Bodecker Partners
Nordic Renewables Report

Market Insight for Decision Makers
Q4 2022

Welcome to our fourth quarterly report 2022!

The new Government's communicated energy politics has begun to result in concrete assignments, and the budget has been presented. We have also read the proposal regarding exclusivity for offshore wind and the Nordic countries' models for the revenue cap. In Norway, sharp criticism is directed at the new production taxes, and cfd-scheme is proposed for offshore.

From the EU we have decisions on gas price caps, faster permit processes within REPowerEU, and a more ambitious and expanded EU ETS.

The build-out of wind, solar, and now also storages, continues at a rapid pace. In our final interview, we talk to the Finnish Wind Power Organization for more insights .

Power prices have been pushed up in the northern parts due to icing, low temperatures, low hydropower and little wind. Despite milder weather for Christmas, there is still continued risks of high Nordic prices this winter.

We wish you pleasant reading and a very Merry Christmas!

A Summary

THE REVENUE CAP for power producers is implemented in various ways in the Nordic countries. Sweden proposes a tax based on spot prices but adjusted for financial contracts.

MUNICIPAL INCENTIVES must not be paid by the state but by the producers themselves according to supplementary directives to an assignment.

EXCLUSIVITY RULES for offshore wind are proposed by authorities, including equalization method, temporary exclusivity, and a planning role for the state.

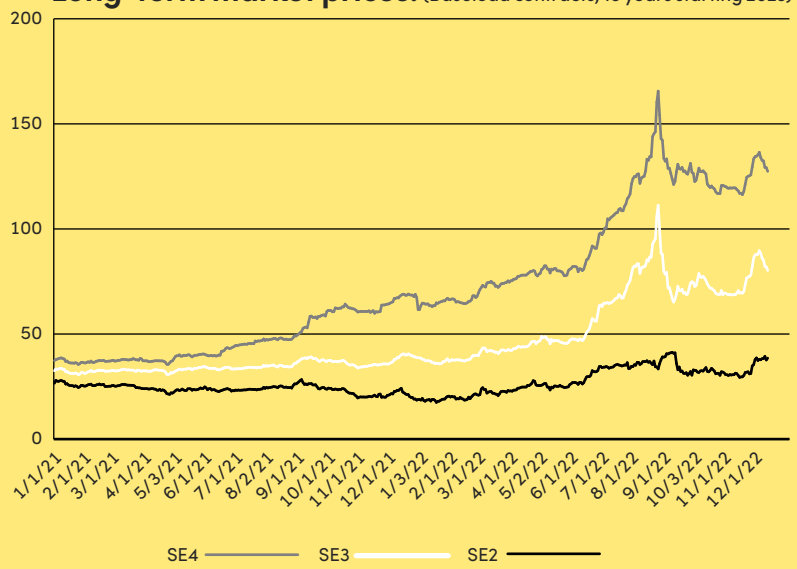
NORWAY'S PROPOSED TAXES on production are heavily criticized and some exceptions for existing wind may come. Cfd-model for auction-based offshore wind is proposed.

REPOWEREU PROPOSALS include increased renewable targets, go-to areas, and maximum limits for permitting processes.

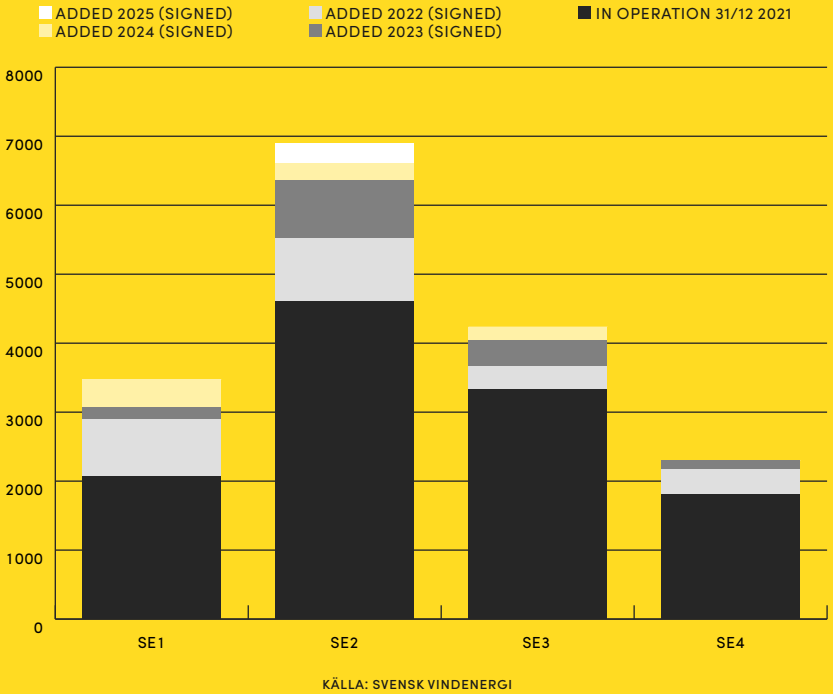
CAPTURE RATES have been very low which, in combination with high prices, has caused problems for wind power owners, especially in combination with PPAs.

Wind power is growing rapidly in western Finland, but the military is restricting development in the eastern parts. We also discuss the Finnish specialty »Mankala company«. Read our interview with Heidi Paalatie from the Finnish Wind Power Association. 28

Long-term market prices. (Baseload contracts, 10 years starting 2023)



SE2 remains dominant in 2021 and 2022



KÄLLA: SVENSK VINDENERGI

Sweden strives for net-zero emissions of greenhouse gases by 2045 and 100% renewable power production by 2040. Norway aims to halve its emissions by 2030. The joint electricity certificate scheme has reached its 2030-target several years in advance.

Revenue cap for Nordic power producers

LAST AUTUMN, the EU decided on a revenue cap of EUR 180 per MWh for power producers with »inframarginal costs.« It has been up to the respective member states to decide on details.

SWEDEN'S MINISTRY OF FINANCE has just sent out a proposal for a 90% tax on revenues above 1957 SEK/MWh (equivalent to 180 EUR/MWh) for all power production above 1 MW. A proxy hourly-based revenue is initially to be calculated based on day-ahead prices compared to cap. After that, the result should be adjusted on a monthly basis for financial instruments - so that only realized income is taxed. The details of these adjustment calculations are not precise, and suggestions are welcome in the referral response.

THE TEMPORARY LAW is proposed to apply from 1st March to 30th June 2023. The proposal is out for consultation until 8th January.

FINLAND introduces a 33% tax on extraordinary income (over 5% return based on income from electricity sales), instead of directly on electricity prices. This is to also take price hedges into account. The law shall apply to both power producers and electricity trading companies that resell contracts throughout 2023 (to be paid in 2024). The proposal is out for fast consultation.

DENMARK has not yet decided on a measure, but it will still apply from 1st December. The Climate and Energy Authority will propose (to the new Government) a revenue cap on all electricity sales. 90% of earnings above this cap is to be paid back.

NORWAY is planning a new tax of 23% when power prices exceed NOK 700/MWh (approx. EUR 67). It was supposed to apply on an hourly basis, but strong criticism has resulted in monthly basis now being considered. The measure is proposed to apply until end-2024.

Sweden

The »Tidö Agreement« – energy policy in the new Government
The Tidö Agreement is a joint declaration of intent between the governing parties and the Sweden Democrats. Some of the reforms are listed here in brief:

- Improved conditions for investments in nuclear through special government credit guarantees. Investigations into requirements to re-start Ringhals 1 and 2, and assignment to Vattenfall to start planning for new nuclear.
- Change of energy policy goal from 100% renewable to 100% fossil-free. Planning for increased electricity use based on an electricity demand of at least 300 TWh in 2045.
- Investigation into the power market design with proposals for increased compensation on support markets where compensation is primarily to be paid by producers who cannot support with these services.
- Clarified mandate to the TSO to procure plannable power production, and to the Energy Agency to plan and promote plannable production where needed.
- Legislative changes, shorter permit processes, and fast track for nuclear power.
- A new CHP strategy and paused re-examination of hydropower.
- Wind power must be built on competitively neutral terms and with environmental- and local interests in mind. All connection fees must be borne by the developers themselves (i.e. the build-out of grid at sea is to be stopped).
- Build-out of export cables, e.g. Hansa Powerbridge, is paused until price differences between bidding zones are lower. Aim to have Sweden as one unified bidding zone long-term.

Directly affecting wind power is, for example, the intention to stop the build-out of main grid at sea and that compensation for support services must be paid by producers who cannot contribute with the same (still very unclear what may involve, but a risk). However, the ambition for technology neutrality is positive.

Municipal incentives and vetoe
The new Swedish Government has given an additional directive to the investigators of local incentives for new wind power.

»No incentives shall be paid by the state«

The investigators can no longer assess where funding should come from. Instead, according to the amendment, the wind power developers themselves must pay any compensation, not the state. The assignment is still to be reported on 31st March, 2023.

The incentive investigation is also crucial for any potential future adjustments to the municipal veto. Proposals for adjusted rules on this veto were rejected by the Parliament last year since several parties wanted to await the results of the incentive investigation.

Exclusivity for offshore wind
Last spring, the Swedish Maritime and Water Authority was tasked with investigating and proposing regulations regarding exclusive rights and queue systems for establishing offshore wind power off Sweden's coasts. On 30th November, the document was submitted to the Government.

»Mediation according to the Environmental Code«

One conclusion is that parks that are already being planned/investigated as far as possible should be »equalized« according to the Environmental Code; otherwise, projects that best match the criteria should have priority. Those who already have permission have priority over others, and in new areas, it should be possible to obtain temporary exclusivity for surveys, etc.

Tove Andersson from Setterwalls Advokatbyrå has briefly commented on the conclusions in the report as follows:
Several possible proposals are submitted, i.a., that a later granted permit may not cover the same area as a previously granted permit on public water if it is not clear that the activities can coexist. A similar rule is proposed for permits in the EEZ.

Also interesting are the interpretations regarding current regulations. One topic is what happens if there are several applications for the same part within the Swedish economic zone. In this part, HaV concludes that the Government is relatively free in its examination and can apply balancing rule 16:11 in the Environmental code - regarding equalization and priority - also outside the economic zone.

In addition, there are proposals for entirely new approaches in the form of exclusive investigation permits and to investigate an instruction procedure or sectoral legislation for offshore energy production.

We can also deduce that the state should take a more active, coordinating, and planning role and designate preferred areas, and that public water should be the property of the state where the Government may grant the right of use.

Climate and Environment in Budget 2023
In November, the 2023 budget was presented by the new Government. It included for example:

- Reduced tax on fuel for three years and lower reductio duty (to EU lowest level) from 1st January 2024.
- High-cost protection of electricity prices financed by bottleneck revenues. Refund based on average price per bidding zone and historical consumption over a year. The reference price is 75 öre/kWh (~69 EUR/MWh), resulting in support only in SE3 and SE4. The support is paid out in February to households and later to companies. Electricity-intensive companies also receive targeted support
- Increased allocation to the Energy Market Inspectorate to streamline permit processes. In addition, investment in research and innovation for new nuclear power.

The Government has previously forwarded proposals to abolish the CO_2 tax for heat production at cogeneration and heating plants within the EU ETS in order to stimulate power production. The waste tax is abolished from 1st January (proposal from the previous Government).

Other political investigations
The Climate- and the Environmental Assessment Investigations have been out for consultation. The Swedish Wind Energy Association has responded to both, and for example, emphasized that the Environmental assessment regulation must be in line with the EU Commission's REPower EU to drastically speed up permit processes. It also stated the importance of quantifying climate benefits of additional power production.

Norway

Fixed price agreements
Fixed price contracts of 3, 5, and 7 years are introduced in Norway, i.a. by Statkraft via, for example, Fjordkraft, after the Government communicated resulting exemptions/adjustments in basic interest tax. In terms of this taxation, Norway is divided into two areas; NO_3/NO_4 and $NO_1/NO_2/NO_5$. Maximum add-on to market prices shall be 2.5 øre/KWh + NOK 99/month. Fixed price agreements communicated so far are priced above 100 øre/kWh in the southern areas, significantly higher for a 3-year contract.

Market players have warned that introducing these fixed price agreements could further damage the market as it risks reducing traded volumes on futures markets even more.

