



# Bodecker Partners Nordic Renewables Report

Market Insight for Decision Makers  
Third Quarter 2021

## **A Summary**

The most important facts and events affecting Nordic renewable power

## **B News and Politics**

News and politics in Europe and Nordic region with an effect on Nordic Renewable Power production and market prices.

## **C Investments and Build-out**

Statistics, reports and the latest investment decisions and projects within wind, solar, storage and industry electrification.

## **D Market development and Forecasts**

The latest price development and price comments on Nordic Power, Electricity certificates and GoOs.

## **E PPA Update**

The latest trends, news and prices, and a selection of transactions and agreements.

## **F Insight**

How long will the high energy prices last? Interviews with leading European analysts.



Welcome to our third quarterly report 2021, this time with a new PPA update!

Nordic and European energy prices have exploded this autumn, and price differences between bidding areas been sky-high with no immediate solution in sight. Sweden's autumn budget has been released and the government has finally assigned to SvK to build-out the grid for offshore wind. In Norway, the NorthSea link to the UK has been inaugurated, a new production fee on wind been proposed, and the country may leave the GoO scheme.

Fit-for-55 has been presented by the EU Commission with a significant potential impact on GoOs and PPAs. Wind- and solar investments continue to grow with much focus also on offshore, flexibility and industrial projects.

In our concluding interviews, we ask leading European analysts how long the high energy prices will last, and how they take into account industry announcements in consumption forecasts.

We wish you a nice read and hope to see you at Wind2021 next week!

*We have updated our [website](#) – go take a look!*

**SWEDEN'S UPDATED BUDGET** has been presented with increased allowances for faster permission processes, regional climate change and increased costs for waste management.

**GRID CONNECTION FEES FOR OFFSHORE WIND** has finally been presented. SvK will be assigned to build-out the grid to suitable offshore areas.

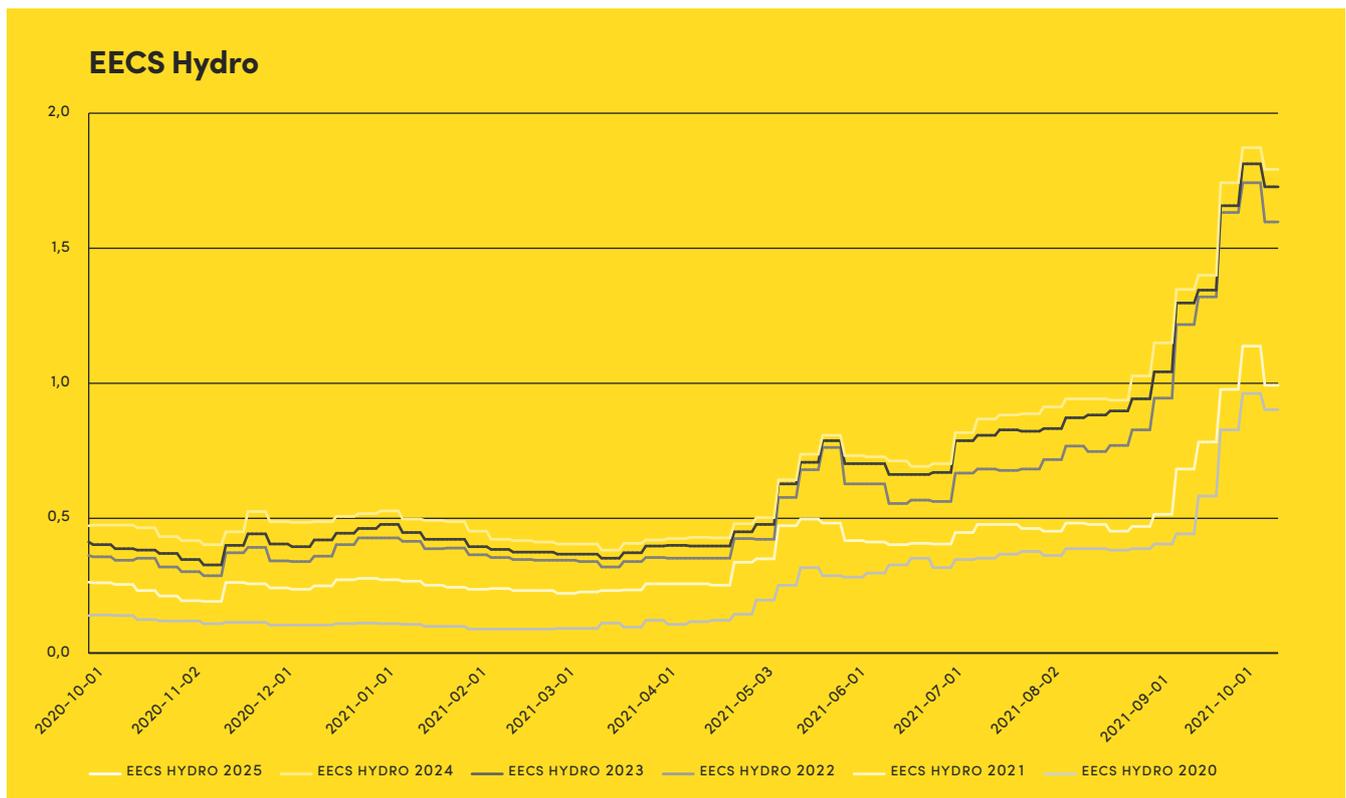
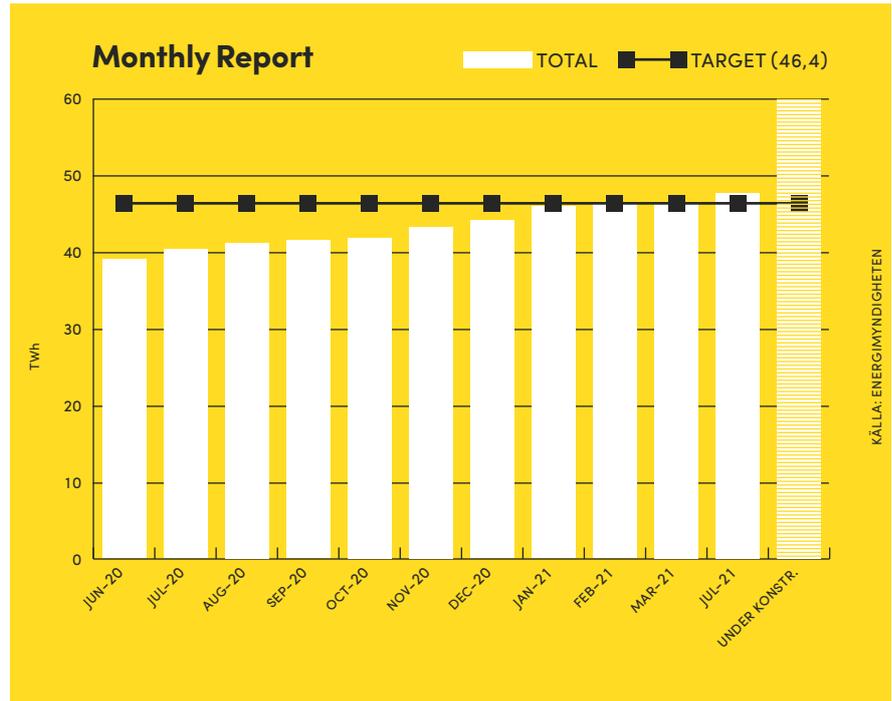
**PRODUCTION FEE ON NORWEGIAN ONSHORE WIND** has been proposed by the outgoing government. Other budget proposals were increased CO2 fees and earmarked money for CCS. Norway may also leave the GoO scheme.

**FIT-FOR-55** strengthen the role for GoOs and PPAs with more focus on measurement and transparency.

**TRANSACTIONS AND INVESTMENTS** continue, now with much focus on offshore wind and solar.

**PPA INTEREST INCREASES** and prices are rising in the south of Sweden. Additionality and temporal correlation is on the table. Some of the latest transactions include Boliden, Outokumpo and Neste.

## How long will the high energy prices last? We interview leading analysts. 26



## 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.

### The Swedish budget bill update

ON SEPTEMBER 20, the Swedish government and cooperation parties presented the budget bill for 2022. Some of the parts with a potential impact on renewable electricity or energy markets were:

- **For faster permission process:** Strengthening of appropriations to the Swedish Environmental Protection Agency, the County Administrative Boards and the Swedish courts. In total SEK 28 million 2022.
- **For faster permissions, electrification and implementation from new EU legislation:** Increased funding for Energy Market Inspections. ~SEK 40 million/yr for three years.
- **For regional climate change protection:** SEK 60-80 million/yr 2022-2024 to the County Adm. Boards to implement climate policy action plan, national wind power strategy and electrification strategy.
- **For skills development:** SEK 100 million/yr 2022-2024 to increase skills within e.g. batteries, hydrogen and renewable energy production.
- **For increased biogas production:** SEK 1900 million 2022-2024.
- **For support of local and regional investments:** Allocation within "Klimatklivet", to increase by SEK 800 million 2022.
- **For industry energy efficiency:** SEK 100 million/yr 2022-2026.
- **For increased costs on waste:** The tax on waste incineration to be indexed to GDP from 2023.

Already communicated adjustments include for example investment in a system for reverse auctioning for bio-CCS.

#### Reduced grid connection fees for offshore wind

The Swedish Government will assign to the TSO, SvK, to build-out the transmission lines also within the Swedish sea territory where the conditions are good for offshore wind. They write that offshore wind plays a vital role in reaching renewable targets to 2040 and the increasing electricity demand. Energy minister also emphasises the potential of strengthened power production in the southern parts. SvK will be assigned to begin necessary preparations, to be reported by 15th June 2022.

#### Government credit guarantees

The framework for government credit guarantees in Sweden will increase five-fold next year and continue to increase thereafter. The guarantees can be given to industrial investments where the capital requirement for the guaranteed loan is at least SEK 500 million, may cover a maximum of 80% of the guaranteed loan, and last for a maximum of 15 years. We are investigating whether the guarantees could be used for PPA between industry and wind farms (own note).

#### The Moderate Party's new climate policy

The moderates have presented their new climate policy, important due next year's election. Some of their points are to keep existing nuclear power, lay the foundation for the next generation of nuclear energy, and support plannable power production. Just like current government,

they want to see faster and more predictable environmental assessments. The moderates want to set climate export benefit goals, evaluate global climate effects in national decisions, increase climate aid, and push all countries to set a price on emissions.

The Moderates are most likely to collaborate with the Christian Democrats, the Liberals and the Sweden Democrats, who are all very pro-nuclear and much more cautious about rapid build-out of wind power.

#### Other climate processes in Sweden

During the autumn, we are awaiting a number of important proposals and decisions with an impact on the build-out of renewables and energy markets.

- The Climate Law Assessment: The Assessment is out for consultation until 21 October. One goal is to make the climate perspective more important within the Environmental Law and clarify that the law must be applied to minimize climate change.
- The Species Protection Assessment In Sweden, we have long had a species protection ordinance that has often prevented build-out of wind power and other infrastructure projects. The assessment's two-part report is out for consultation until 25 October. For wind power, the most crucial part is about impact on birds, and the current proposal, in combination with a recent EU hearing, means this issue is expected to be treated differently (helping the wind industry) in the future.

- Legally secure wind power assessments: Includes i.e. proposal to repeal or adjust the municipal veto for new wind power, to replace it with an early localization decision. It is out for consultation until 5 November. More info and comment from Foyen law firm:

#### Foyen Law Firm

New investigation regarding the municipal veto - some tailwind for wind power (FOYEN.SE)

- Modern and efficient environmental assessment: An investigation is underway for faster, simpler, and more predictable assessment processes for environmental and climate-improving investments. The assignment to be reported by 15 December. Could lead to faster permission processes for wind power.
- GoO - Implementation of revised REDII: Proposals for certain amendments to the GoO Act. Consultation period until 15 October. Previous proposal to prevent measurement of GoOs within internal (IKN) grids has been postponed.
- Electrification strategy: Investigation is ongoing and will be presented this autumn.

