



dominique.hischier@pexapark.com

HELLO@PEXAPARK.COM

WWW.PEXAPARK.COM