B News & Politics
Nordics

Basic interest tax on wind power faces strong criticism
The Government›s proposal for a basic interest tax on wind power of 40% is heavily criticized. Several law firms consider it unconstitutional, and the wind industry has warned of non-investment and bankruptcies and that Norwegian industries with PPAs will also be hit hard. Some actors have threatened to sue the Norwegian state. The proposal is to be sent out for consultation.

Cfd-auctions for offshore wind
The Oil and Energy Agency (OED) has sent out offshore wind plans for consultation, and they open up for state support to the first part of Sørlige North Sea II (1500 MW). An auction model with 15 years cfd-contracts is proposed. The process is proposed to begin with a pre-qualification to participate in the auction. The number of participants will be limited.

«Allocation based on innovation and technology for Utsira Nord»

For Utsira Nord (1500 MW floating wind power), a slightly different auction procedure is proposed, with allocation based on more qualitative criteria on innovation and technology development. There are to be three separate processes for different parts of the park. There will be a support mechanism with some form of price competition, but the model is not communicated yet.

Referral period is until 6th January, and auction processes to begin Q1 2023.

Investments in renewable energy and grids
The Norwegian Government proposes new funds (NOK 165 million) in the budget to increase the build-out rate of renewable energy. Statnett announces NOK 60-100 billion in reinforcements in the electricity grid until 2030 (excluding costs for connecting offshore wind). Area plans for 10 regions are now being drawn up. The first ones finalized in first quarter of next year.

READ MORE about the development in Norway in our previous report›s interview with Arne Jacobsen from Norwea!

FOR NEWS REGARDING development in Finland, take part in our interview with Heidi Paalatie from the Finnish Wind Power Organization at the end of the report!

Other Nordic News

- **DENMARK** has a new government in which the Social Democrats merge with both the Left Parties (Venstre) and the Moderates.
- **RE-EXAMINATION** of Swedish hydropower is paused for 12 months. Those already started are not covered.
- **FORTUM** will do a feasibility study on building new nuclear power in Sweden and Finland. The focus is SMR, but also conventional reactors are included. The 2 year study will also include location, permit processes and possible partnerships.
- **WSP›S** new forecast shows that Sweden may have 6-25 SMRs by 2050, the first of which will be in operation in 12-15 years.
- **3000 MW ELECTRICITY OUTPUT** from stationary power plants can be started at short notice in southern Sweden according to Teknikföretagen and WSP. It would require scrapped taxes on cogeneration, assignment to SvK to procure the power, as well as temporary exemptions in environmental legislation.
- **AN INCREASE IN THE BALANCE** responsibility fee in Sweden of 40% is planned for 2023, but according to SvK, a 200% increase would be needed to also cover increased costs for ancillary services. The TSO›s application to use bottleneck revenues to cover these costs (instead of increasing balancing fees more) was rejected. Two large entities; Tibber and Göteborg Energi, have already discontinued their balancing services due to the risk of greatly increased costs.
- **NORWAY NET EXPORTED 3.5 TWH** to the UK through the new 1.4 GW North Sea Link during the first year of operation (4.5 exports and 1.1 imports). A third of the investment costs have already been covered by bottleneck revenues.
- **NEW PERMIT REGULATION** for onshore wind in Norway will be sent out for consultation in the beginning of next year.
- **THE CLIMATE TARGET** in Norway is raised to at least a 55% reduction in emissions by 2030 compared to 1990

The global Paris Agreement forms the basis for the EU emission reduction targets and increased renewable power. Climate neutrality by 2050, and a 55% emission reduction by 2030 have led to a new proposed renewable target of 40% by 2030.

RePower EU and faster permit processes

AS PART OF RePowerEU, the Council of Ministers has now agreed on changes in the renewables energy directive, proposed by the Commission in early November, to accelerate the build-out of renewable production.

- Increase of renewables target to at least 40% by 2030 (lower than the proposed 45%, but higher than current 32.5%).
- »Renewables go-to-areas« to be set by member states within 30 months with simplified area-based environmental assessments and where projects are classified as »overriding public interest«.
- Permission process of max 1 year (2 years for offshore) in the go-to-areas. For other areas a maximum of 2 years (3 years if offshore).
- For repowering, co-located storage, and grid connection of these, permission process must generally be max. 6 months (1 year for offshore). For solar, limit should be 3 months.

The agreement is to be negotiated with the EU Parliament.

MORE INFO HERE : REPowerEU : Council agrees on accelerated permitting rules for renewables (europa.eu)

The member states have also agreed on measures and support for the energy transition plan; totaling close to 300 billion euros of which a large part to increased production of renewables. After the regulation enters into force (start 2023), member states have 30 days to decide whether to use unused corona funds to finance new energy projects, after which the funds are made available to other EU countries.

The EU countries have also agreed to raise the emission reduction target for sectors outside the EU ETS from 30 to 40 percent.

Price cap on natural gas

The EU's energy ministers have agreed on a temporary price cap on futures contracts for gas. The cap is set at 180 EUR/MWh, but only comes into effect if the price of the TTF front- month contract exceeds this level for three working days in a row, and that it is at least 35 EUR/MWh higher than the LNG reference price during the same days.

The start date is February 15, and Acer will monitor the market and report if limit is reached. This would activate a 20-day automatic bidding limit for LNG price plus 35 EUR/MWh.

The Commission can deactivate the cap at any time if, for example, volumes drop, demand for gas rises above certain levels, etc. The cap also does not apply to the OTC market, day-ahead or intraday trading .

Currently the applicable gas contract is traded at ~EUR 100, so far from the cap.

Extended EU ETS and climate import tariffs
The Council and the EU Parliament have finally reached an agreement on Europe's climate package, including the EU ETS. Emissions trading is expanded to include 75% of Europe's emissions instead of the current ~40%, for example by also including aviation, shipping, transport, housing and waste incineration.

"Climate import tariffs are introduced, and free allocation phased out"

In addition, they have agreed on the climate import tariffs/border adjustment mechanism (CBAM), where emission-intensive goods manufactured in a non-EU country and imported into the EU are charged with a fee linked to the price of EU ETS emission allowances. This opened up for the resulting decision to gradually phase out free allocation to competitive industry by 2034, starting in 2026.

The EU ETS emission reduction target will increase from 43% to 62% by 2030 (cf. 2005), 1% higher than proposed by the Commission. The target will be achieved through a sharp reduction in allowance allocation (both a "one-off" and annual decrease). In addition, the 24% share of potential oversupply will continue to be placed in the reserve fund limiting market surplus.

More about all this in our **CARBON UPDATE** in January.

Doubled innovation fund
The EU's innovation fund has opened up four new calls with a total of three billion euros in the pot, a doubling compared to last. The support may be granted to e.g. new renewable production, efficiency improvements, energy storage, electrification, hydrogen production, etc. Up to 60% can be financed.

UK and EU cooperation for offshore wind
Great Britain and EU countries around the North Sea have signed a letter of intent for cooperation on build-out of offshore wind in the North Sea, also including grid connections and hydrogen projects. The region has a potential of 600 GW of offshore wind.

Germany
Germany decided at the end of October to extend the operation of its remaining nuclear power plants, until the middle of April next year. Simultaneously, authorities have been tasked with drawing up an ambitious plan for energy efficiency and a concrete strategy for phasing out coal power.

LATEST ON RENEWABLE TRANSPORT fuels in REDIII and Delegated Act in our PPA update later in the report

C Build-out and investments

The Nordic renewable build-out is very fast and we also see electricity consumption increasing rapidly. In this section, we go through the latest statistics and a selection of new investment decisions and projects in wind and solar, storage and industrial transition.

Statistics & Forecasts

NEW STATISTICS FROM Swedish Wind Energy Association (SWEA) show an increase in wind power in 2020-2022 of about 15 TWh. Approximately the same volume is expected during 2023-2025. At the same time, they warn of a lack of new turbine orders – a sign that the build-out rate may decrease significantly thereafter.

»1500 MW commissioned next year«

In 2023, about 1,500 MW are expected to be commissioned, and 1,000 MW in 2023 and 2024 (based on turbine orders). During next year, 800-900 MW will be commissioned in SE1 and SE2, respectively, while SE3 and SE4 are expected to receive about 350 MW each. SWEA forecasts a wind power production of roughly 52 TWh in 2025 (~18 MW).

»30 + 175 TWh waiting for permission!«

Furthermore, they report licensed onshore wind power corresponding to ~20 GWh and offshore wind corresponding to 12 TWh. In addition, about 30 TWh of onshore is awaiting permission, and over 175 TWh of offshore!

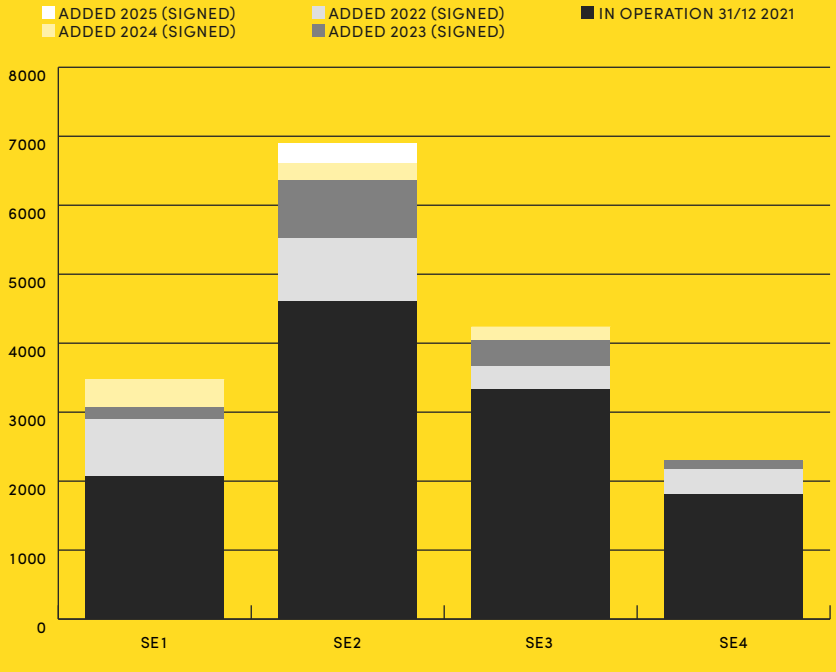
I HIGHLY RECOMMEND the following statistics, lists of projects and summary of Swedish policy and its impact on wind power build-out!

STATISTICS-AND-FORECAST-WIND-POWER-SWEDEN-Q3-2022-FINAL.PDF (SVENSKVINDENERGI.ORG)

"Ice formation has caused major production issues"

At end-Nov and start-Dec, many wind farms in northern Sweden had significant problems with ice formation, which caused many downtimes. During one weekend, ~ 1000 MW was out. Hydropower has also been limited due to icing.

SE2 remains dominant in 2021 and 2022



KÄLLA: SVENSK VINDENERGI

C Build-out and investments

Also in Denmark, installed renewable production capacity is expected to quadruple by 2030, compared to current barely 10 GW. Simultaneously, a sharp increase in electricity consumption is forecasted.

"Doubled build-out rate in Finland"

In Finland, the build-out rate has doubled this year compared to last, and Fingrid forecasts an increase from 3 to 21 GW by 2030. The Finnish Wind Power Organization indicates production increases from about 10 to 25 TWh by 2026.

REPORT HERE: FINGRID_ELECTRICITY_SYSTEM_DRAFT_SCENARIOS.PDF

READ THE INTERVIEW with the Finnish wind power organization at the end of this report, as well as with the Swedish and Norwegian counterparts in our previous report (Q3-2023)!

New investments in wind power

HERE ARE SOME of the latest publications regarding the development of wind power projects in the Nordics.

Onshore wind

STORA ENSO will supply wood to both Modvion and the German start-up Voodin Blades. Modvion manufactures wind power towers made of wood (up to 290 meters, built in modules). Voodin Blades develops turbine blades in wood.

COPYRIGHTMODVION

RES RENEWABLES NORDEN has signed a letter of intent with Modvion regarding a future order of wooden towers for wind power worth SEK 4 billion for roughly 20 towers over ten years starting in 2026.

RES is also investigating building a wind farm near Uppsala in SE3. The consultation process is underway and, according to Energimarknaden.se, the military defense has approved.