#### Norway changes government

The Labor Party (AP) became the largest party in the autumn elections in Norway, and Jonas Gahr Støre will be the country's prime minister. The new government thus consists of the AP, the Socialist Left Party (SV) and the Center Party (SP) - a real turn to the left.

Energy and climate were high on the agenda during election campaigns, and the country's Green Party (MDG) demanded a halt to oil and gas extraction by 2035. SV also want to stop oil drilling and raise emissions targets, but the AP has not wanted to set an end-date for oil. The AP's energy spokesperson, Espen Barth Eide, wants to keep the energy policy for green transition and have clear goals for offshore wind and hydrogen. The Center Party has also claimed they want to limit electricity exports when

hydro reservoirs are low and electricity prices high, and they (together with the Left Party) are skeptical of close EU cooperation on climate- and energy issues. However, the leading party, AP, considers it essential to keep open electricity import/exports as this also provides security of supply to Norway.

The following table shows restrictions.

#### Offshore wind in Norway

The Norwegian government is working to clarify criteria and framework for allocating areas for offshore wind through auction. In this summer's consultation, more than 130 responses were received, several of which were critical of the auc-

CONNECTION	CAPACITY	MW UNAVAILABLE 30/9-31/12	MW UNAVAILABLE 2022
SE3-DK1	715	355	0-355
SE3-NO1	2.095	1.345	0-1.095
SE3-SE4	6.200	1.700	0-2.700
SE2-SE3	7.300	1.800	0-1.800
FI-SE3	1.200	800	0-600

SOURCE MONTEL NEWS

#### Southwest Link and North Sea Link up and running

With an additional 1.2 GW transmission capacity from SE3 and SE4, and 2.8 GW in the other direction, the Southwest link has finally been commissioned (after 22 delays...). The former northern part of the link was finished six years ago. The investment decision was made 16 years ago, and the investment totalled SEK 7.3 billion.

### “Norwegian exports ~10 TWh a year”

The North Sea Link, 1400 MW, between Norway and the UK (actually the world's longest underground power connection according to Montel) was tested during the autumn and commissioned on 1 October with the first “day-ahead auction” on 30 September. 700 MW is the maximum capacity for a first period, after which it increases to 1400 MW. Analysts expect Norwegian exports via the cable of about 10 TWh per year. Earlier in the year, 1400 MW of cable to Germany was inaugurated.

#### SvK extends grid restrictions

SvK will extend grid restrictions to and from SE3 until at least the end of 2022, but warns that they may apply until 2030.

tion model. Norwea wants the government also to consider qualitative criteria in the award decision, i.e., to gain better control and ensure equal conditions and socio-economic benefits.

Several actors have already formed a consortium and started work ahead of the process. RWE has signed a cooperation agreement with NTE and Havfram, Shell will be involved together with BKK and Lyse, and Equinor and Orsted are also expected to submit bids.

#### Production fee for Norwegian wind power

The outgoing Norwegian government wants to introduce a fee of 10 NOK/MWh (~1 euro) on onshore wind power production. The money will go to the municipalities. Energi Norge and Norwea have warned that a new fee on existing turbines could damage investors' confidence (already damaged from elcertificate failure). Also, several projects have based their long PPA agreements with Norwegian industry on previous cost figures that now change.

Other measures proposed in the budget were increasing the CO2 tax, earmark money for CCS and establish a research center for hydrogen and ammonia. Budget is to be approved by Parliament. Also a new government will take seat.

### Build-out of Swedish

Until 2040, the Swedish TSO, SvK, will build close to 500 km of new national grid. Together with the Energy Market Inspectorate (EI), they have presented a three-point list to shorten lead times. The goal is to halve current lead times in 10-12 years. Proposals are to run several permission processes in parallel, increase collaboration with county administrative boards, and investigate a fee-financed system to add more resources to EI. More measures will be presented in the electrification strategy.

### Review of Swedish price areas

In 2019, SvK presented a proposal in which SE1 and SE2 were combined and SE3 split with Stockholm separated. In October, SvK will submit a node price analysis to Acer, forming the basis for their forthcoming proposals. The proposal is expected next quarter. In Sweden, implementation is expected end-2024 at the earliest. The underlying problems creating bottlenecks within SE3 and, thus, transmission restrictions will be included in the review. EI has also initiated an investigation into whether SvK lives up to the 70 percent rule or not.

### Statnett plans for 60% higher electricity consumption

Norwegian TSO, Statnett, has presented a new strategy including a 60% increase in consumption, 220 TWh, by 2050. Their scenarios range between 160 - 220 TWh with base-case 170 TWh by 2030 and 190 TWh by 2050. According to Statnett, grid build-out must take into account the highest scenario. In our June report, we wrote about a planning framework for doubled electricity use in Sweden by 2045. ▶▶

## Swedish electricity consumption

**ANNOUNCEMENTS OF INDUSTRY** electrification projects and new facilities continue to be published. In our previous report, we briefly described some of the most significant projects. Here is our own latest, and relatively conservative, estimate of Swedish consumption growth.

Summing up existing power production and estimated production from already planned projects, we get ~200 TWh. We have estimated that 70% of permitted wind power (numbers from SWEA) is built. This means an additional ~80 TWh would be needed.

If we also expect nuclear power to be phased out as planned, around 130 TWh is needed; 6 TWh/yr needs to be built 2022-2045. In the highest scenario, close to 300 TWh would be required to ensure long-term climate targets, or 350 GWh if nuclear is also phased out.

This means that the build-out rate of Swedish power production needs to be 3-15 TWh/yr 2022-2045 (in addition to already planned). In 2021-2023, the rate was at a record high of ~5 TWh/yr. According to our numbers above, this rate would need to be at least maintained, or more than doubled, starting from next year.

Consumption, conservative estimate	TWh
EXISTING	140
ALREADY ANNOUNCED PROJECTS	96
Transition LKAB, SSAB, Hybrit (70 TWh)	
New industry climate smart steel H2GS (12 TWh)	
New hydrogen Liquid Wind (5 TWh)	
New battery factory & IT Northvolt, Texel, ABB/Talga (6 TWh)	
Oth indus. Ovako, Perstorp, Höganäs, Heidelberg mfl. (low est. 3 TWh)	
CONSERVATIVE ESTIMATE ANNOUNCED PROJECTS	33
Chemistry (15 TWh)	
Transport (13 TWh)	
Other industry (5 TWh)	
NEW INDUSTRY, EG. SERVERHALLS, BATTERY, HYDROGEN, ETC.	8
<b>TOTAL CONSUMPTION (CONSERVATIVE EST.)</b>	<b>277</b>

Estimated planned production	TWh
CURRENT PRODUCTION (H2 2021)	168
WIND- AND SOLAR UNDER CONSTRUCTION	15
EST. BUILD-OUT PERMITTED PROJECTS	18
EST. PLANNED SOLAR	2
<b>TOTAL PROD. (EXIST. NUCLEAR REMAIN)</b>	<b>203</b>

Scenarios need for new production ca 2045	TWh	TWh/yr
CONSERVATIVE EST. BASED ANNOUNCED PROJECTS	75	3
IF NUCLEAR PHASED-OUT LIFESPAN	123	5
FOR TOTAL CLIMATE TRANSITION	298	13
TOTAL CLIMATE TRANSITION AND NUCLEAR PHASED-OUT	346	15

### Other Nordic News

**EXTREMELY HIGH ELECTRICITY PRICES**, and Epcas above 50 euros in the Nordics. Nasdaq has warned of extreme volatility – a “stressed market”. More about this under “Market Development” later in the report.

**DENMARK HOLD NEW TECHNOLOGY NEUTRAL AUCTION** of up to DKK 1.2 billion for support of 428 MW. Cfd model is used, and max fixed price is 25 ore/kWh for 20 years. The projects must be commissioned within two years, or three years if offshore wind. Deadline is October 22.

**SVK INCREASES BALANCING FEE** by approx. 23% from 1 November, while switching to a single-price model with equal fees for consumption and production, imbalance fee net per price area and volume fee on total volume. New fees are: Volume fee 0.850 euros/MWh, imbalance fee 1,159 euros/MWh, and weekly fee 30 euros/week.

**SEVERAL INDUSTRIES HAVE REDUCED THEIR PRODUCTION** as a result of the extremely high energy prices during the autumn. Norwegian Yara reduced its ammonia production by 40% due to record gas prices.

**STORAGE OF SWEDISH NUCLEAR WASTE** has been a hot potato during the autumn with warnings from Vattenfall that reactors may need to be shut down in 2024–2025 should the situation not be resolved. The intermediate storage, Clab, has now been granted an extended permit and the risk of early closures is politically considered eliminated. However, a decision on final disposal has been postponed. Vattenfall has published a UMM (UrgentMarketMessage) that reactors can still not be restarted 2024/2025 unless a final repository is in decided.

**OLKILUOTO 2** is delayed again, now until June 2022. It should have been started in 2009. Fennovoima is also delayed one year, until 2029 and the estimated cost has been increased by EUR 500 million to a total of about EUR 7–7.5 billion.

**SWEDISH COMPANIES MAY PARTICIPATE IN POLAND’S CAPACITY MARKET** without the need to export electricity from Sweden to Poland at the time of the needed effect. Anyone bidding on the energy activation market will be called by PSE if necessary. Auctions will take place annually.

**THE SWEDISH GREEN PARTY’S ENERGY SPOKES PERSON**, Lorentz Tovatt, positively active in the wind power build-out and elcertificate discussions, will leave politics after next election. ■

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.

**Germany – Power Prices Tumble After »Panic Buying«**

**German Power Futures Soar Past EUR 300 As Fuels Rally**

**Carbon Nears Record Highs on Relentless Gas Surge**

**Coal Soars Usd Amid Supply Dearth**

**EU Leaders to Discuss Energy Prices at 21–22 October Summit**

### Extreme power prices open up for discussions on measures

THE EXTREMELY HIGH electricity prices in Europe have led to politicians pushing for price regulation and questioning the proposed sharpening of EU ETS. During a Council of Minister meeting, criticism was raised on a too one-sided focus on renewable power production and the planned extension of the EU ETS to several industries. There was concern of sharply rising electricity prices and some countries wanted to introduce regulations as price caps.

On 13 October, the Commission proposed measures for member states, for example to temporarily reduce fees for electricity consumers, to use parts of the increased revenues from EUA auctions, and to support PPAs with, for example, government guarantees.

*“Concern “FIT-FOR-55” proposals will not be realized”*

Within the EU Parliament, there have been proposals for stricter EU ETS regulation to prevent speculative capital. Some also demand price caps or want to temporarily increase auction volumes. There is now some concern that the high ambitions in “Fit-for-55” could see hard resistance in the upcoming negotiations.

### Fit-for-55 and wind power build-out

This summer, the EU Commission presented its “Fit-for-55” package to achieve a 55% emission reduction by 2030. The proposals were crucial for e.g. EU ETS and, thus, for European and Nordic power prices. Several parts, mainly the proposal for an updated renewable directive, “RED III”, also have consequences for wind power build-out and PPAs.

*“Strengthened role for GoO and PPA”*

The renewable energy target to 2030 was to be raised from 32% to 40%, which, according to WindEurope, would mean a need for doubled build-out rate. The proposal also contained a clear ambition to electrify heavy industry and to clarify requirements for renewable energy.

They want to strengthen the role of and requirements on GoOs and PPAs, for better transparency and measurability. Member States would be forced to issue GoOs for all renewable production, regardless of support scheme. To facilitate PPAs, the Commission wants to remove obstacles and reduce financial risk, e.g. through government credit guarantees. Guidelines to be presented by 2024.

*“Areas for offshore wind to be inventoried”*

On offshore wind, the Commission wants member states to investigate suitable areas in their NECPs, and quantify long-term potential. In parallel with Fit-for-55, a review of the EU's TEN-E Regulation is carried out to streamline permission processes for offshore production capacity and infrastructure.

For green transport fuels, renewable criteria are developed and new certificates proposed. Requirements previously mentioned GoOs, geographical and temporal correlation between consumption and production, and additionality. This draft adjustment of RED III did not set out any clear requirements for additionality (which Vattenfall, Fortum and Statkraft welcomed), but final criteria (in "Delegated act RFNBO") will be presented by year-end. The regulations for renewable fuels may be guiding for other sectors later.

In summary, the package sends a clear signal of prioritization of wind and solar, increased transparency and measurability and industry. Both GoOs and PPAs will have a prominent role, and physical, geographical and temporal correlation must be shown.

Now months, probably at least a couple of years, of negotiations are awaiting.

### Bodecker Partners is launching Bodecker Carbon.

We are also publishing a new report; "Bodecker Carbon Update", where we cover FIT-FOR-55 impact on the EU ETS.

READ MORE AT [BODECKERCARBON.COM](https://bodeckercarbon.com)

### Adjustments of the Energy Tax Directive

As part of Fit-for-55, the Commission also presented proposals for an adjusted energy tax directive, for example to remove subsidies for fossil fuels, to review and reduce current exemption from tax liability (e.g. aviation and marine), and to better link minimum tax rates with energy content and environmental impact. They also strive to reduce differences between countries by closing loopholes.

### EU taxonomy for sustainable investments

At end-September, the EU Parliament's Environment and Finance Committees voted in favour of the taxonomy proposals. There was only little support for an initiative to stop it, driven by Swedish parliamentarians Emma Wiesner (Center Party) and Jessica Polfj rd (the Moderates). Emma and Jessica claim the taxonomy does not favour green transition and risk hitting Swedish hydropower, bioenergy and forestry hard.

The first part of the taxonomy is to be formally approved by Parliament next month. The topics on nuclear and natural gas have been postponed with discussions resumed this autumn.

### Hourly measurement of GoOs?

There are ongoing discussions within the EU to adjust the GoOs to hourly settlement instead of annual. The reason is to provide an instrument to prove hourly use of renewable electricity, to avoid so-called "green washing". Swedish EU parliamentarian Emma Wiesner is pushing for this solution.

There are also a number of technical initiatives and systems for hourly matching, some based on GoOs and some on hourly data from the grid.

We (Bodecker Partners) are sceptical about strict requirement of 24/7 matching and if this really contributes to build-out of renewables. We are also hesitant to if hourly GoO resolution is the best model. However, we strongly advocate a diversified PPA portfolio in combination with flexibility to achieve as many hours

as possible with renewable supply. This will be a topic in a later chronicle from us.

### Germany's new government

The Social Democrats, SPD, will be the largest party, but partner(s) is still uncertain. The conservative CDU is stepping down and negotiations are underway between the SPD and potential coalition parties, most likely the Green party and the liberal FDP.

## *"An additional 150 GW of wind and 300 GW of solar needed"*

A major issue going forward is considered to be ensuring a stable, cost-effective and environmentally friendly energy system. Nuclear power will be fully phased out next year. To achieve climate neutrality by 2045, an additional 150 GW of wind power and 300 GW of solar power is needed (currently ~120 GW) according to the country's TSO.

Forecasts on Germany's electricity consumption have, like in the Nordic countries, increased sharply. The previous official forecast was 655 TWh by 2030, but the latest analysis from the energy authority showed a probable increase to close to 700 GWh in 2030 and 910 GWh in 2045. The study indicates a need for doubled build-out rate of both renewables and gas (later hydrogen) and that Germany will be dependent on imports. Instead of net exports of ~50 TWh (2018), net imports of ~40 TWh is expected in 2030.

The leaders of SPD have emphasised strong climate focus but have given no promises of early coal phase-out. They favour a 100% renewable target by 2040. The Greens want to increase emissions targets further, to at least 70% by 2030, set a minimum price of 60 euros on emission allowances, phase out coal power earlier, stop NordStream 2 and move the 100% renewable target to 2035. The FDP favours CCS, has strong focus on EU ETS

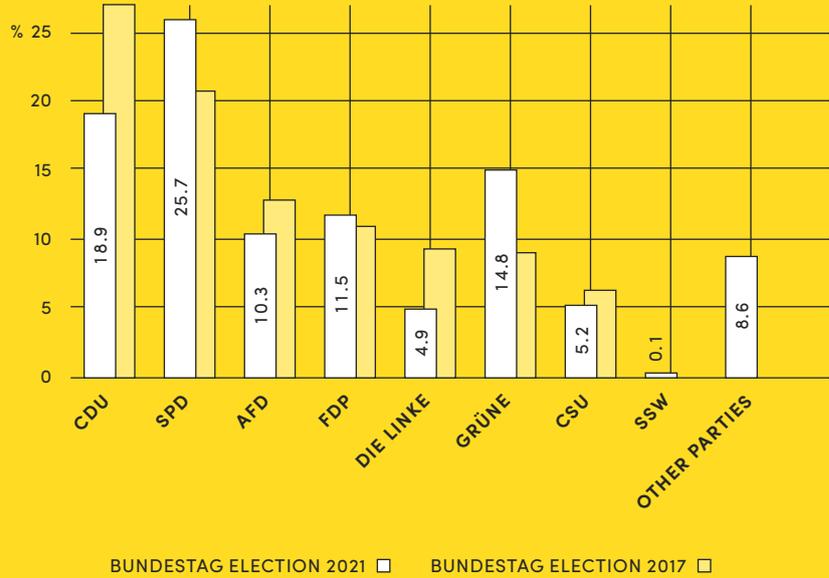
and hydrogen, and has no explicit re-  
newable target

**Analysis from Thema**

For more info on the German politics, I recommend contacting Marcus Ferdinand at Thema, to receive his analysis.

[marcus.ferdinand@thema.no](mailto:marcus.ferdinand@thema.no)

**Percentage of second votes**  
Bundestag election 2021, Germany. Provisional result



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

### Swedish Wind Energy Association

At the end of 2020, the Swedish wind power production corresponded to ~27.5 TWh. Swedish Wind Energy Association's latest quarterly report after Q2-21 (next to be presented at Wind2021) showed that ~2.72 GW had been added, ~8.8 TWh of annual production.

*“Another 35.2 TWh of wind power this year”*

The forecast for 2021 as a whole is a build-out of in total 12.8 GW, corresponding to an additional 35.2 TWh!

*“49 TWh of Swedish wind power in 2024”*

According to the organization, so far this year, investment decisions of SEK 15 billion had been made within Swedish wind power. It's also interesting that all new projects reported in Q2 will be built in southern Sweden and not in SE1 and SE2. Sweden accounts for just over 50% of the total Nordic-Baltic build-out. The forecast is that we will have just over 49 TWh of wind power by the end of 2024.

As we mentioned in our previous report, there is, however, considerable industry

Planned wind power projects in 2017–2023 can be found here:



I recommend SWEA's quarterly report for more interesting information on investment volumes, expansion, and statistics. Read it [HERE](#).

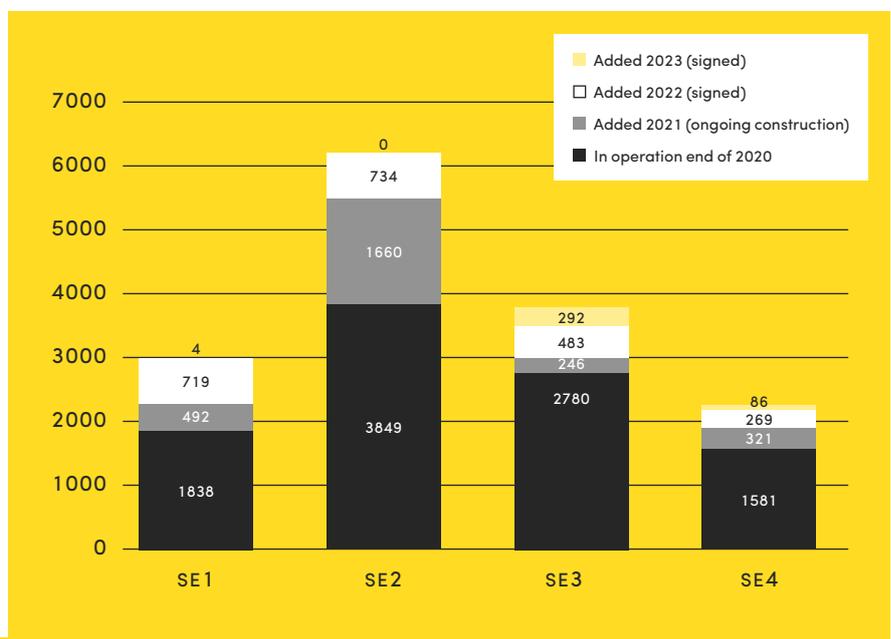
concern for later deceleration as fewer and fewer permits are granted.

### The Swedish Energy Agency

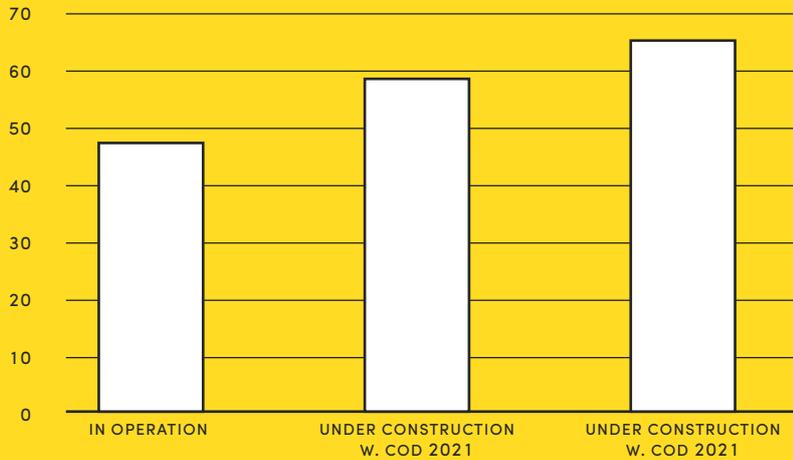
The latest quarterly report from the Swedish Energy Agency (1 July 2021) showed that we had just below 50 TWh renewables in operation and a further ~12 TWh with planned commissioning this year. This means an overdevelopment of ~13 TWh compared with the build-out target within the electricity certificate system of 46.4 TWh.

Next year, the Agency estimates that a further ~6 TWh will be commissioned in Sweden (stagnant in Norway), resulting in a total build-out of just under 66 GWh by end 2022.

SEE GRAPH ON NEXT PAGE ►



## Acc. wind power Sweden + Norway



### Some of the major projects reported as “under construction” in Sweden were:

- Enercon’s Ersträsket phase II in SE1 (0.4 TWh)
- RWE’s Hästkullen and Björnlandshöjden in SE2 (0.8 + 0.6 TWh),
- Stena Renewable’s Tvinneskeda-Badeboda and Åby-Alebo in SE4 (0.6 + 0.5 TWh),
- Holmen Energi’s Blodrotberget and Blåbergsliden in SE2 and SE1 (0.5 TWh each),
- OX2’s Åndberget in SE2 (0.8 TWh),
- Arise’s Skraftåsen in SE2 (0.7 TWh)
- Svevind’s Markbygden Önusberget at 2.1 TWh in SE1.
- Vattenfall’s Tuggen (hydropower) and Fäbodberget in SE2 (0.5 TWh each)
- Jämtkraft’s Hocksjön in SE2 (0.4 TWh)

Some of the largest projects with the status “investment decision made” were Eolus Stor-Skälsjön with 0.8 TWh and Arise Ranasjön with 0.5 TWh. Both in SE2.