FU-GEN has acquired the wind power project "Riberget" in Ljusdal municipality in SE2 from OX2. Installed power is 70 MW (11 plants) and commissioning expected in H2 2024. Fu-Gen has also bought "Havsnäs" wind farm in Strömsund municipality, also in SE2. The park is already in operation (since 2010) with 93.4 MW and approx. 263 GWh average annual production.

EOLUS has received permission to expand its planned wind farm in Örebro County.

PRIME CAPITAL has purchased a 90 MW wind farm under construction in Finland from Svevind. The project is located outside Vaasa and commissioning is expected during the next year.

ILLMATAR is planning the 200 MW wind farm, "Vermassalo", in northwestern Finland together with the forestry company Finsilva. Commissioning of the 20-25 turbine park is expected in 2028. Illmatar is constructing six wind farms in Finland and a number of solar farms.

BAYWA RE has purchased 50% of Exilion Tuuli's 350 MW (48 turbines) "Karhakkamaa" wind farm with planned commissioning in 2025-2030. Exilion is owned by Finnish pension funds and has 13 wind farms.

HELEN and the **BANK OF ÅLAND** have bought a 145 MW (22 turbines) wind farm in eastern Finland from OX2. The park named "Niinimaki" will be commissioned end-2024 and produce 400 GWh per year.

FINLAND HYOTYTUULI, a Finnish wind power developer, will build a 243 MW wind farm in north-west Finland with commissioning in 2025. About 700 GWh per year is forecasted from the 38 turbines. The company is owned by municipal utilities and already has two wind farms under construction.

RWE'S and **MAGNORA'S** wind farms "Oddeheia" and "Bjelkeberget" in Norway are to be reviewed by politicians. The parks have previously been refused by the municipality. Since then, there have been decisions on new taxes and the energy crisis has led to an increased need for new power.

VARDAR buys 25% of the wind power company Zephyr from Glitre Energi. Thus, Østfold Energi and Vardar now own 50% each of the company. Glitre Energi merges with Agder Energi.

Latest statistics and forecasts on Swedish wind power development

→ Latest statistics and three year forecast

→ Planned wind power projects years 2017–2024

C Build-out and investments

Offshore wind

Sweden
In Sweden, over 30 TWh of applications for offshore wind power are on the new Government´s table, and SvK had already received 125 GW of valid applications for grid connections earlier this year. SvK has presented prioritized areas for grid build-out at sea, but the new Government's intention to stop this assignment makes uncertainty high.

We have continuously presented projects in previous reports, here are some additional news since the last time.

EOLUS and **SIMPLY BLUE GROUP** plans to jointly develop four floating wind farms in Sweden and Finland (Baltic Sea). The joint venture is named "Sea Sapphire". Total planned production is up to 40 GWh per year. The following projects are planned:

- Skidbladner southeast of Stockholm (SE3, Sweden)
- Herkules, southeast of Gotland (SE3, Sweden)
- Wallamo, off Satakunta (Finland)
- Unnamed, Finnish Economic Zone (Finland)

OX2 has started the consultation process for the 4.5 MW "Neptunus" project outside southeast coast including a combination with hydrogen production. OX2 also has interesting plans to combine offshore wind power with producing algae, for example in collaboration with "Kobb" at the wind park "Galatea-Galatea" outside Falkenberg.

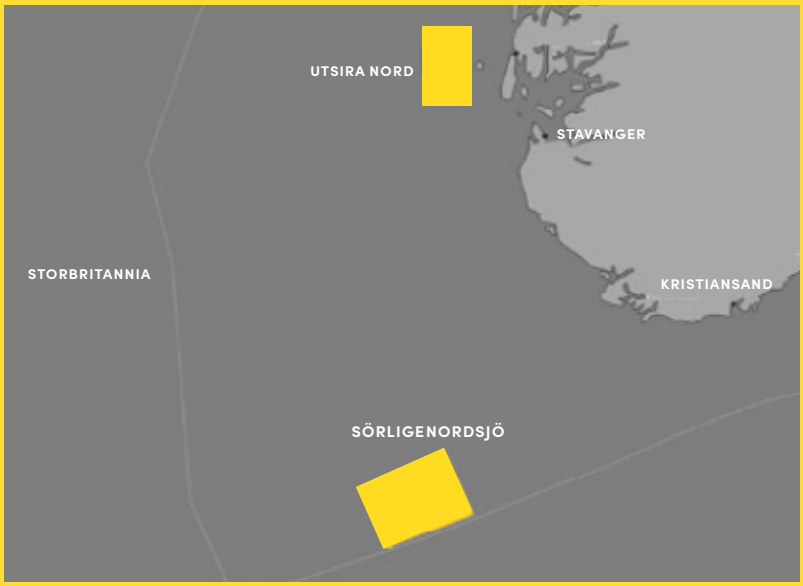
ØRSTED›S planned «Skånes havsvindpark"south of Ystad has been approved by the county board and now awaiting Government approval. 125 turbines (max 385 meters) with a planned capacity of 1500 MW can, according to Ørsted, be commissioned from 2029 if clarity on grid connection and exclusivity is received by next summer. Investment costs are estimated at SEK 25–50 billion.

UTPOSTEN 2 (first developed by Svea Vind Offshore) had its application rejected by the Environmental Court in October due to not meeting consultation requirements. A new application is being processed with consultation until December 16.

Norway

The Oil and Energy Agency (OED) has sent out offshore wind plans for consultation and proposed an auction model with cfd contracts for the first part of Sørlige North Sea II of 1500 MW. An auction is also proposed for Utsira Nord (1500 MW floating), but with more focus on innovation and technology development.

Some of the consortiums that have so far announced that they will apply to build are:



Utsira Nord (flytande)
- Green Investment Group, Agder Energi
- Statkraft, Aker Offshore, Ocean Winds
- RWE, Havfram, NTE
- NorSea, Parkwind
- Fred Olsen Renewables, Hafslund Eco, Ørsted
- Deep Wind Offshore (Haugaland kraft, Sunnhordaland Kraftlag, Knutsen OAS)
- Seagust (ev. samarbete Vattenfall)
- Equinor, Vårgrønn
- Kvitebjørn Havvind
- Magnora Offshore Wind
- TotalEnergi, Iberdrola, Norsk havvind

Sørlige Nordjø II (bottenfast)
- Green Investment Group, Vårgrønn, Agder Energi
- RWE, Equinor, Hydro Rein
- Norseman Wind (Norgesgruppen, EnBW)
- Statkraft, Aker Offshore
- NorSea, Parkwind
- Fred Olsen Renewables, Hafslund Eco, Ørsted
- Deep Wind Offshore (Haugaland kraft, Sunnhordaland Kraftlag, Knutsen OAS)
- Seagust (ev. samarbete Vattenfall)

C Build-out and investments

TROLLVIND of 1 GW can, according to the Minister of Oil and Energy, receive special treatment as it reinforces the power system in the Bergen area in the relatively short term. Equinor develops the park with several partners (including Shell, Total, Petoro, Conoco Philips), and it could be commissioned from 2027.

HYWIND TAMPEN, also developed by **EQUINOR** and owned by the Gullfaks and Snorre fields partners, will supply 35% of the electricity needs to the two platform. Production has now started and a further 6 (out of 11) turbines are to be commissioned during the year.

Finland

SKYBORN RENEWABLES is planning a 3,6 GW offshore park with potential production of ~19 TWh per year. The project may be combined with an electrolyzer for hydrogen production, but this depends on the proposed hydrogen cable in northern Sweden and Finland. Environmental analyzes are to start in 2023, and commissioning is planned for 2030. Also OX2 is carrying out investigations in the same area, according to Montel.

OX2 is planning yet another offshore wind farm, Noatun with 5 GW, off Åland. The project is divided into two; north and south, and the Bank of Åland is a long-term owner through its funds. Export cables are planned to Åland, Sweden, Finland, and Estonia.

EOLUS and **SIMPLY BLUE GROUP** will, through the joint venture "Sea Sapphire" build two wind farms off the coast of Finland; "Wallamo" and an a yet unnamed project. SeaSapphire - Powered by Eolus and Simply Blue Group

Some other parks planned in Finland are "Korsnäs" and "Tahkoluoto" where the Norwegian Forestry Agency has sought partners, "Reimari" by Skyborn Renewables and "Halla" and "Laine" from OX2.

MORE ABOUT FINLAND and offshore wind in the interview with Heidi Paalatie at the end of the report.

Denmark

Nine countries have now joined the Denmark-initiated alliance to expand global offshore wind from the current 57 GW to 380 GW by 2030. The countries are Germany, Belgium, the Netherlands, Norway, the UK, the US, Colombia and Japan.

«High power prices results in low costs for offshore wind support»

In Denmark, the high power prices have resulted in Denmark›s state support for offshore wind through Cfd-contracts being at least 3.5 billion DKK (~470 million EUR) lower than budgeted according to Green Power Denmark. The parks Anholt (400 MW), Horns Rev (407 MW) and Kriegers Flak (600 MW) have guaranteed prices of DKK 1.05/kWh, 77 øre /kWh, and 37.2 øre/kWh, respectively for 10-12 years. When market prices are higher, these differences are collected and discounted against possible later support.

ØRSTED and **CIP** plan to jointly develop four wind farms of, in total, over 5 GW; "Vikings Banke" and "Jyske Banke Nord" in the North Sea, and "Bornholm Basin South and Øst" in the Baltic Sea. The projects are planned within the so-called «open-door system «, i.e. outside government auctions.

HOFORS´ 300 MW park outside eastern Denmark near Copenhagen has been approved by the authorities, and commissioning could be as early as 2026.

In our last report, we wrote briefly about the planned energy island «Bornholm» with cables both to Denmark and Germany. More info here: Energy Island Bornholm | The Swedish Energy Agency (ens.dk)

Miscellaneous

SWEDEN›S ENGINEERS HAVE written a report reviewing permit processes for offshore wind in Sweden. The report states that countries, for example, Denmark, with clear national targets and single authority responsibility for pre-planning. The report proposes for example:

- National plan for the built-out of fossil-free electricity that includes all power sources
- Fast track for offshore wind (as proposed for nuclear) aiming to prepare 10 sites in 6 months.
- Single authority responsibility for coordination. Early involvement of the Defence.
- Maximum permitting lead times according to the EU Commission's recommendations - 2 years for planned areas.
- Auction scheme where the state covers part of the connection fee.
- Municipal compensation – similar to the Danish model

C Build-out and investments

Solar power

THE EU COMMISSION has, as part of the EU Solar Energy Strategy and REPowerEU, launched an industry alliance for solar power. Read more here: Commission kicks off work on a European Solar Photovoltaic Industry Alliance (europa.eu) Becquerel Sweden expects Swedish solar will have accelerated to at least a 50% increase compared to last year, with 750 MW of new installed capacity (total ~ 2.4 GW). Growth has, however, been slowed down by component shortages. Recession, and prolonged permission processes are expected to affect build-out next year.

"Tax reduction increased from 15 to 20 percent"

At end-October, the Department of Finance submitted a proposal to increase the tax reduction for solar installation, from 15 to 20 percent from 1 January 2023.

There is a record high interest in solar cell installations. Swedish manufacturer, Midsummer, has signed letters of intent for more than 400 MW and plans a new factory in Sweden with an initial capacity of 20 MW growing to 200 MW (currently 2 MW is manufactured in Sweden and 50 MW in Italy).

European Energy's solar park in Svedberga in SE_4, with 128.5 MW of installed power, has received much attention in the local media due to a Land and Environment Court ruling.

"Energy production versus food production in a high-profile court case"

An earlier rejection by the County Administrative Board, due to the park being constructed on fertile soil, was overruled by the court, which, among other things, argued that:

- The park will be removed after its lifespan with no or minimal damage to the soil
- The regional energy demand is extensive, and the solar park would contribute to local power production
- A location investigation had been carried out for the park

The case has received attention due to the conflict between food cultivation and energy production, which has resulted in a solar park rejection by county administrative boards in several cases.

We recommend a report from Chalmers University regarding LCOE for Swedish solar parks :
ECONOMIC ANALYSIS OF THE EARLY MARKET OF CENTRALIZED PHOTOVOLTAIC PARKS IN SWEDEN – SCIENCEDIRECT

Some new swedish solar projects

DIF CAPITAL PARTNERS buys a majority stake in the solar cell developer Alight for EUR 150 million and a secondary buyout of some existing shareholders. Alight will continue its journey towards becoming an IPP and to develop at least 5 GW PPA-based solar projects in the Nordics and Europe by 2030.