Major permitted projects planned for commissioning 2023–2023 were RES’s Björnberget with 1.2 TWh in SE2 and Enercon’s Markbygden stage 2B with 1.4 TWh.

With planned commissioning further ahead, we find e.g. Svevind’s Markbygden stage 3B with 1.9 TWh, WPD’s Rålidén, and Vattenfalls Pauträsk with 1.1 TWh each.

## New investments in wind power

HERE ARE SOME of the latest publications on wind power transactions in the Nordic region.

### Onshore wind and hydropower

**ARISE** has received final approval for the Kølvalen wind power project. It comprises 43 turbines with a maximum total height of 220 meters. This means a total possible build-out of ~300 MW. The sales process is to start around year-end 2021/22. Arise has also entered into agreements with Hällefors Tierp Skogar and HT Skogar for rights to develop more than 1500 MW of wind power in SE3.

**ILLMATAR** will build the Alajarvi wind farm with 216 MW capacity divided into 36 turbines. Commissioning is planned for the second half of 2023. According to Montel, Illmatar bought the project from EDF Renewables last year. Illmatar will also build the Finnish Lapinjarvi wind farm of up to 20 7–10 MW turbines, a total of 140–220 MW. Investment decisions are planned for 2024 and commissioning 2027.

**OX2** is planning a 150–400 MW wind farm in northern Finland with expected commissioning in 2026. It is called Rahkola-Hautakangas and will consist of 25–40 turbines of 6–10 MW each. Final investment decision expected in 2023.

**HYDRO REIN**, Hydro’s renewable energy company, last summer bought the Stor-Skälsjön wind farm of 260 MW with commissioning in 2023 and they aim to invest in 7 GW of onshore and offshore wind in the Nordic region before 2025.

**SMÅKRAFT**, a Norwegian hydro power company, has bought 12 small-scale hydropower plants in Sweden from Orsa

+13 TWh

2030-target exceeded by 13 TWh in June, 2021.

Q2-21TWh	Commissioned	Commissioning 2021	Commissioning 2022
BIO	4,9	0,0	0,0
HYDRO	7,7	1,4	0,2
WIND	34,8	10,7	6,0
SOLAR	0,3	0,0	0,0
<b>TOTAL</b>	<b>47,6</b>	<b>12,1</b>	<b>6,3</b>

Besparingsskog. Total annual production is about 40 GWh and the power plants are located in central Sweden in Mälardalen and Hälsningland.

**CLOUDBERRY** has bought the small-scale hydropower plant Usma Kraft from Trønderenergi. Installed power is 9 MW and annual production around 25.5 GWh.

Other companies that we wrote about in our previous report were for example:

- ERG, an Italian wind power company that has taken the step into the Nordic market through the acquisition of Furuby wind farm in SE4.
- Alecta, which became the third Swedish pension company to buy into Stena Renewables
- Lundin Energy who bought the 86 MW Karskröv project in SE3
- RES, which received financing from Svensk Exportkredit for Björnberget and which also bought the Ranasjö and Salsjöhöjden of a total of over 240 MW.

## Offshore wind

**KRIEGER FLAK**, Scandinavia's largest wind farm, was inaugurated in September. 72 offshore turbines of a total of 604 MW have been commissioned outside Copenhagen and Malmö. Investment decisions were made as early as 2012 with Vattenfall as developer. Kriegers Flak increases Danish wind power production by 16 percent.

**KATTEGATT OFFSHORE** off Falkenberg on the Swedish west coast has been developed by Agrivind AB. Green Investment Group (GIG) has now bought the project rights. Estimated power is 260 MW and the park is expected to produce over 1 TWh. The project's area amounts to ~ 21 square kilometers and commissioning is estimated by mid-2024.

**CLOUDBERRY** from Norway plans 2.5 GW offshore wind in the Baltic by 2030. Among the first investment decisions will, however, be 100 MW "Stenkalles Grund" in the Swedish lake Vänern in SE3. They have recently recruited a new manager in Charlotte Bergqvist, previously at SvK and WPD.

**METSAHALLITUS**, a state-owned real estate company in Finland, is looking for partners to develop 1.3 GW of offshore wind, starting in 2028. The park would be Finland's second offshore park.

**HEXIKON** is planning three projects totaling 4.5 MW of floating offshore wind in southern Sweden. Two of the projects are planned in the Baltic Sea around Gotland (connection to SE3 or SE4), and the third is planned outside Gothenburg on the Swedish west coast. Hexikon wants the parks to be commissioned within 4-8 years, but that depends on the permit process.

We wrote in the previous report that Hexikon and Aker Offshore have entered into a collaboration to look for suitable sites and that they are now also interested in PPA buyers.

Other planned offshore parks and actors in Sweden that we commented on in our June report included:

- Kustvind has started a consultation process for a 500 MW park off the Swedish south coast (SE4). Magnora ASA is gradually increasing ownership. Construction start 2026-27.
- Zephyr plans "Poseidon Nord" and "Syd" with floating foundations of 61-94 plants (5.5 TWh) off Sweden's west coast (SE3). Permit application next year and est. commissioning 2031.
- OX2 is planning the Galatea-Galene project on the Swedish west coast (SE3). 68-101 turbines, approx. 6 TWh. Investment decision ~2025.
- Eolus is planning "Sjöllengrundet" between Malmö and Copenhagen with 15-25 turbines. Aiming for permit by 2026, but great uncertainty.
- Vattenfall is planning Stora Middelgrund with 108 turbines of 8 MW, 3-3.6 TWh. Application for adjustment to halved number of larger turbines.
- Hofo is in the permission process for 160 MW park between Malmö and Copenhagen with the name »Nordre Flint«.

Sørlige Nordsjø II with an estimated 3 GW in Norway will be auctioned off. Green

Investment Group (GIG), Vårgrønn and Agder Energi have communicated a joint consortium to submit bids. RWE, Equinor and Hydro Rein have also entered into partnerships for this purpose, and other actors, such as Danish Orsted and the oil companies BP and Shell have expressed interest.

**UTSIRA NORD**, a Norwegian offshore wind farm, will also be auctioned off. German RWE, Norwegian Havfram and NTE have entered into a collaboration for joint bidding. Permission process starts around year-end. RWE also has the TetraSpar project near Utsira Nord.

**THE DANISH ENERGY AGENCY** is looking for alternative areas for a 1.2 GW offshore wind farm. They already look outside Hesselø in the Kattegat but also in other places in the Kattegat, the Baltic Sea and the North Sea. After that, an auction process will begin.

It may also be interesting that Siemens Gamesa has produced its first recyclable turbine blades for offshore wind. These will be used in parks commissioned from next year.

## MORE INFO

Siemens Gamesa 'produces first fully recyclable offshore wind turbine blades' | Windpower Monthly

## Solar power

**ACCORDING TO SWEDISH** solar power association, Svensk Solenergi, the number of PV systems has exploded this year. A total of 100,000 systems is expected at year-end, of which ~65,000 will have been installed this year. One explanation is that a simplified tax deduction has replaced a previously more cumbersome investment support.

The Swedish manufacturer of rooftop solar cells, Midsummer, has increased its order intake by 505%(!) in Q3 this year compared to same

quarter last year and by 72% compared with previous quarter.

Johan Lindahl, spokesperson for Svensk Solenergi, estimates a doubling from the current ~ 1 TWh within two years. The CEO estimates that the 10 TWh target of solar by 2030 is within reach, but states that permit reforms are required.

In Denmark, there is concern that a new producer fee for new solar will reduce planned solar cell investments by 13 GW.

### Some Nordic solar projects

**EUROPEAN ENERGY**, a Danish project developer, plans 200 MW of renewables in Sweden over the next 2-3 years and then 300 MW of wind and solar per year from 2025. In Sweden, they have ~800 MW in the project pipeline. European Energy also focuses on Power-to-X and in Denmark they have entered into a collaboration with Maersk on the production of green e-methanol. They are active in several countries and have recently acquired 85.8 MW, divided into eight wind and solar power plants in several different countries, from Vattenfall.

**SOLGRID** and Solkompaniet commissioned their solar park outside Varberg in southern Sweden of 4.8 MW with est. annual production of ~5,5 GWh. It consists of 9000 double-sided solar panels. Solgrid aims to build 2000 MW in the Nordics by 2030 and the first park in Norway is expected to start construction next year.

**HELIOS** has reached its goal of 1 GW in development 6 months in advance. The new target is now to double this to 2 GW by the end next year. Magnora bought 25% of Helios last winter and has now exercised its option to increase this to 40%.

**SOLTECH**, a subsidiary of Swede Energy, will build the Nordic region's largest roof-top PV plant to date. It will be built at InfraHub's logistics center in Norrköping in SE3. Capacity will be 6.5 MW and cover an area of 65,000 sqm. Previously, Swede Energy built a 3.7 MW plant on the property of the real estate company Castellum in Gothenburg.

**SWEDE ENERGY** will also build solar for City Gross, with real estate Co Castellum owning and managing the facilities. Bergendahls Food (where the

City Gross stores are included) will purchase the electricity in a PPA. City Gross is expected to cover 25% of its electricity consumption from solar.

**ENERGIENGAGEMANG** will build the solar park Ulvåsa of 24 MW outside Motala in SE3. The utility Jämtkraft will buy the electricity and commissioning is expected in September next year.

**E.ON** has built PV systems for real estate company Wihlborgs, at Ideon Science Park in Lund. It is E.ON's largest plant to date with expected production of ~247 MWh/yr. The companies state that the solar panels has a lower climate footprint than standard panels.

**BETTER ENERGY** has started production at a 158 MW solar park in Holstebro in western Denmark. The park is owned by investment company Heartland. This company is also a PPA buyer, and the electricity will cover half of their consumption of ~200 GWh/year within the Bestseller fashion group. Bolagen uppger att använda solpaneler har ett lägre klimatavtryck jämfört med standardpaneler.

### Storage & Flexibility

The quantity of electricity fed into and withdrawn from the power grid must always be in balance. When our energy systems move towards more and more variable renewable power, we need new incentives and mechanisms that manage the balancing. In the Swedish market,

the balancing responsible parties, the BRPs, must maintain the balance up until one hour before delivery. From that last hour, the TSO (SvK) takes over. SvK has launched several markets with both automatic reserves and manual measures to maintain and restore the frequency.

We will explain these further in our upcoming reports and also summarize ancillary services for other Scandinavian countries.

The table below summarizes markets for ancillary services in Sweden, some of which may be relevant for wind and solar power producers.

RESERVE	BID SIZE	PROCUREMENT	ACTIVATION	DESIGN
FCR-N	0,1 MW	Two/one day before Total approx. 200 MW	Active +/- 0,1 Hz Within 180 seconds	Symmetrical
FCR-D	0,1 MW	Two/one day before Total approx. 400 MW	Active below 49,9 Hz Within 30 seconds	Symmetrical
aFFR	5 MW	Once a week Total of about 150 MW	Resets FCR-N Within 120 seconds	Bid for up- or down regulation
mFFR	10 MW (5 MW)	During operating hours Volume as required	Purchase as needed Within 15 minutes	Bid for up- or down regulation

SvK has recently communicated to increase the volume within the aFRR in Q4 this year. They are looking for facilities able to deliver aFRR in Sweden. Interested parties should contact them at aFRR@svk.se.

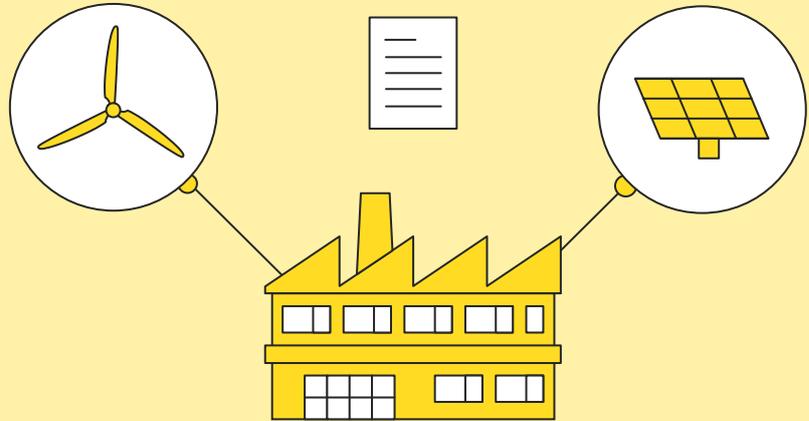
There are currently, in Sweden, several smaller markets for consumption flexibility, e.g. Cordinet (688 MWh winter 20/21), Stockholm Flex (operated by Vattenfall on Nodes platform) and Switch in southern Sweden (operated by E.ON and 115 MW winter 20/21).

Here are some of the latest publications on flexibility or storage projects in Sweden.

**VARBERG ENERGI** is investing in a grid battery storage. Solkompaniet will handle delivery and installation of the battery. Varberg is looking to evaluate the technology and optimisation of flexibility services to the energy system. The battery will be commissioned in Q1-2022. As a next step, a larger battery storage of 10 MW/20 MWh is planned.

**AZELIO** has started production of its energy storage system TES.POD. Production will increase continuously and two orders, from Sweden and Dubai, have so far been secured according to Energinyheter. Already this summer, Azelio had signed 14 letters of intent with 18.5 billion in potential revenue since the end of last year.

**ÖRESUNDSKRAFT** intended to procure 10 MW of user flexibility from their end-customers in SE4, to cut capacity peaks this winter. So far, however, interest from customers has been weak. The flexibility market in southern Sweden, Switch, had a total of 115 MW in power last winter.



## Industrial projects & Electricity consumption

**SWEDISH INDUSTRY ELECTRICITY** consumption increased by 7.5% in July compared with the same month last year. Steel and metal accounted for the sharpest increase. During the same month, SSAB manufactured its first fossil-free steel, delivered to Volvo in August. Read more about the exciting first delivery here: [The world's first fossil-free steel ready for delivery - SSAB](#)

The construction company Peab has signed an agreement with SSAB for their fossil-free steel from 2026. Electricity consumption from the Swedish steel industry may increase 60-70 TWh by 2045.

### “60% increase from Swedish electric vehicles”

Electricity consumption from Swedish electric vehicles increased 60% last year according to the Swedish Energy Agency. Passenger cars accounted for 460 GWh and electric buses for 35 GWh. The latest assessments are that the Swedish transport sector may increase its consumption 26 TWh by 2045. In Norway, electric cars consumed 1.1 TWh last year, up 27% compared to the year before.

In 1.5 years, SvK has received applications for new industrial establishments of more than 10 GW. In previous years, they have averaged ~1500 MW per year.

Norwegian TSO, Statnett, is planning for an increase in consumption to 220 TWh (compared with current 140 TWh). Danish energy authority states that the electricity usage should increase by more than 70% by 2030.

Here are some of the latest publications on industrial projects in Sweden and some highlights from rest of Nordics.

**OVAKO** has invested in CO<sub>2</sub>-neutral steel production from 2022 by heating steel with fossil-free hydrogen (add. electricity consumption not communicated). The plant is being built in collaboration with Volvo, Hitachi ABB, H<sub>2</sub> Green Steel and Nel Hydrogen. The small remaining emissions are to be compensated with climate certificates.

**EUROPEAN ENERGY** and **REINTEGRATE** will build a Danish e-methanol plant, supplying fuel to Maersk vessels already from 2023. 10,000 tonnes of CO<sub>2</sub>-neutral e-methanol will be produced using renewable energy from a PV-plant and biogenic CO<sub>2</sub>.

**GEN2** is planning an industrial park in Mosjøen in Norway with production of green hydrogen from 2024. A letter of intent for electricity deliveries is to be signed with Alcoa. Earlier this year, they communicated plans for a similar industrial park in Vestfold.

**H2 ENERGY EUROPE** is planning a 1 GW hydrogen plant at Esbjerg in Denmark (DK1) with commissioning in 2022. CIP (Copenhagen Infrastructure Partners) has previously said that they will build a 1 GW ammonia plant on the same site.

**STRANDMÖLLEN AB** has received investment support for a 2 MW hydrogen plant in Ljungsby in SE3 for delivery to heavy vehicles. The company has previously produced hydrogen in Denmark.

**MICROSOFT** will build two new data centers near Oslo.

**HYDROGENPRO** has entered into an agreement with Mitsubishi Power to build an electrolyser on Herøya in Norway with a capacity of over 5 MW and installation beginning of next year.

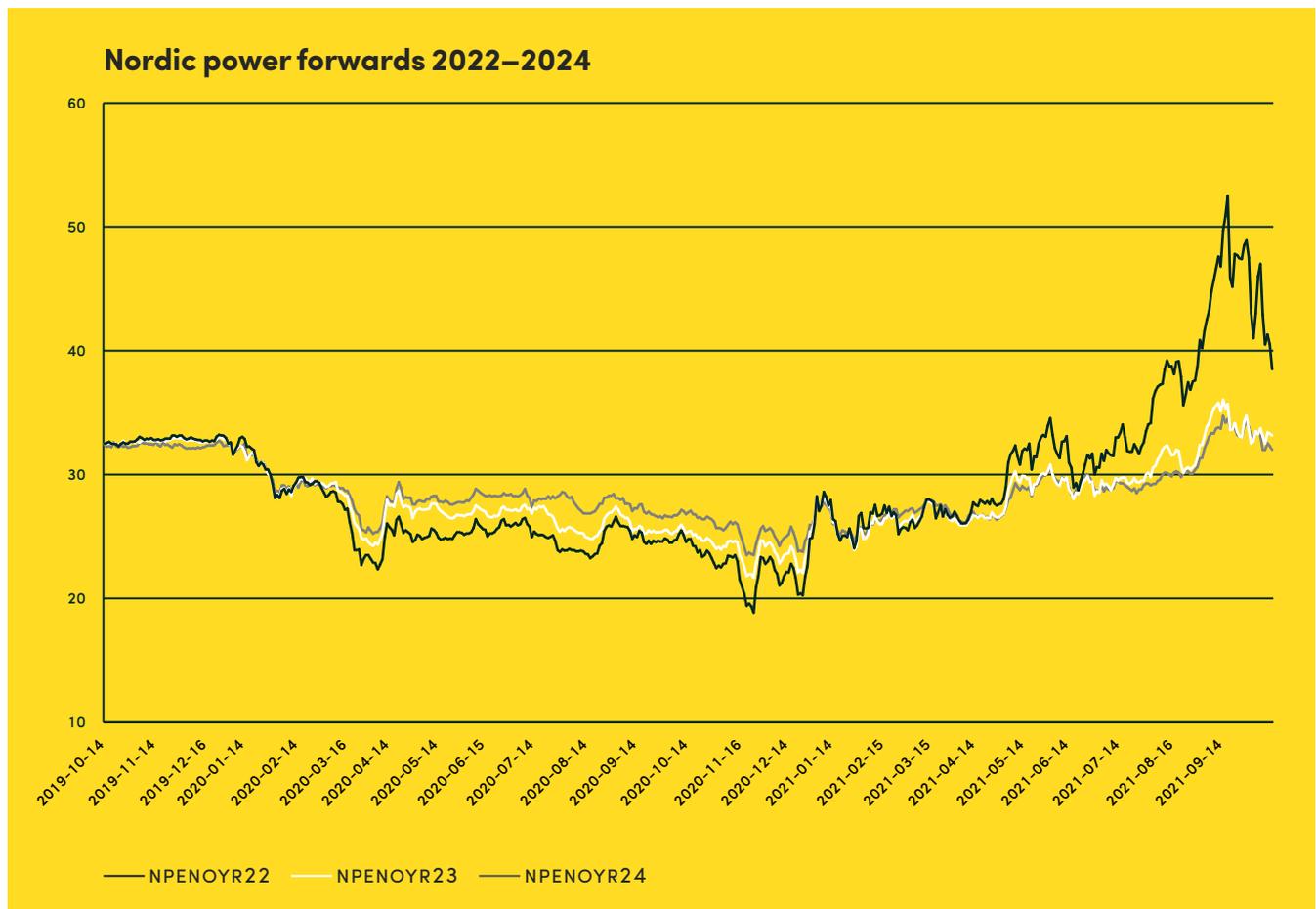
**FREYR**, a Norwegian battery manufacturer, has entered into a non-binding agreement with the Finnish Minerals Group and the city of Vaasa for a potential large-scale battery factory. The production capacity will be ~40-50 GWh per year. They have previously communicated a planned factory in Mo i Rana with about 43 GWh per year battery capacity. Expected electricity consumption for each factory is about 3 TWh per year.

**NORTHVOLT** will build another battery factory, together with Volvo Cars. The location is still uncertain. Production will, according to Montel, start during Q2 2025 with 30 GWh production capacity (150 MW power), later to be increased to 100 MW/55 GWh.

**HORIZON ENERGY, EQUINOR** and **VÅR ENERGI** will jointly build a blue-ammonia factory in Finland. The electricity capacity requirement is stated to be 300 MW, but only 20 MW is expected to be required from the grid due to large in-house production. ■

News on EU ETS and other climate politics you will now find in our separate report **Bodecker Carbon Update**.

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

### Statistics

The high and volatile prices in the Nordic electricity areas remain, just as in the rest of Europe. Due to low hydrological balance, the Nordic countries are also more affected by prices in interconnected countries.

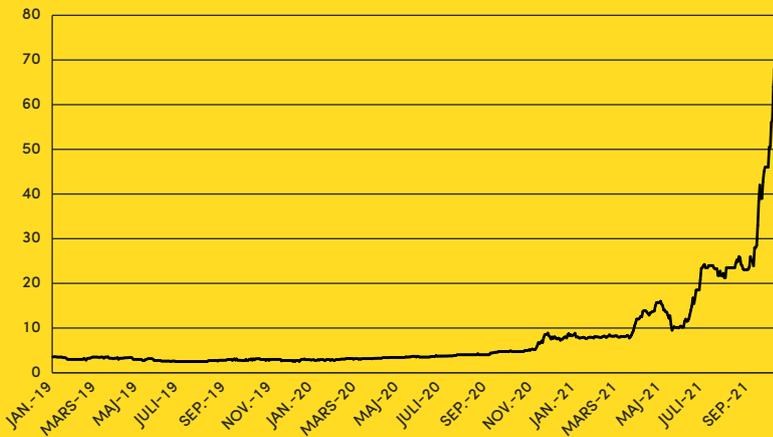
*“Limited flows from north to south”*

In addition, SvK has severely limited the flow from north to south. It depends, i.a. on grid maintenance, nuclear revisions in SE<sub>3</sub>, and a more east-west flow of electricity in the Nordic region. The east-west flow is a relatively new phenomenon due to more wind production in the

north, reduced output in Ringhals, and increased export capacity from Norway to the continent (and most recently to the UK). The restrictions have contributed to significant price differences between price areas with significantly higher prices in the southern parts of Scandinavia.