OMNES CAPITAL, a French investor, invests ~SEK 2 billion in HP Solartech and, thus, is the new majority owner. HP Solatech targets 1.5 GW solar parks by 2028, and will invest close to 10 billion over the next five years.

POLHEM INFRA and **SOLKOMPANIET** will cooperate to develop up to ~600 MW large-scale solar in Sweden. Two projects, totaling 100 MW, are currently developed. Several others are expected to be commissioned within 2-4 years. Polhem Infra is owned by AP funds.

EOLUS has received permission for its first two solar parks in Sweden; "Södra Valla" in SE_3 and "Säbyholm" in SE_4. 37 or 51 MW will be installed.

E.ON has bought the Swedish company Idola Solkraft, which supplies turnkey solar installations, makes installations and has solutions for energy storage, electric car chargers, etc.

EUROPEAN ENERGY is planning a hybrid park with wind + solar. The 37 MW solar park will be located at the newly built "Kingebol wind farm" in Åmål municipality (SE_3). European Energy has also communicated a similar hybrid park in Ydre municipality, also SE_3, as well as in Småland (8 turbines + 2 solar parks).

European Energy is also close to start construction of the 128.5 MW solar park in Svedberga, where they have just been approved by the Land and Environment Court.

OX2 has begun the process for a solar park outside Halmstad with estimated production of ~110 GWh per year. This is their third project in this west-coast region.

ILLMATAR plans a large solar park with an est. production of 340 GWh/yeraoutside Älmhult in SE_3.

HELIOS Nordic Energy is planning, through a subsidiary, a 50 MW solar park near Uppsala.

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Several local utilities are also planning solar parks, including:

- Trollhättan Energi: Solar park with an expected output of 3.4 GWh located located next to their recycling center. Commissioning expected 2023/24.
- Mölndal Energi: 5.4 MW park on a landfill built by Svea Solar.
- Affärsverken Karlskrona: Expansion of the Karlskrona solar park potentially doubling the production to 5.5 GWh.
- Kraftringen: Inaugurated their first solar park outside Klippan in SE4 in October. Target is to increase biodiversity through several projects.

Other Nordic Countries

We clearly see that the build-out of solar in both Norway and Finland has really taken off. We have previously reported on Magnora and Helios merging into a new company, and Skagerak Energi in cooperation with Isola Solar in Norway. Analyzes show that Norway could increase solar installations to 2 GW already before 2025. In Finland, we have reported about Illmatar and Exillon Tuulihankeet who have received major state support to develop 70 + 150 MW parks, and Better Energi & Forus and Ib Vogt planning several large parks.

Here are some news since last report.

Norway

Å ENERGI and **BTG SOLENERGI** establish the joint company "Solutvikling" with high ambitions. Å Energi (merger of Glitre and Agder Energi) recently launched plans to build more than 500 MW over the next four years on available land around their hydropower plants. The first park to be built will be the 10 MW "Birkeland" solar park.

ENERGEIA and **EIDSIVA** are planning two solar parks (Oystadmarka and Maehlum) in NO_1 with a total capacity of 240 MW, also combined with fodder production. The companies are planning further 30-150 MW solar parks, in total up to 1000 MW. They refer to falling investment costs for solar, currently around 15-20 øre/kWh, according to a Montel article.

GREENSTAT and **SKAGERAK KRAFT** plan a 6 MW solar park in Larvik with est. annual production of 6.5 GWh.

Finland

OOMI and **OOTUN SEUDUN SAHKO** (utility) plan 10-15 solar parks totaling 100 MW by 2025.

1KOMMA5 has bought the solar company Solar Age and plans further acquisitions during the year. They have previously bought several companies in other countries and installed 42,000 facilities. The company is also active in Sweden, where they recently launched an energy management system, acquired Cellsolar and signed an agreement with Bixia.

NEOVA plans 310 MW of solar in Finland. The first park is expected to start construction next year and the company has communicated six 5-80 MW projects. They are planning four hybrid parks with 500 MW of wind and 450 MW of solar.

KORKIA has recently communicated the development of 1 GW of solar power in Finland by 2027. More than 20 projects of 40-100 MW each will produce up to ~1 TWh/year.

Denmark

EQUINOR has acquired the solar developer Be Green with a project portfolio of 6 GW. The projects are to be commercialized through Equinor›s subsidiary Danske Commodities.

NORDIC SOLAR has bought a portfolio of 250 MW solar parks in Denmark from the developer GreenGo. Commissioning is expected within 3-5 years. Expected investment cost is stated at 1 billion DKK (~134 mEUR).

COMMERZBANK and **HYDRO REIN** invest a total of EUR 600 m to finance 1 GW of GreenGo›s solar power expansion in Denmark. The first two parks with a total of 362 MW are expected to start production in 2026.

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RESERVE	BID SIZE	VOLUME REQ.	PROCUREMENT	ACTIVATION	DESIGN
FCR-N	0,1 MW	Max 230 MW	2/1 day ahead	60 sec–3 min	Symmetrical
FCR-D upp	0,1 MW	Max 556 MW	2/1 day ahead	5–30 sec	Symmetrical
aFFR ned	0,1 MW	Max 530 MW	2/1 day ahead	5–30 sec	Symmetrical
aFRR	1 MW	Max 140 MW	Weekly	5 min	Bid for up or down regulation
mFFR	10 MW (5 MW)	–	Intraday	15 min	Bid for up or down regulation

Storage & Flexibility

NEW PROJECTS FOR storage and flexibility are continuously published. SvK has launched several markets to maintain and restore the frequency. The table summarizes services in Sweden.

SVK has been commissioned to procure consumption flexibility during peak hours from 1 December 2022 to 31 March 2023. SvK has also submitted an application to EI to be allowed to use bottleneck revenues to procure this flexibility this winter.

SvK's procurement of FCR-D down started in 2022, and volumes will increase to 210 MW for all hours in Q1-2023, thereafter stepped up as the pre-qualified volume increases.

SvK has also presented proposed models for the procurement of plannable power, choice will partly depend on the final revenue cap model.

NORDIC TSOS have started a »fast reserve market«, aFRR, from 7 December; where bids can be submitted between bidding zones 7 days before delivery.

THE FOUR AUTHORITIES THE ENERGY INSPECTORATE, THE TSO (SVK) , THE ENERGY AGENCY AND SWEDAC have been tasked with presenting proposals to promote system flexibility. Reporting is due on 15 December 2023.

STOCKHOLM FLEX has started its third season with tripled volumes (155 MW) of short-term flexibility potential. The marketplace includes 26 municipalities and is a collaboration between SvK , Ellevio and Vattenfall, with E.ON also connected.

Some of the latest publications regarding the development of flexibility or storage projects in Sweden:

- Jämtkraft is planning several batteries in connection with its power production. The first is a 15 MW/15 MWh battery at a hydropower plant in SE2. They are also looking into a hybrid park with wind, solar & battery.

»Reduced costs and higher ancillary service demand«

Jämtkraft states that profitability lies in reduced costs for batteries in combination with increased income from SvK's ancillary/frequency services

- Borlänge Energi invests in a 10 MW/10 MWh battery at its CHP plant to offer frequency regulation to SvK. The SEK 50 million investment is expected to be repaid after just a few years.
- OX2 will start the construction of a ~40 MW battery storage before year-end. Commissioning expected in spring of 2024. The battery consists of 21 containers, covers an area of about one hectare, and will deliver support- and frequency regulation services to SvK.
- Alight and Tekniska verken are about to commission a 2 MW/2MWh battery storage at their 12 MW solar park in Linköping. Infranode is the main financier. The battery will offer support services to grid owners and frequency regulation to SvK.
- Varberg Energy and MVS have signed a cooperation agreement regarding grid-connected energy storage . Varberg has also signed an agreement with Alight to build 25 MW of energy storage in southern Sweden by 2025. Varberg will offer flexible services and Alight will develop the batteries.
- Mälarenergi and Mine Storage has signed a letter of intent for an in-depth feasibility study for three pumped storage plants in disused mines with a total output of ~45 MW. The intention is price optimization and offering support services.
- Vattenfall is looking into restarting its 335 MW »Juktan« pumped storage plant from 1978 in SE2. The facility has previously been converted to a normal hydropower plant and the storage capacity is estimated to be around 30 GWh.
- Ingrid Capacity is a new Swedish battery company establishing a 70 MW battery storage in Karlskrona and a 20 MW storage in Vimmerby. They have 500 MW under development in Sweden. The company has now brought former energy and industry minister Ibrahim Baylan into its board.

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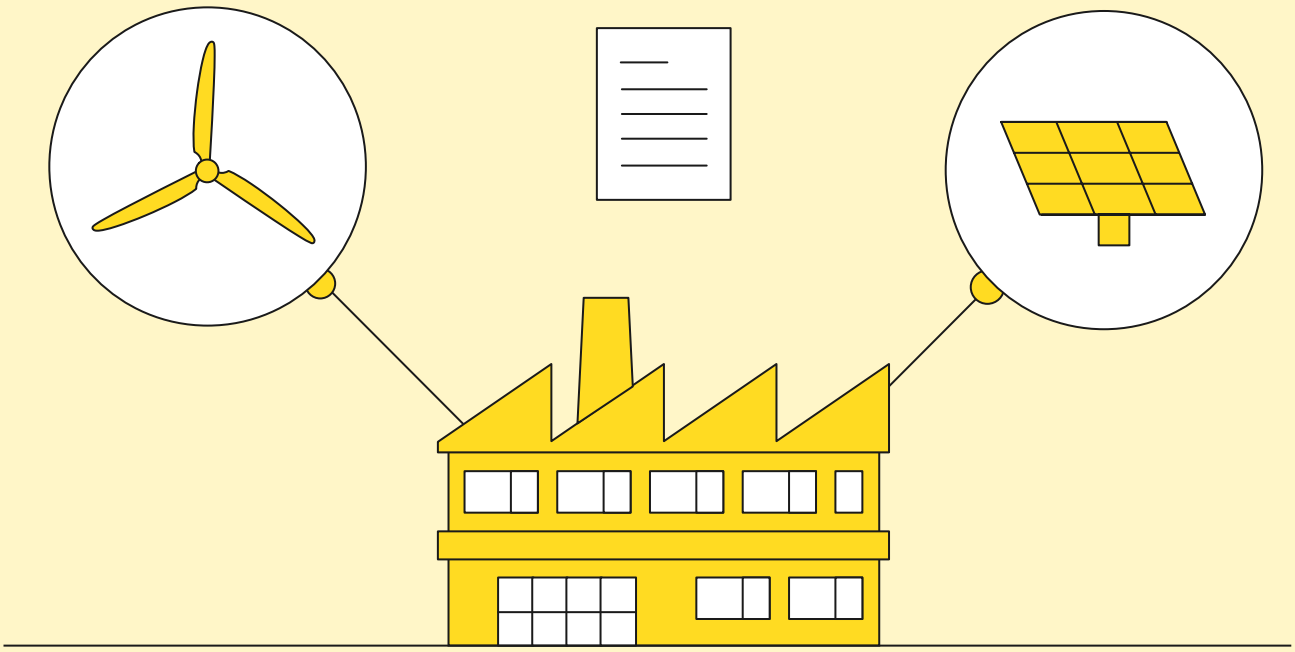
- Polarium, a Swedish energy storage and optimization company, has raised capital from Alecta, Formica Capital and Absolute Unlisted. Polarium is also owned by for example AMF, Vargas, Roosgruppen and Beijer Invest.



Industrial projects & consumption

THE SWEDISH ENERGY AGENCY, the TSO, the Energy Market Inspectorate, and the Swedish Transport Administration have written a joint report based on the previous Government's electrification strategy. The report shows for example: »Need a build-out rate of 6–12 TWh per year«

- Increased electricity demand to 210–370 TWh by 2045 and potentially doubled electricity demand of 280 TWh already by 2035.
- A large part of existing production will disappear between 2035–2045 (lifespan).
- In addition to already planned wind and solar power, at least 50 TWh and up to 125 TWh of new power production is required by 2045. The higher scenario would require 6 TWh/year until 2030, and 12 TWh/year thereafter.
- Onshore wind must account for the most significant part of new production until 2035, after which there is also high potential for offshore wind and nuclear.
- Lead times for new power production, grids and charging infrastructure need to be shortened and acceptance increased.

REPORT IN SWEDISH HERE: Joint authority monitoring of society's electrification – main report3 (tt.se)

Electricity consumption by Swedish mining companies may increase by more than 30 TWh/year according to industry association SveMin, needed to reach industry climate targets by 2030. The industry currently uses about 5 TWh per year and estimated to increase to

C Build-out and investments

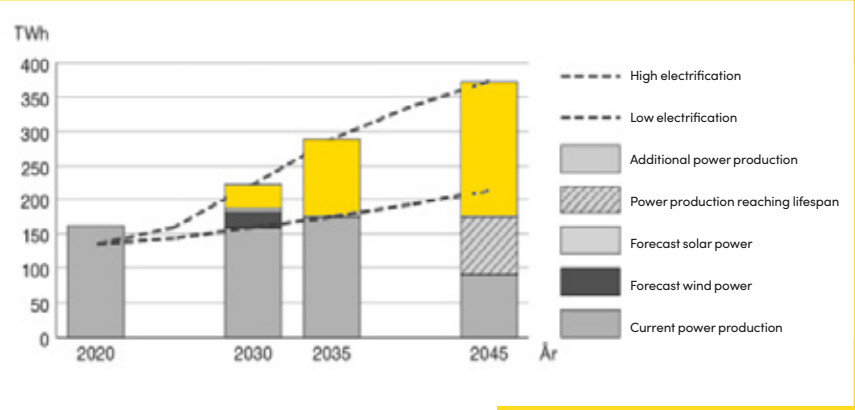
38 TWh by 2035 and to 74 TWh by 2045. LKAB accounts for the largest part.

PWC estimates that Norway may need 75 TWh of new power production as early as 2030 to reach climate targets and industrial roadmaps. Statnett has also shown that Norway may have a power deficit from 2027.

A new analysis from the Miljødirektoratet also shows that the electricity demand in the Norwegian transport sector may increase by 32 TWh by 2050.

Power prices of max. 50-60 øre /kWh by 2030 is needed to make green ammonia production profitable, according to the director of North Ammonia. According to Alcoa's energy director, the prices must not exceed 40 øre/kWh.

Gasgrid Finland, OX2, Nordion Energi, and CIP have joined forces in the »Baltic Sea Hydrogen Collector« to investigate possibilities for a hydrogen pipeline in the Baltic Sea between Sweden, Finland, Åland, Denmark, and Germany, incl. planned energy islands.



SOURCE: THE SWEDISH ENERGY AGENCY

Some of the latest publications regarding industrial projects in Sweden as well as some examples from the rest of the Nordics:

OVAKO has been granted an environment permit for a hydrogen plant at its factory in Hofors in SE3. The 17 MW electrolyser will produce hydrogen gas to replace LPG from Q2-2023. By 2030, Ovako wants to replace all its LPG with self-produced hydrogen. Flexibility will be used to provide ancillary- and regulatory services to SvK.

H2 GREEN STEEL has raised another SEK 750 million (in total SEK 2.8 billion) as well as securing debt financing of 38 billion from financial institutions. H2GS and Norwegian Hydro Havrad have also agreed on cooperation.

LIQUID WIND raised EUR 15.2 million in Series B financing, in which existing investors and UK HyCap participated. They have previously received SEK 4 million in A-financing. During the quarter, the company also started the permit application for its second factory – FlagshipTWO in Sundsvall. Their FlagshipONE has not been taken over entirely by Ørsted.

LHLYFE and **HÄRJEDALEN MUNICIPALITY** are investigating the possibility of 5 MW renewable hydrogen production in Härjedalen in combination with the region's two wind farms.

CIRLE K has inaugurated the Nordics' first public charging and hydrogen filling station in the Port of Gothenburg.

FLEXENS plans a green hydrogen and ammonia production facility in western Finland. 300 MW electrolyser to be commissioned in 2027 at an estimated cost of EUR 500 million. PPAs are to be signed.

HYUNDAI and **OX2** have signed a letter of intent for a 3 MW (electrolyzer) hydrogen station for vehicles at at Möckelö on the island of Åland. Commissioning is expected 2024 in combination with OX2's solar park.

ALLIANZ has bought a minority stake of Finnish Ren-Gas.

EUROPEAN ENERGY has received DKK 400 million in support from Denmark's green investment fund DGIF for an e-methanol project in Jutland with est. power consumption of ~400 GWh per year. Power will be delivered from a 300 MW solar park in Kassø. Commissioning is expected already next year.

ØRSTED and **SKOVGAARD ENERGY** are planning a 3 GW hydrogen plant in DK1 with an initial 150 MW electrolyser. Power to be delivered from wind- and solar power.

EQINOR and **AKER BP** have made investment decisions to expand the Kraftla field in Norway. The 140 MW/1,2 TWh electricity demand from 2029 will be covered with onshore power production. ■

D Market Development & Forecasts

Nordic power prices are becoming increasingly volatile, the elcertificate market is quiet whereas interest in GoOs is rising in Europe. We go through the latest price developments and summarize published forecasts and comments.

Nordic Power

Spot prices

Until end-November, mild and rainy weather resulted in low spot prices and downward pressure on financial contracts. Persistent rain and strong winds in the mid-month resulted in the lowest spot prices of the year in large parts of the Nordic region. However, receding hydro levels and high-pressure weather helped hydro producers to regain control, and spot and futures prices have since risen sharply.

At the beginning of December, the cold weather hit with force, and temperatures fell to about 4-7 degrees below normal. Prevailing high pressure also led to dry weather and light wind. Further, this coincided with major nuclear outages.

- **RINGHALS 4** is out due to extensive maintenance, with restart postponed until end-Feb 2023.
- **OLKLIUOTO 3** in Finland is yet again in trouble and now scheduled back on 6th Feb 2023. Highly uncertain if it will be fully operational this winter.
- **OSKARSHAMN 3**, Sweden's largest reactor, is out since 9th Dec and scheduled back on 18th.

Thus, December has been strained with rising demand and low production. While we have, therefore, needed much hydropower, the modest rainfall has instead resulted in a hydrological deficit of about 20 TWh compared to normal.

»Price differences have largely disappeared«

At end-Nov/start-Dec, the previously large price differences between northern and southern Scandinavia had largely disappeared. Only NO_4 had significantly lower prices than other bidding zones. SE_1 and SE_2 skyrocketed, and, for many days and hours, all of Sweden had the same high spot prices – also on par with Germany. A major reason was massive ice formation affecting both hydro- and wind power producers. In mid-December, hydropower capacity in SE_1/SE_2 was reduced by about 2400 MW.

The ice formation problems should be temporary, and we should see an increased difference between north and south again. Potentially, however, slighly lower than previous due to SvK´s increase of transmission capacity between SE_2/3 and, together with Statnett, between SE_3 and NO_1.

Forward/Futures prices

At the time of writing, the SYS January contract is trading at EUR 250/MWh, down over EUR 100 since end-Nov. The EPAD price for SE_4 is 43 EUR/MWh, and for NO_2 it is 29 EUR/MWh. The corresponding German contract trades at 320 euros, and the marginal cost for gas condensation is 302 euros.

The next quarter, Q1-23, has again come down to 240 euros after peaking at 360 euros end-Nov. The bull-run from cold forecasts and low nuclear power has gradually subsided. The annual contracts have gone in the same direction and are now traded at 170 resp. 85 euros (2023, 2024). Overall, the forward curve has leveled out, and the distance between delivery periods has decreased.

The TTF contract (gas) with delivery in January trades at around 130 euros/MWh, significantly below August's price peaks of 320 euros/MWh. The futures curve for TTF gas is still at a high level at 130/100/65 euros for 2023/2024/2025. These prices are still higher than the Asian futures prices, meaning that Europe is more profitable to export to - critical now that we are replacing Russian gas with LNG. Germany plans to open 11 new LNG terminals at an estimated cost of around 6 billion euros.

We see a substantial risk that this infrastructure will become a relic of Europe's fossil-dependent era and that it could reduce the incentives for the EU's green goals.

Looking ahead

Weather forecasts point to milder weather in January, and also more wind. Further, we expect to get at least some of the Swedish nuclear back by the new year.

»More nuclear power in both Sweden and France«

French nuclear power production had a record-poor availability in 2022, but there is light in the tunnel after EDF's latest forecasts. This has contributed to falling futures prices lately.

However, the price of EU ETS emission allowances has picked up speed again. The higher coal burning in Europe increases emissions. Further, the latest negotiations on a stricter EU ETS scheme (read more in

D Market Development & Forecasts

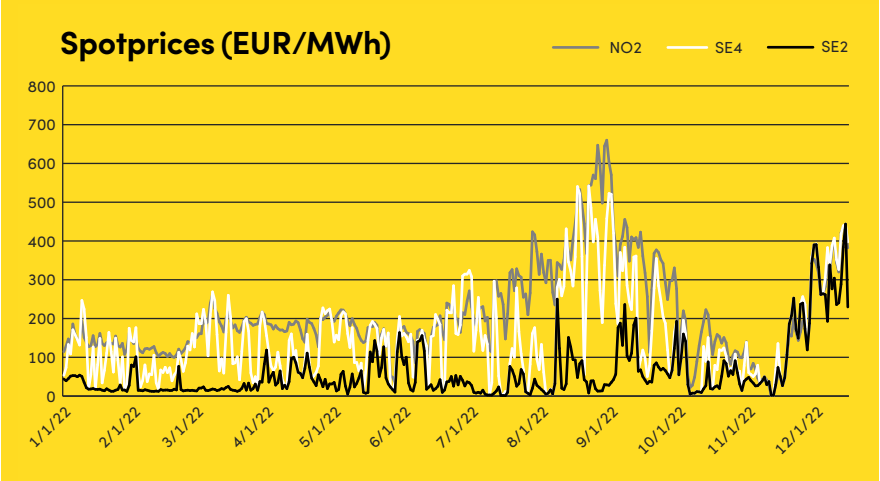
News&Politics section) have contributed to higher prices. EUA prices were down at 65 euros in Sep/Oct, but now again above 85 euros/ton.

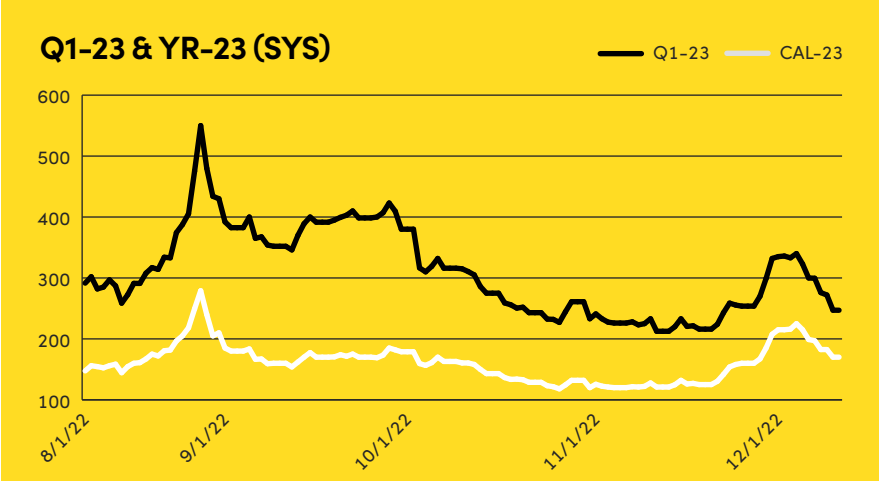
In summary, we see some relief from the record-high levels recently seen. However, we don´t expect such dramatic weather changes that would result in a hydro surplus. As long as continental prices are higher than the Nordic ones (which we foresee), we export power, keeping hydro levels down. We expect a better net balance in France, but continued exports on the new cables between NO2 and the continent and Great Britain. The new cables also make it less likely that large hydrological surpluses will occur.

For the next few years, we generally expect continued high power prices. However, we foresee more and longer periods with wind power costs affecting the prices since the build-out rate is very high during the next couple of years.