The constraints between SE<sub>2</sub>-SE<sub>3</sub> (and also SE<sub>3</sub>-SE<sub>4</sub>) will remain throughout the year, and some also throughout next year (more on this in section “News & Politics”). This has contributed to the longer Epad

## SE4 Epad YR-22



contracts also increasing sharply, to current record high of SE4 at 79 euros for Q1-22 and 65 euros for 2022! The years 2023-2025 are priced at 28-33 euros.

*“Risk of gas shortage this winter”*

One explanation for the high power prices is the risk of gas shortages this winter.

Gas inventories are low at the same time as there is uncertainty on LNG deliveries to Europe (most goes to Asia now). TTF Gas prices are now just below 85 euros/MWh for delivery Q1-22, up from about 25 euros in our previous report. However, only a week ago, the price was over 115 euros!

At the same time, the price of EUAs has exceeded 60 euros, making it even more expensive to produce fossil-based electricity in Europe.

Volatile prices have also led to increased cash (marginal) requirements from Nasdaq, forcing market participants to close positions. Our CEO, Fredrik, commented in Montel’s magazine Kraft-Affärer: “Forced stops is an important factor. Suddenly there are no buyers left, and we could quickly see a push down to 50-100 euros. Volatility is disconnected from fundamental analysis.”

The hydrological situation is improving, but it will be a while before it is normal, and hydro producers may be forced to reduce production. Norway is also expected to export 6-10 TWh to the UK via the newly inaugurated cable. Gas prices began to ease somewhat after statements about increased deliveries from Russia, and the EUA price has also declined slightly after discussions of EU intervention.

Average spot prices and price differences compared to system prices for the different price areas have been: ▼

## Monthly average spot per price area

EUROS/MWH	NORDIC	SE1	SE2	SE3	SE4	NO1	NO2	NO3	NO4	NO5	FIN	DK1	DK2
JAN	46	45	45	49	50	48	48	44	36	48	51	50	51
FEB	47	43	43	53	54	53	47	43	41	53	57	47	55
MAR	34	25	25	36	45	41	41	25	25	41	38	45	47
APR	38	26	26	33	42	45	44	28	27	44	37	48	48
MAY	44	38	38	43	48	48	48	37	33	48	46	54	55
JUNE	44	34	34	40	73	46	54	35	21	46	56	74	74
JULY	54	51	52	58	68	56	57	46	22	56	79	80	81
AUG	65	58	58	66	84	72	72	57	43	72	68	83	84
SEP	86	56	56	90	121	106	106	53	50	106	89	125	124
OKT	75	40	40	77	109	102	105	39	32	103	75	149	143

## Monthly average price difference to system price

	NORDIC	SE1	SE2	SE3	SE4	NO1	NO2	NO3	NO4	NO5	FIN	DK1	DK2
AVG JAN		-1	-1	3	4	2	2	-2	-9	2	5	4	5
AVG FEB		-4	-4	6	7	6	1	-4	-6	6	10	0	8
AVG MAR		-9	-9	2	11	7	7	-9	-9	7	4	11	12
AVG APR		-11	-11	-5	5	7	6	-10	-11	6	-9	2	2
AVG MAJ		-6	-6	-1	4	4	4	-8	-12	4	0	8	9
AVG JUN		-9	-9	-4	30	3	11	-8	-23	3	10	28	28
AVG JUL		-3	-2	4	14	2	3	-8	-32	2	33	34	36
AVG AUG		-8	-8	0	18	6	6	-8	-23	6	22	37	39
AVG SEP		-31	-31	4	35	20	20	-33	-36	20	43	80	78
AVG OKT		-35	-35	2	34	27	30	-36	-43	28	0	74	68

Q1-22:	€60,75/MWH
Q2-22:	36,45/MWH
YR-22:	40,15/MWH
YR23:	33,30/MWH
EUA DEC 2021:	58,9/T
COAL API2 2021:	\$244/T
GAS TTF Q1-22:	€84,6/MWH
GAS TTF 2022:	€50,6/MWH

Value (pre Wattsight) commented a few weeks ago that reservoir levels in Sweden and Norway could reach critically low filling levels next spring and that the October weather would be decisive for winter prices. From November, precipitation falls as snow, not affecting prices until spring. Value's analyst believed that the March-22 contract was undervalued despite prices over 70 euros. According to the company, the new cable from Norway to the UK could increase system price by 5 euros in the winter.

Storm Geo's analysts have also stated a belief in continued high prices, close to German levels, throughout the autumn and winter. They believe that the NO2 price may be lifted 10 euros from the new cable.

### Longer term forecasts

**BIXIA** expects, in its new long-term forecast, Nordic prices at a 40-euro level until 2035. After that, prices may decline. These relatively low levels are despite a belief in a 25% consumption growth (94 TWh) in the period. One reason is an estimation of a renewable build-out of 150 TWh, with 110 TWh of it already by 2030. Swedish wind power accounts for the most prominent part, but construction is also underway in Norway, Finland, and Denmark, especially within offshore from next decade.

From 2025, Bixia expects electricity exports of 40-50 TWh. After 2030, exports are to increase with more cables-. Thus also a closer price link to the continent.

**NORDIC ENERGY RESEARCH**, a Nordic think tank, estimates that the energy transition will not lead to any significantly higher Nordic power prices. In all three scenarios, they conclude the average

price will only increase by 5-10 euros by 2040 in Sweden, Norway, and Denmark. This increase is believed to mainly stem from higher EUA prices and increased electricity consumption. The EUA price is estimated at 79 euros/t in 2030 and 125 euros in 2040.

Their long-term forecast for Nordic power is about 38 euros/MWh in 2050. SE3 and SE4 are expected to be priced highest, at ~49 euros in 2050. Furthermore, they conclude that the share of wind power would likely rise from current ~15% to close to 50% by 2050. A potential of 14 GW is seen in Norway by 2050 (up from

approx. 4 GW) and 28 GW in Sweden (~10 GW now). Solar forecast is about 12-16 GW by 2030 and 30-40 GW by 2050, mostly in Denmark. All this leads to increased price volatility, and they emphasize that political incentives for flexibility will be needed.



[READ THE REPORT HERE](#)

## Good and Easy Summaries of Interesting Reports

**THE IEA** has released a new market report for the global electricity market.

You will find a good Executive Summary with interesting charts here:

[EXECUTIVE SUMMARY - ELECTRICITY MARKET REPORT - JULY 2021 - ANALYSIS - IEA](#)

**WEO** has released the new report "World Energy Investment 2021".

A good summary with interesting graphs is found here:

[EXECUTIVE SUMMARY - WORLD ENERGY INVESTMENT 2021 - ANALYSIS - IEA](#)

**IN THE REPORT** "Offshore wind and hydrogen" we find some of the following conclusions on offshore wind and hydrogen potential in the Baltic.

- Hydrogen, and other Power-to-X, will play a crucial role in decarbonizing e.g. heavy transport, aviation, and steel/chemical industry, and the potential of hydrogen to balance variable renewable power production could be a "game-changer"
- Over 90% of current 11.5 million tonnes hydrogen per year are produced with fossil fuels.
- The European Hydrogen Strategy assumes green hydrogen production capacity of 6 GW by 2024 and 40 GW by 2030, but most countries lack national plans.
- The EU target for offshore wind is 60 GW by 2030 and 300 GW by 2050. After the North Sea, the Baltic Sea is one of the most significant markets, but accounts for only 9% of the build-out, whereas the potential is about 93 GW. Germany and Denmark are seen as most mature.

Take a look at the report here:

[OFFSHORE WIND AND HYDROGEN FINAL STATE OF PLAY](#)

## Electricity certificates

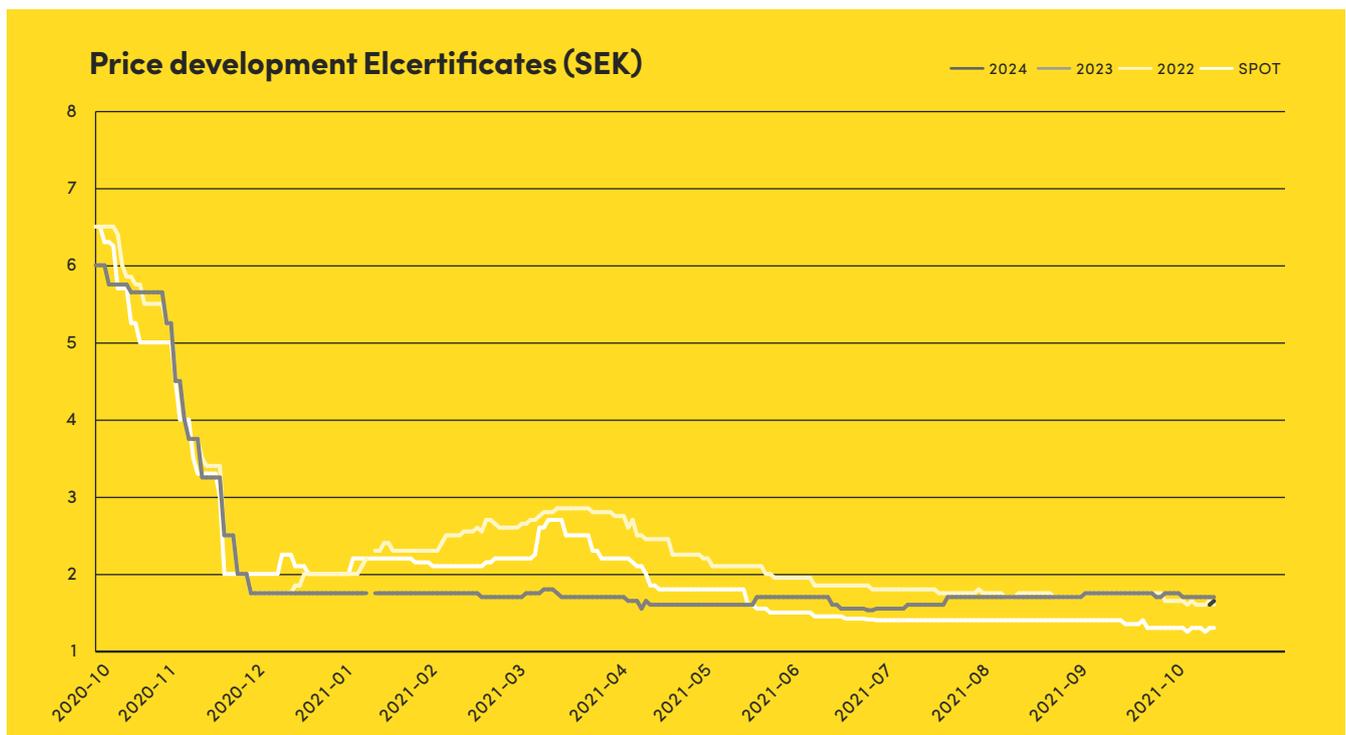
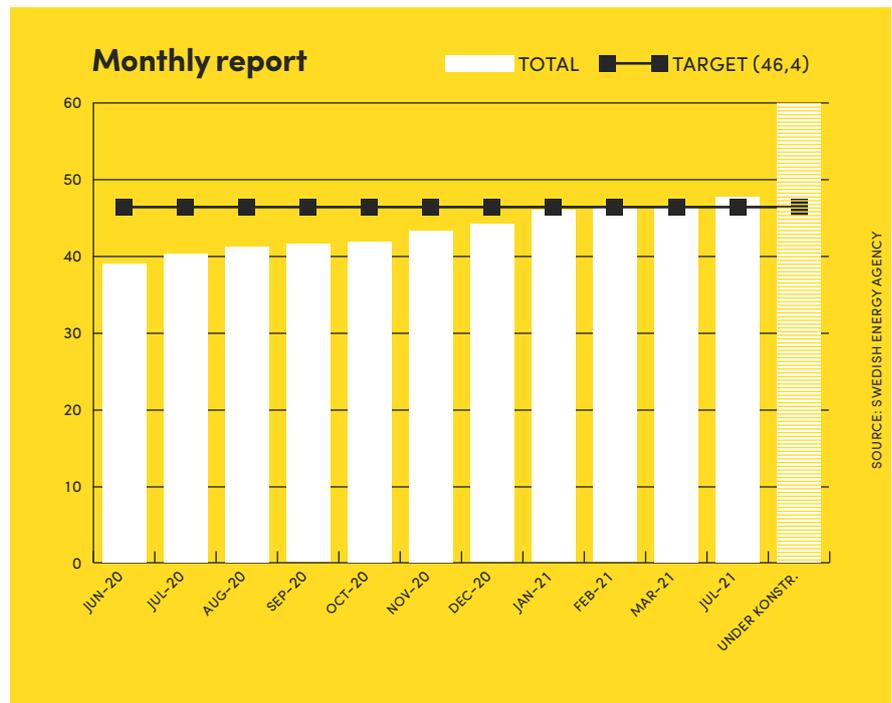
We have had a continued calm Electricity Certificate market with falling spot prices and an even demand between weeks, only slightly more trade ahead of monthly issuance. Average weekly traded volume was between 200,000 - 300,000 certificates, half compared to last year.