MARKET PRICES FROM 15 DEC

Q1-2023:	€244/MWH
Q2-2023:	€170/MWH
YR 2023:	€166/MWH
YR 2024:	€82/MWH
EUA 2022:	€85/MWH
COAL API2 2023:	$225
GAS TTF Q1 2023:	€135/MWH
GAS TTF YR 2023:	€135/MWH





NEDAN: Genomsnittliga spotpriser samt prisskillnader mot systempris för de olika elområdena har varit:

AVERAGE €/MWH	NORDIC	SE1	SE2	SE3	SE4	NO1	NO2	NO3	NO4	NO5	FIN	DK1	DK2
2020	11	14	14	21	26	9	9	9	9	9	28	25	28
2021	62	42	43	66	81	75	75	41	35	75	72	88	88
2022													
JAN	93	28	28	101	106	140	140	26	26	137	107	118	112
FEB	90	25	25	73	79	120	120	18	16	119	81	113	100
MAR	145	22	22	123	146	192	192	18	16	192	86	236	228
APR	134	51	52	86	110	181	181	47	19	181	79	164	153
MAY	114	55	55	98	133	163	163	16	11	163	133	172	163
JUNE	116	48	48	119	170	146	181	12	8	146	140	214	213
JULY	94	21	21	82	115	164	258	2	2	164	184	275	233
AUG	223	17	49	211	289	351	443	19	3	348	261	457	450
SEP	212	94	94	212	224	355	355	75	36	355	215	343	329
OKT	74	46	47	74	74	127	127	34	20	127	114	137	137
NOV	109	112	112	120	124	109	109	62	43	109	195	140	145
DEC	324	296	296	361	363	349	349	273	127	349	356	365	365

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External forecasts

VOLUE BELIEVES THERE is a significant upside to Nordic power prices in case of a cold winter due to low hydro levels and unavailable nuclear in the Nordics and on the continent.

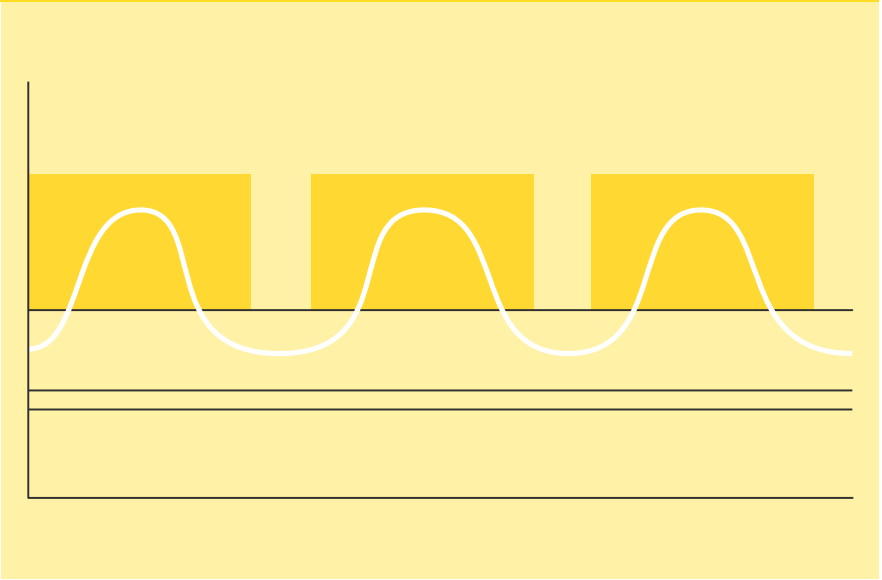
A couple of new long-term price forecasts have been presented, varying between ~40-80 EUR.

»Long-term power prices based on renewables production cost«

MODITY ENERGY TRADING estimates that the high power prices in southern Sweden (SE4) will fall to around EUR 50 by 2027 and EUR 45 after 2040. As Europe finds alternatives to Russian gas, pricing should be increasingly based on the marginal cost of renewable power; in northern Sweden for onshore wind (~30 EUR/MWh), and in the southern parts on offshore (~45 EUR/MWh).

SIGHOLM forecasts higher power prices than Modity and believes that the system price will remain at the 70-80 euro level and that Nordic prices will still depend largely on German power market. They foresee a normalization at ~130 EUR in Germany – higher than the current price for the 2030 futures contract. Also in the Nordics, Sigholm expects the power price will exceed current futures contracts.

SWECO has, on behalf of Swedish Wind Energy Association, concluded an analysis showing that the new wind power (25 TWh) added in 2022-2025 will push the annual average Swedish power price by about 0.7 EUR/MWh.



»Cutting export cables would affect prices the most«

Sweco has also, in another report, shown that new nuclear power would press the price in southern Sweden by 24 öre, and the corresponding amount of new offshore wind power by 27 öre. Blocked export cables would have the greatest impact, but also lead to increased vulnerability.

STATNETT has forecasted that Norway could have a power deficit from 2027, and would have to rely more on imports. They expect consumption to increase from 140 TWh to 163 TWh, and production only by 6 TWh. The largest deficit (7 TWh) is expected in southern Norway. Last year's exports were just below 18 TWh.

»Norwegian power deficit from 2017 and prices in southern Norway normalizing at 60 EUR"

Statnett expects power prices in southern Norway to normalize over the next five years towards 50-70 EUR/MWh. ■

D Market Development & Forecasts

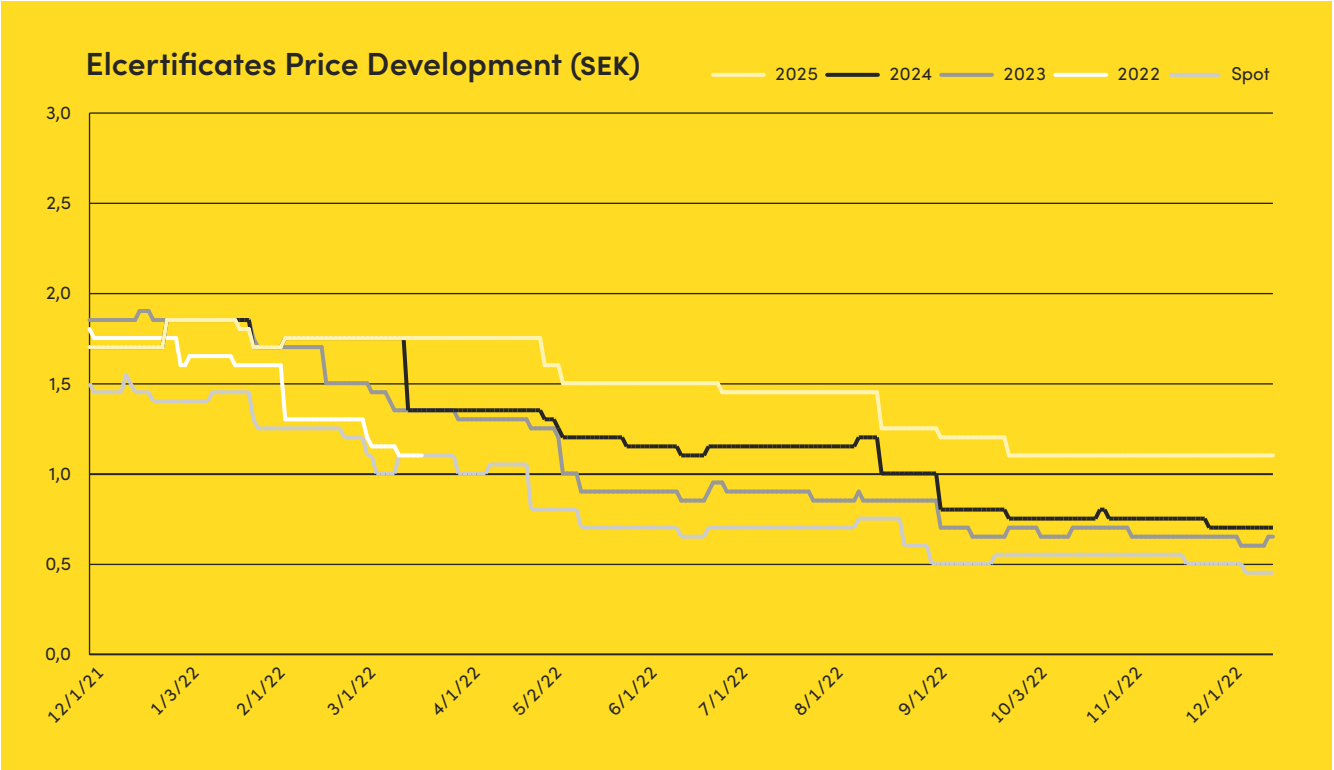
Electricity certificates

THE ELECTRICITY CERTIFICATE market is still calm with only occasional OTC deals. Prices are at the same levels as the previous month; Spot at ~0.30 SEK, March-23 at 0.40 SEK, and March-24 at ~0.70 SEK.

For October, 5.4 million certificates were issued, almost 2 million higher than last month, mainly due to high wind- and hydro production. The estimated accumulated balance at end-October was ~40 million. November production was much lower than forecasted, but the market did not react to this.

There are no news regarding control station 2023 and the Energy Agency's report. The latest quarterly report (1 Oct) showed that 56.5 TWh has been approved for the certificate issuance, 10 TWh above the target.

STATUS PER 01.10.2022 IN OPERATION	TWH
Sweden	35,3
Norway	21,2
IN TOTAL	**56,5**
Target	46,4
OVER THE TARGET	**10,1**



Guarantees of origin (GoOs)

GOO PRICES ARE at an all-time high due to low production from hydropower and high demand. The Hydro 2022 contract traded at EUR 10/MWh in the last week of November, but fell sharply to EUR 5.30 at the start of the week, and recovered slightly in the last few days to EUR 6/MWh.

We are approaching the Christmas holidays, leading to lower demand. Furthermore, the weather situation is improved. We can expect volatile prices in the coming months before the market finds a comfortable price level for both sides.

Nordic EECS GoOs are now traded at the following approximate prices (euro/MWh).

	HYDRO	WIND	SOL
2021	5.24	5.24	5.20
2022	6.00	6.09	5.95
2023	5.95	5.80	5.80
2024	4.10	4.90	3.90
2025	3.80	3.80	3.80

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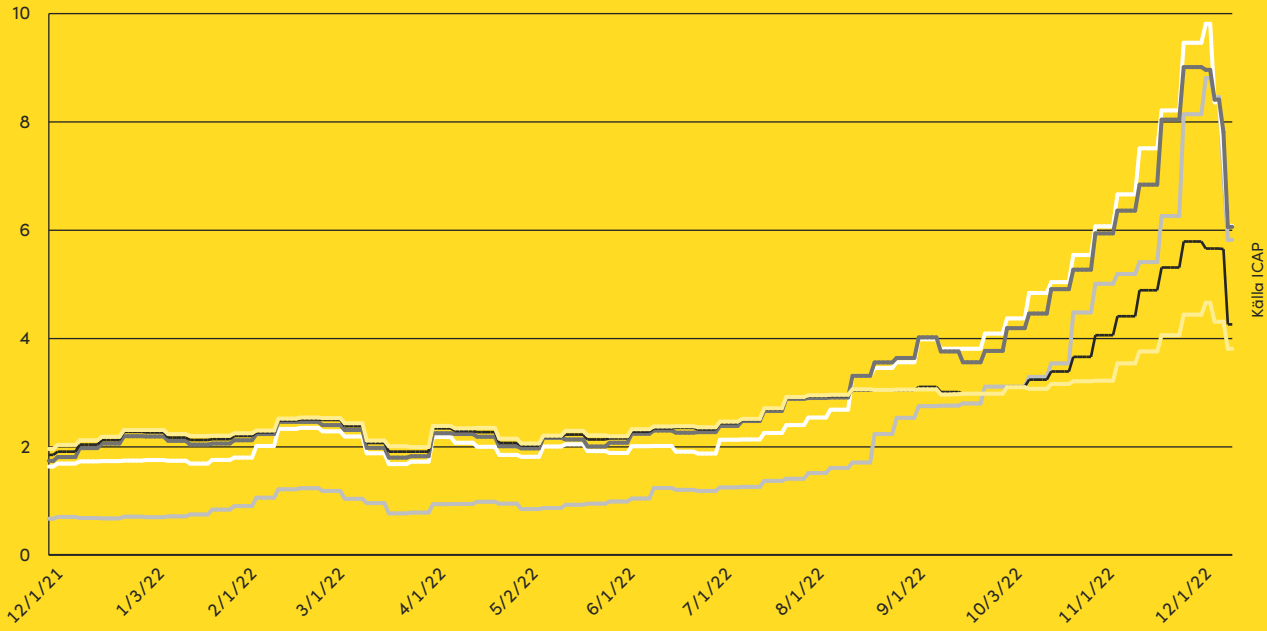
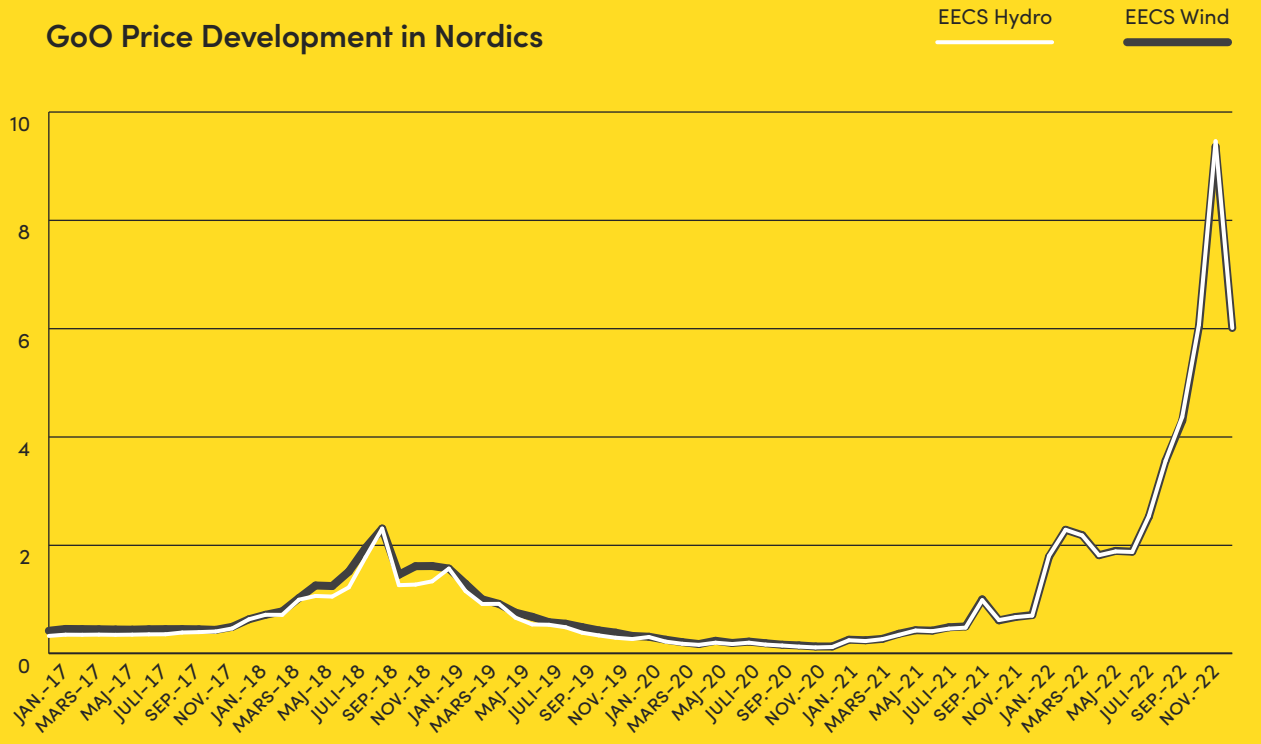
EECS Hydro



GoO Price Development in Nordics



D Market Development & Forecasts

The incredibly high recent GoO prices have several reasons. The most obvious is reduced hydro production for the delivery year 2022 due to hot and dry summer in Europe. Many hydropower producers sell their forecasted volumes in advance, and, with lower production output they had to buy back some volumes on the market. This further boosted demand.

»Increased demand increases confidence in GoO scheme"

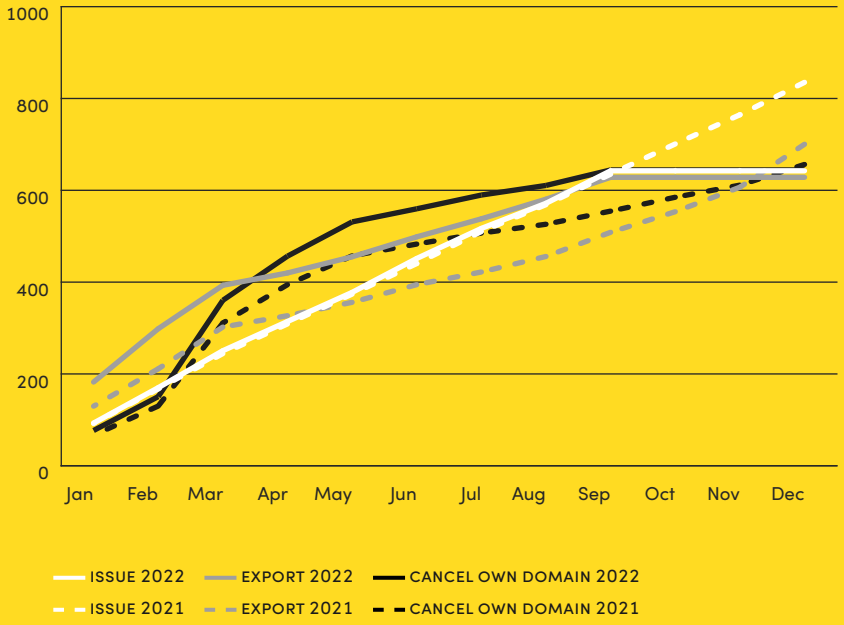
High GoO prices mean increased energy costs for consumers, but also a contribution to the profitability of renewable energy. The willingness to pay, shows confidence in the scheme.

In our latest monthly summaries, we have also written about RE100 with companies committed to using 100% green electricity, and their new additionality requirements with a 15-year limit for facilities. This is expected to increase demand for solar- and wind, which may benefit from a price premium compared to older hydroplants. It should also increase transparency.

»Increased GoO interest from nuclear«

We have also mentioned an increased interest in GoOs also from other fossil-free sources due to the high prices. The GoO-price for nuclear power has risen by ~0.2 EUR since last summer and is now traded at 0.70 EUR/MWh. The only countries that can currently issue and cancel these are Sweden, Finland, the Netherlands, and Slovakia.

Annual cumulative evolution of transactions from AIB-statistics (TWh)



STATISTICS FROM AIB show that issued GoOs so far this year are the same as last year, while exported GoOs increased by about 25% compared to last year. Canceled GoOs increased by 16% in AIB domains, while cancellations decreased by 37% in external domains.

E PPA Update

Corporate long-term PPAs are becoming increasingly common and is also highlighted by the EU commission for renewable build-out and sustainable electricity sourcing. We summarize the latest trends, price development and go through some of the latest transactions.

PPA Update

News & Trends

The volatile power prices have affected producers' views on long-term contracts and price hedging strategies. This year's price levels have not resulted in increased income for all producers, as many have been locked into fixed-price agreements. Since many fixed price contracts also include a fixed volume commitment, several players have instead suffered from negative settlement invoices on their price hedges, sometimes even of more significant amounts than the spot revenue for total production. This is largely due to the recent very high cannibalization effect (low capture rates).

»Investors forced to change hedging strategy«

This trend has led to many investors adjusting future strategies, i.e., more and more investors are choosing to invest in renewable electricity production without (or only with a smaller percentage) PPAs.

We also see a certain risk that the above problems have increased risk premium for the Nordics in general, especially in combination with political uncertainty in both Norway and Sweden.

The high market prices have increased interest in PPAs among industry and other corporates, but few are willing to commit to current market prices that are two to three times higher than historical prices. Many expect producers to offer prices corresponding to production and investment costs.

»Interest in operational renewables increasing«

Interest in PPAs has also increased from relatively smaller power-intensive new factories as well as already operating businesses. These are often looking for an immediate start of the PPA. This has contributed to an increasing interest in already operational wind-, solar-, hydro- and biomass plants.

"More Pay-as-Produced agreements"

Due to the financial problem for several producers with financial baseload hedges, this type of contract is no longer offered as much. Thus, only varying types of Pay-as-Produced structures are available to corporates. This requires higher buyer competence since profile- and volume risks are handed over and the total electricity cost of the buyer will most likely be above the agreed PPA-price.

" Utility PPAs declining"

Traditional energy trading companies/utilities have largely stopped offering wind and solar parks "Pay as Produced" structures, and offered prices for baseload contracts are combined with high mark-ups/deductions and collateral requirements.

CONTACT BODECKER PARTNERS
if you own wind- or solar power in Sweden or Norway! We have interested offtakers both in the short and long term.

Brief European outlook

The combination of high power market prices and low supply in relation to high demand has caused PPA prices to rise further during the quarter. Wind and solar project developers testify to slower permission lead times, increased costs, and inflation. Simultaneously, offtakers are starting to get closer to climate target pledge deadlines.

RED III and the Delegated Act for Renewable Transport Fuels, which we have summarized before, have still not been decided. The proposals on the requirement for power from the grid differ in the two separate proposals:

- Additionality: In the REDIII proposal there is no requirement for

E PPA Update

additionality, while the delegated act sets a 3-year limit from 2027.
- Temporal correlation: Quarterly correlation (instead of previously proposed hourly) applies in both proposals, but the Delegated Act wants hourly from 2028.
- Geographical correlation: REDIII requires the same or neighboring country, while the Delegated Act requires same bidding zone.

We are still awaiting final information on the regulation.

READ ABOUT RECENT Nordic wind- and solar projecs in the section Investments & Build-out in our Nordic Renewables Report.

Tip

On the website from Re-Source, a European platform for renewable energy supply, you will find country information about type of PPAs, volumes, and companies etc.

Read about it here:
EUROPEAN CORPORATE SOURCING DIRECTORY - RE-SOURCE PLATFORM (RESOURCE-PLATFORM.EU)

Nordic PPA-prices

THE PRICE HAS slightly recovered in most bidding zones since last month, especially in SE_1 to SE_3, with, on average, about 20-25% for a 5-year average.
In December, the spot price was the highest ever for the low-price areas in northern Sweden and Norway. So far for the month, we have a price of 296 EUR/MWh in SE_1 and SE_2, 127 EUR/MWh in NO_4, and 273 EUR/MWh in NO_3. More about this in the »Price development« section.

Prices for long PPA contracts have also recovered in recent weeks. The forward prices for a 10-year baseload contract in Sweden starting from 2024 have increased by ~7 euros in all biddding zones to about 36 EUR/MWh in SE_2, 68 EUR/MWh in SE_3, and 111 EUR/MWh in SE_4.

»Very low capture rates, also in Finland«

Capture rates affect the valuation of so-called Pay-as-Produced PPAs, i.e. including profile and volume risks.

Capture rates were very low in all Swedish bidding zones during November; in SE_1 and SE_2 only about 40%, and in SE_3 and SE_4 at about 70%. Also in Finland, we start noticing a sharp deterioration in capture rates (also mentioned in our end-interview). This year average capture rate for wind power in Finland was 67%. In November it was only 53%. This is far below the 94% in 2021.

The capture rates in Norway were significantly higher, especially in NO_2 with close to 99% during November and 88% for the whole year so far. Last year it was 102%.

»Market prices no longer relevant as a reference price in northern Sweden«

As we have discussed before, market prices as indicated above are often not reflected in actual PPA negotiations. In northern Sweden, many wind power investors are unwilling to lock power into long PPAs at prices far below 50 EUR/

The table below shows average spot prices in each bidding zone in 2020 and 2021, and per month in 2022.