Spot is priced lowest and has fallen below previous floor of SEK 1.50. Lowest so far is SEK 1.25. There has been most interest in the Mars-22 and Mars-23 contracts, traded at a maximum of SEK 1.75, but falling back slightly last week. March-21 is traded at SEK 1.60 and March-22 at SEK 1.70. The contracts for March-24 and March-25 are at SEK 1.65 and SEK 1.60, respectively, while Mars-26 was last sold at SEK 1.50.

The issuance for August was at the same level as for July, with about 2.3 million certificates. A bit more wind power and a little less hydropower compared to previous month. Accumulated balance increased to ~15.4 million certificates. September issuance is due this week

and expected to be ~4 million, compared with demand of ~2.5 million. The demand is much lower than the issuance in the coming months, contributing to a balance increase of another 10 million. Expected surplus after 2021 is about 25 million.

*“Accumulated balance of 25 million after 2021”*



## “Market participants purchase for future deliveries”

Market participants show interest in purchasing for future deliveries. This is an indication of continued belief in the market function and its future existence. The latest quarterly report, from August, showed that the system was overbuilt by 1.2 TWh and that a further 12 TWh is under construction with planned commissioning this year. If everything is commissioned and approved for certificate issuance, the system will be overbuilt by 13 TWh, corresponding with ~200 million electricity certificates.

## Guarantees of origin (GoO)

There has been a continuous increase in GoO prices for many weeks, except last week where we had a slight rebound. All contracts are now traded over 1 Euro. The strong price development is due to increased demand while some caution from producers. Last week, we noticed increased sales interest from producers, which quickly pushed prices down 10-15 cents. The highest interest is for Nordic hydropower, which has resulted in the product being sold a few cents above wind power.

The September French GoO auction was fully subscribed with an average price at present market prices. The October auction will open soon, with results available end of next week (42). Nordic EECS GoOs are now traded at the following approximate prices (EURO CENTS).

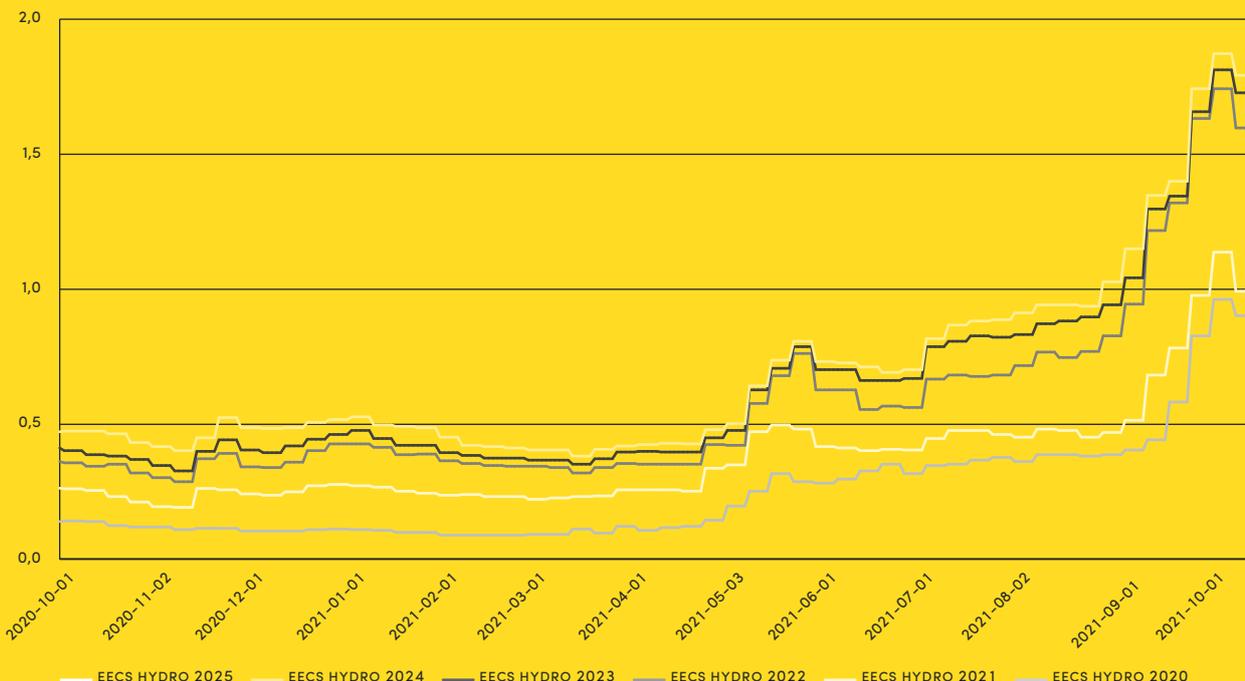
## “AIB statistics show volume increase of 16%”

AIB compiles statistics on transactions from members’ GoO domains. The chart “Annual cumulative evolution of transactions from AIB statistics” shows the development of GoOs issued, exported and canceled between this year’s and last year’s transactions (completed transactions per month in which they were actually executed). Issued GoOs rose by 11% and exports/imports by 16% each. The annulled GoOs have decreased 7%,

	HYDRO	WIND	SOL
2020	0.90	0.89	0.91
2021	1.02	1.00	1.00
2022	1.68	1.64	1.63
2023	1.72	1.70	1.75
2024	1,80	1.79	1.81

Källa ICAP

## EECS Hydro



but this may be because it refers to 2020, a year with lower electricity consumption.

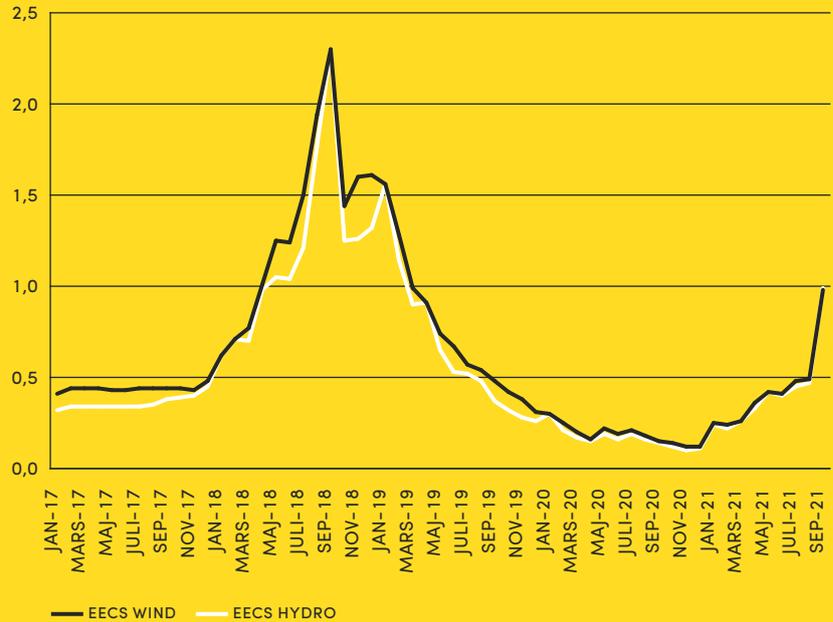
*“Will the high demand last?”*

GoO prices are the highest we have seen in two years. Last time was 2018-2019 when demand was high and hydro production historically low across Europe. At that time, we had GoO prices above 2 euros (diagram “EECS-price development in Nordics”). Demand and prices decreased when the French GoO auction procedure was announced. The question is how long demand will stay up this time.

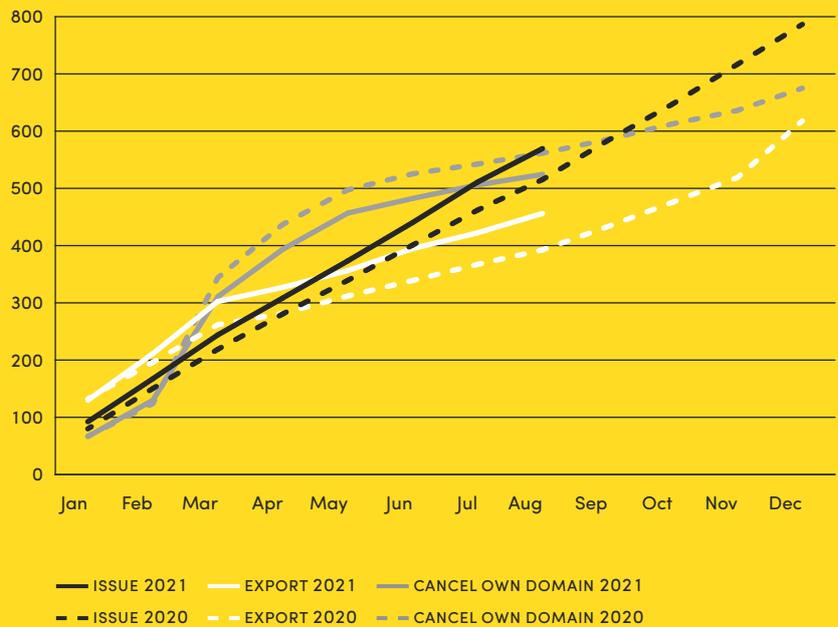
*“Norway may leave the GoO scheme and reduce supply sharply”*

A few weeks ago, Norwegian company Yara announced they would, in contrast to most of its “industry colleagues”, support the GoO system and purchase the certificates for its consumption. If more Norwegian industries were to follow suit, exports of GoO from Norway would fall sharply as they would be needed internally in the country. This week, however, the new Norwegian government announced they want Norway to leave the GoO scheme. This means Norway move completely in the opposite direction compared to the EU Commission and the Fit-for-55 package. The Norwegian power industry would lose significant revenues if Norway left the system, and the supply of GoO in Europe would fall sharply (pushing prices up). Currently, Norwegian GoOs are mainly purchased by continental industries. ■

**EECS-price development in Nordics**



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



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.

## News & Trends

### Increased PPA interest

Long-term Power Purchase Agreements (PPA) between electricity-consuming companies and producers of renewable power are becoming increasingly common in Europe and the Nordics. Previously being relevant only for very large electricity users, such as Norsk Hydro, Alcoa, Google and Facebook, it is now an appropriate alternative also for small and medium-sized “ordinary” industries, real estate companies, and others. In the last six months, interest in taking the next step in the company’s “sustainability ladder” for green electricity purchases has gained even more momentum.