AVERAGE €/MWH	NORDIC	SE1	SE2	SE3	SE4	NO1	NO2	NO3	NO4	NO5	FIN	DK1	DK2
2020	11	14	14	21	26	9	9	9	9	9	28	25	28
2021	62	42	43	66	81	75	75	41	35	75	72	88	88
2022													
JAN	93	28	28	101	106	140	140	26	26	137	107	118	112
FEB	90	25	25	73	79	120	120	18	16	119	81	113	100
MAR	145	22	22	123	146	192	192	18	16	192	86	236	228
APR	134	51	52	86	110	181	181	47	19	181	79	164	153
MAY	114	55	55	98	133	163	163	16	11	163	133	172	163
JUNE	116	48	48	119	170	146	181	12	8	146	140	214	213
JULY	94	21	21	82	115	164	258	2	2	164	184	275	233
AUG	223	17	49	211	289	351	443	19	3	348	261	457	450
SEP	212	94	94	212	224	355	355	75	36	355	215	343	329
OKT	74	46	47	74	74	127	127	34	20	127	114	137	137
NOV	109	112	112	120	124	109	109	62	43	109	195	140	145
DEC	324	296	296	361	363	349	349	273	127	349	356	365	365

E PPA Update

MWh, not even in Pay-as-Produced structures. As this would result in even higher total costs for an industry, this is not reasonable for many offtakers.

In SE3 and SE4, actual PPA prices are now closer to market prices, taking into account volume and profile risks.

	SE1	SE2	SE3	SE4
Q1-23	-160,00	-160,00	13,30	41,50
YR-23	-115,00	-115,00	13,00	85,00
YR-26	-26,70	-26,70	3,95	45,00

Baseload PPA

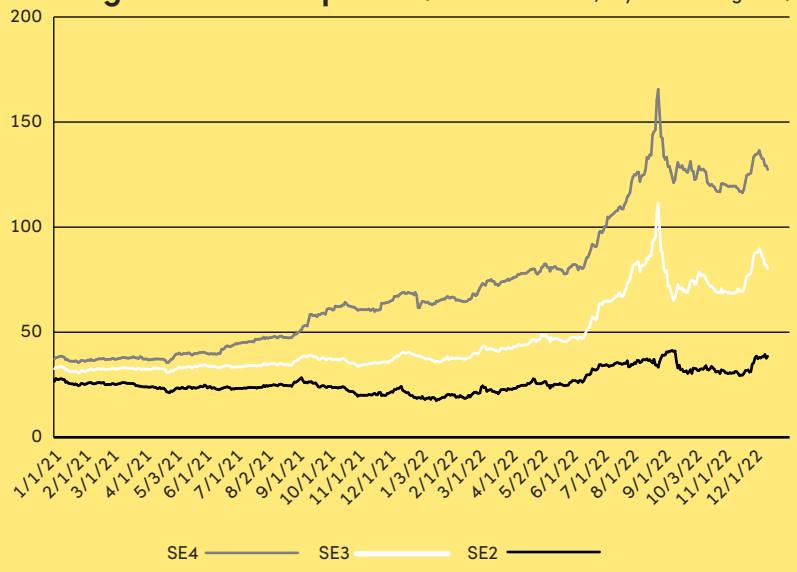
OUR CTRM SYSTEM includes market prices for Baseload PPAs. The table below shows updated prices for SE2, SE3 and SE4 (EUR/MWh). For other bidding zones, contact us. This year, a 5-year PPA in SE2 and SE3 have increased ~150%, and ~132% in SE4. A 10-year contract has increased by almost 110% in SE2 and just below in SE4.

TRADE DATE	03.01.2022 EUR/MWH		14.12.2022 EUR/MWH		DEVELOPMENT IN %	
START 2023	5 YEARS	10 YEARS	5 YEARS	10 YEARS	DIFF 5 YEARS	DIFF 10 YEARS
SE2	18,0	18,6	44,5	38,5	147%	108%
SE3	38,3	38,5	97,1	80,2	154%	109%
SE4	65,0	63,6	150,5	127,4	132%	100%

Explanations
Market prices in EUR/MWh per bidding zone per trading date 3 January and 5 October. The prices are average price of 5 years (2023-2027) for Epads and of 10 years (2023-2032) for Nordic futures.

Baseload PPA is a PPA price based on a fixed annual volume per year (equal production every hour all days a year) and quoted futures prices on Nasdaq OMX Commodities.

Long-term market prices. (Baseload contracts, 10 years starting 2023)



Profile costs
To obtain a »theoretical« Pay-as-Produced price for each bidding zone, a certain percentage for profile cost, or capture rate, must also be deducted. For a typical Swedish wind farm, the capture rate in 2020 was about 85%. So far this year it has been about 58% in SE2, 67% in SE3, and 66% in SE4. For a typical solar park, the capture rate so far this year has been 131% in SE3 and 121% in SE4. In our CTRM system, we calculate risk assess this for each registered wind farm, in combination with volume risks.

E PPA Update

News & Transactions

SINCE WE STARTED our PPA update we have, for example, reported on PPAs with Boliden, Outokumpu, Neste, Orthex, Axel Johson Group, Microsoft, Volkswagen, Arla Foods, Eliisa, Equnix, Yara, Borealis, Wacker, Owens Corning, H2GS, Telenor, and Borealis.
Here are some of the new transactions we've seen in the last quarter:

H&M has signed a PPA with Neoen and Alight for electricity from a 90 MW solar power park at the airport of Hultsfred in southern Sweden. Commissioning estimated in 2025.

BOREALIS has signed a PPA with Axpo for electricity from the 60 MW »Hultema« wind farm in Sweden. The contract includes ~130,000 MWh per year and is valid for 10 years. The wind farm is owned by the Swiss company Reichmund & Co.

NORSKE SKOG has signed a new PPA with Statkraft. The contract includes ~400 GWh per year for 7 years from 2024. The company already purchases 900 TWh/year from Statkraft in an agreement that expires after 2026.

VISITIN PHARMA, a Norwegian pharmaceutical, has also signed a PPA with Statkraft where electricity with GoOs is to be delivered to their factory in NO2.

CENTRICA has signed a 10-year agreement with Downing for electricity produced at the 30 MW »Konttisuo« wind farm in Finland.

AKER HORZONS has signed an agreement with Tinn Energi for the delivery of 234 GWh per year to a new hydrogen project of 40 MW with commissioning in 2025.

SNELLMAN, a Finnish meat producer, has signed a 10-year PPA with Exilion starting from 2025. The electricity will be supplied from the 70 MW »Palokangas« wind farm.

POSTNORD has signed an agreement with Swede Solar for a 6.3 MWp plant on Postnord's roof where Postnord leases a larger area than is required for its own consumption. They enter into PPAs for their own consumption, and Swede Solar sells the rest separately.

GE HEALTHCARE has signed a 7-year agreement with Statkraft for 800 GWh of electricity from the hydropower plant »Kjela« in southern Norway. ■

F Insyn

WELCOME TO INSIGHT!
In this section we interview people within interesting companies with an influence on, or being affected by, renewable energy and the Electricity Certificate market.

A selection of previous topics include Technology development – flexible wind power, storage and airborne wind, Riskmanagement and market views of banks, New concepts for photovoltaics, Bankruptcies in wind and Offshore wind.

Finland in focus

In our previous report, we interviewed Arne Jakobsen from Norwea, and Lina Kinning from Swedish Wind Energy Association about the most crucial issues for wind power in Norway and Sweden. In this report, we focus on Finland with its enormously rapid build-out and we interview Heidi Paalatie, Director of Operations at the Finnish Wind Energy Association.

HEIDI PAALATIE
DIRECTOR OF OPERATIONS
FINLANDS VINDKRAFTSORGANISATION

On the political agenda, which are the main factors affecting Finnish wind power now?

The national elections are coming up, and the debate is heating up. The Coalition Party is in clear lead according to the polls. The right-wing party, Finns Party and the Social Democrats have a tight competition on the second and the third place. The Coalition party has proposed a somewhat controversial market structure that could result in some changes compared to today.

»Finns party most opposed to wind power but not likely to take part in Government«

The Finns party is the one with the most vigorous opposition to wind power, they are not very likely to be part of the new Government, but it is not ruled out. They have been firmly against feed-in tariffs and have also argued health impacts from, for example, infrasound from wind power etc, but these days there some more neutral voices for wind power as it benefits the local economics The Center party is doing very badly in polls, and also the Greens have lost support. In general, the public is more favorable to nuclear today than earlier.

Another important current issue is windfall legislation implementation. A proposal has been sent out, and comments were due today (13th Dec). The proposal was a 33% extra tax on revenues above a certain level.

»Proposed 5% revenue cap is too low«

Finland's proposal was not the worst in Europe but may still cause some problems. We believe the accepted level of return (5%) is too low. If this is to last for the whole year, it will result in a stricter measure than the 180 EUR proposed by the EU. It is suggested to last from 1st January until year-end, so longer than proposed by the EU. We will see what the final law will look like.

Are there any discussions in Finland to divide the country into bidding zones?

Voices are raised that, at some time, we may need to divide into zones, but at the moment this is not planned for, and the opinion of Fingrid is that it should be avoided for as long as possible.

What is the status on the build-out of onshore wind? Any obstacles?

We have a good knowledge of projects to be commissioned until 2025 since most

of them already have investment decisions. This shows a very good build-out rate (list is on our website). After this, it will depend much on industry plans and resulting consumption increases. Fingrid expects wind power to cover around 28% of consumed electricity with wind power by around 2025, and 21GW in 2030, but this depends on the increases in consumption.

»Military coexistence problems stop projects in the East and South«

There are significant problems regarding coexistence with the military. Due to their radar systems, wind power is not allowed at all in many areas, for example, most of the eastern parts of the country (onshore) and the southern sea areas (south of Åland). There are also restrictions in part of the western areas due to this.

»Profile costs increasing with all wind power in same area«

Due to this, around 40% of our current fleet is in Northern Bothnia now. This is causing several problems. There will be a lack of space, grid capacity is lacking despite Fingrid doing a very good job, and we are starting to see higher profile costs with all wind power in the same area.

There is an ongoing investigation on military radar systems until end January, performed by a military expert, but the process could be prolonged. It will be interesting to see the conclusions, hopefully, this will open up for some potential to have wind power also in more areas.

How does the permission process work, any other issues?

Permission process is, in general, working well. In Finland, the municipalities have a monopoly to do spacial planning, and if they have not planned for wind power, no wind power can be built. So there is a municipal veto, but the conditions are known early in the process. There are strong local incentives due to the high wind power property taxes that are paid to the municipalities.

Grid development is constrained due to long queues in the supreme administrative courts.

Do you start seeing cannibalizing effects with low capture rates? What is the forecast for this?

Compared to Sweden and Norway, one difference is that we only have one bidding zone. However, it is a strongly increasing problem since production is concentrated in western regions. It will be crucial that wind power can also be built in other areas (meaning military restrictions must be loosened).

What is the status and plans for offshore wind?

»Monopoly in territorial waters«

There is a huge interest in Finnish waters. The state-owned Metsähallitus have a monopoly of territorial waters, and they have to grant permissions to anyone wishing to develop wind power there. They are expected to communicate a partner for their first project very soon, and they will auction at least another three or four projects in 2023-2024. They have been reluctant to grant permissions to private companies; there is only one such company that has been granted a lease agreement so far.

Since territorial water are restricted by Metsähallitus, several developers have instead started projecting in the economic zone. Some already have study permits, and some have submitted applications for it. However, some of these are in overlapping areas – we have no clear regulation on exclusivity yet.

Are there any support schemes or state payments of grid connection?

There are no support schemes for onshore or offshore. Developers themselves pay for grid connection fees.

How is the investor interest compared to available projects?

We see a massive interest in Finnish wind power, and not enough projects for sale.

»The market is overheated«

The market is overheated, so prices have gone very high for projects to purchase. This has resulted in many companies starting to develop their own green field projects. Also the land-lease rates have gone up.

There are several different types of project development companies. State-owned Metsähallitus have some, but companies like OX2, WPD, and several similar Finnish ones develop most. Many are also long-term owners, while others develop to sell. There are several big institutions owning plants.. There is also interest from municipalities, but no actual projects so far, to our knowledge.

F Insyn

Do you see corporate PPA:s being signed?

We hear of some PPAs being concluded, but due to the rather high power prices for several years in Finland, many projects are also developed on market prices.

»Mankala companies – a Finnish speciality«

We also have the Finnish speciality; the »Mankala companies«. This is where big power consumers and retailers form a company owning production facilities and purchase produced power for a fixed cost according to their shareholdings. This was originally from big hydro-, CHP, and nuclear plants, so it includes all production sources and also heating.
The EU doesn't like it and has taken it to court some times, but, so far, it still exists.

MORE INFORMATION ON MANKALA COMPANIES

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