There are several reasons why interest in PPAs has increased so sharply:

- The IPCC’s latest climate report was unequivocal, and heatwaves, floods, and storms across Europe and globally have become increasingly common and severe. This has led to more and more companies making promises, stepping into initiatives, and taking the next step towards sustainable energy sourcing.
- In EU climate policy, and most recently “Fit-for-55”, PPAs were put forward as an essential contribution to reach targets. To facilitate PPAs, the Commission wants to remove obstacles and reduce financial risk, e.g., through government credit guarantees. Guidelines will be presented by 2024.
- For hydrogen and renewable transport fuel, the EU will publish so-called

“Delegated Acts” with clear requirements and criteria for measuring and proving green and sustainable electricity sourcing. In leaked documents, PPAs can play an essential part in contributing to new renewable electricity (“additionality”), transparency and a clear link between consumption and production. These criteria may also be indicative for other industries.

- GHG Protocol and similar climate reporting methods are gaining increasing traction. Companies need to ensure that the entire supply chain meets current and future requirements for renewable energy sourcing and increase ambitions. Higher requirements are also set to get a good rating in various sustainability indices.
- Feed-in tariffs and other support systems are being phased out in more countries, thus opening up for long-term PPA agreements instead. In addition, some governments are beginning to support corporate PPAs by issuing guarantees, most recently in France. This will become more common.
- Finally, electricity prices have been highly volatile, and this trend is expected to continue. Costs can increase rapidly for industries when both CO<sub>2</sub>- and power prices rise. PPAs provide long-term stability and, so far, relatively low prices.

Guarantees of origin (GoO) have also been given a more substantial role in the EU’s climate policy. For example, Member States will be required to issue certificates for all renewable power production, regardless of support schemes.

Discussions are also underway to adjust GoO to hourly settlement. More on this in the News & Politics section and in a future chronicle we plan to write.

### Additionality and Temporal Correlation

What will be the criteria for securing, proving, and measuring electricity from green and renewable sources? From the new proposals within Fit-for-55, the Renewable Directive (RED III), and leaked delegated acts, we understand that “additionality” and “temporal correlation” will play a role. For additionality, previous drafts have focused on commissioning, not the date of investment decisions. For temporal correlation, it is a matter of ensuring that renewable power is, in fact, used, not only on an annual basis but closer in time to consumption. In leaked drafts, focus has been on the price area having a sufficient amount of renewable electricity to cover consumption on an hourly basis. The renewable directive also imposes higher requirements on grid operators to provide hourly data.

### Solar PPAs growing

Demand from companies to sign up for long-term PPAs from solar parks is increasing rapidly in Sweden, especially in the southern parts of SE<sub>3</sub> and SE<sub>4</sub>. The background is a combination of extremely high electricity prices in these parts (several days over 100 euros), a willingness to contribute to more renewable energy locally, and increased ambitions for sustainable energy sourcing. There is also a vital concern about security of supply and a desire to support development by contributing

to more new local power production in these areas.

The LCOE for large-scale solar power is, according to the IEA, around 30-35 euros/MWh. In Sweden, market participants communicate slightly higher levels, ~35-40 euros. In contrast, power prices in SE4 have increased from 9 euros on average in 2020 to around 50 euros last summer and over 100 euros this autumn.

However, longer permission processes and local grid restrictions are beginning

to slow down build-out also for solar. There is also a noticeable conflict between solar and agriculture/biodiversity.

Mikkel Kring at Our New Energy and Harald Överholm at Alight have commented to a Montel article that PPA-prices for solar have increased ~40% since last spring.

**Read more about solar power build-out and specific projects 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

**PPA PRICES, ESPECIALLY** so-called “Utility PPAs”, are in many cases based on power market prices in combination with forecasts. Power prices have soared in recent months, which has also begun to affect long-term PPA prices. The table below shows average monthly power prices per bidding area. These are general, i.e., not calculated per type of production taking into cannibalization etc.

Prices in the southern bidding areas are now significantly higher than those in the north due to significant build-out of wind power up there, but recently also affected by limitations in transmission capacity. Restrictions between SE2-SE3 (and also SE3-SE4) will continue throughout the year, and some throughout next year. As a result, the longer price area difference contracts, so-called Epads, have also

risen sharply and are at a record high.

SE4 Epad is now at 65 euros for 2022 and 28-33 euros for 2023-2025, in contrast to SE1 and SE2 at minus (negative) 20 and 15 euros for 2022 and minus 10 euros for 2023-2025. For market-based PPAs in SE2, you would, thus, need to deduct ~10 euros from the Nordic futures contracts.

For relevant PPA prices from Nordic wind farms, a certain percentage for so-called cannibalization must also be deducted (prices are generally lower during hours with most wind production). This gives you a so-called “capture rate”. We calculate actual capture rates for each wind farm within our CTRM system.

### Bodecker CTRM

In our CTRM system, we have prices for Baseload PPAs. Below you find the latest prices for SE2, SE3, and SE4. For other areas, contact us.

Market prices per bidding area per 5 January and 11 October. The prices are average 5 years (2022-2026) and 10 years (2022-2031). Since the year-end, the price of a 5-year PPA has doubled for SE4, while the SE3 price has increased by 24%. For SE2, the price has instead fallen by 6%. The 10-year contract has increased by 78% for SE4, 15% for SE3, and decreased by 12% for SE2

TRADE DATE	05.01.2021		11.10.2021		DIFF 5 YRS	DIFF 10YRS
START 2022	5 YRS	10 YRS	5 YRS	10 YRS		
SE2	25.2	27.0	23.6	23.9	-6%	-12%
SE3	30.6	32.6	37.8	37.6	99%	78%
SE4	35.7	37.5	71.1	66.6		

## Månadsmedel spot per elområde

EUROS/MWH	NORDIC	SE1	SE2	SE3	SE4	NO1	NO2	NO3	NO4	NO5	FIN	DK1	DK2
JAN	46	45	45	49	50	48	48	44	36	48	51	50	51
FEB	47	43	43	53	54	53	47	43	41	53	57	47	55
MAR	34	25	25	36	45	41	41	25	25	41	38	45	47
APR	38	26	26	33	42	45	44	28	27	44	37	48	48
MAY	44	38	38	43	48	48	48	37	33	48	46	54	55
JUNE	44	34	34	40	73	46	54	35	21	46	56	74	74
JULY	54	51	52	58	68	56	57	46	22	56	79	80	81
AUG	65	58	58	66	84	72	72	57	43	72	68	83	84
SEP	86	56	56	90	121	106	106	53	50	106	89	125	124
OKT	75	40	40	77	109	102	105	39	32	103	75	149	143

## Base-load PPA:

A PPA price based on a fixed annual volume (equal production per hour every day of the year) and quoted futures prices on Nasdaq OMX Commodities.

For a typical wind farm in SE2 and SE3, the capture rates were, in 2020, about 91 and 92 % respectively, and so far this year about 93% in both areas.

According to Pexapark, PPA prices are, in general for the Nordic region, at 33.89 euros/MWh, in Germany at 58.5 euros, and in Spain at 36.12 euros. In Poland, the calculated price is above 80 euros. They comment that prices are on the way down after the market has calmed somewhat. Montel Qwatt's latest prices for western Norway (start of September) were just over 38 euros for 10 years, and for Finland, just over 36 euros for the same period.

**For more information on market prices and power forecasts, read the Market Development & Forecasts section in our Nordic Renewables Report.**

## News & Transactions

**WE KEEP GETTING** updates of Nordic PPA transactions. Currently, there is much going on within solar in southern Sweden and wind power in Finland. Here are some of the latest transactions.

**BOLIDEN** has signed a 15-year PPA with Statkraft. This applies to 1.6 TWh of annual electricity to cover Boliden's consumption in Odda in western Norway, where they increase their zinc production, lifting electricity consumption by 700 GWh. Delivery starts in 2024.

**OUTOKUMPU** has signed an agreement with Gasum and the new 10-year PPA from 2023 will cover their consumption in a mine in Kemi in Finland. Gasum uses partners for wind power production.

**KINECT ENERGY** has signed a PPA with WPD, a German wind power developer with a Nordic office in Stockholm, for the supply of electricity from the 188 MW Karhunnevangas wind farm in Finland. COD is expected in 2022 and estimated production of 600-700 GWh per year. Kinect is an "intermediary" with end-consumers in its portfolio. WPD has previously signed another PPA from the park with Finnish UPM for 130-160 GWh annually for 25-30 years.

**ORTHEX** has signed an agreement with Vattenfall for the supply of electricity from hydropower, to cover consumption at a factory in Finland. Since last year, they also have an agreement on supply to Swedish factories. Orthex's goal is CO<sub>2</sub>-neutral production by 2030. Total volume is ~16.5 GWh per year.

**STATKRAFT** has also signed a PPA from 2022 with Aquila Capital of 350 GWh per year from the Finnish wind farm Mastokangas (68.4 MW) and Korkeakangas (43.2 MW). Statkraft will resell electricity to its consumer clients.

**NESTE**, a Finnish oil company, has signed a 10-year PPA agreement with Statkraft for 215 GWh from 68 MW Mastokangas's wind farm (same as Aquila above). The electricity will cover 18% of the electricity consumption at Neste's Porvo refinery.

**JÄMTKRAFT** has signed a 20-year PPA from a 24 MW solar park built by Energiengagemang. The park is being built at Motala in SE3, will be commissioned in H2 2022 and the electricity will be resold by Jämtkraft to their customers. ■

### Do not miss next quarter's PPA Update!

From the next edition of our quarterly PPA Update, we will also include an interview with an interesting industry, electricity producer or other exciting market actor within Nordic PPAs.

**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.

## How long will the high energy prices last?

We have had a perfect storm with extremely high gas prices, low hydro in reservoirs, and sharply increasing carbon prices. This has resulted in Nordic power prices of over 100 euros, and in the southern parts over 300 euros. How long can this last and what could change the picture? Will the EU intervene? And how much of all communicated industry projects do analysts take into their price forecasts?

**WE HAVE INTERVIEWED**

three leading analysts; Tor Reier Lilleholt from Volve (pre. Wattsight), Ole Tom Djupskaas from Refinitiv and Marcus Ferdinand from Thema.



TOR REIER LILLEHOLT



OLE TOM DJUPSKAAS



MARCUS FERDINAND

**There is a perfect storm with extreme gas- and carbon prices and low hydro levels. How long will it last and what is most likely to change the picture?**

**TOR REIER:** Weather might change overnight, and we see that wind generation makes strong volatility, but we often see a hydro situation have effect on prices for the next 12 month even with normal weather into delivery. For fuel markets I believe this winter will be crucial for how long this energy crisis might last. Mild winter might bring it back to more normal levels while a cold winter will postpone this for another year.

**OLE TOM:** We expect the EUA price to average €67/t in Q4, €60/t in the first half of 2022 and €56/t in the second half. So no sharp decline in carbon the next years, but we see increasing prices in 2026-30.

The European gas market is expected to remain tight most of 2022. We expect lower gas prices from Q2-22, but with SRMC gas for Q2-22 still above €100/MWh.

For Nordic power, we expect a sharp decline in prices from April due to more normalized hydrology, lower demand, expectations of lower German/Dutch power prices and lower SRMC coal, Olkiluoto 3 in production and higher wind power output due to gradually higher wind power build out. Our latest price forecast gives €89/MWh for Q1-22, €46/MWh for Q2-22, €33/MWh for Q3-22 and €51/MWh for YR-22.

Also for Germany we expect falling prices from Q2-22, however still at a much higher level in the Nordics. Our latest price forecast gives €203/MWh for Q1-22,

*»We expect €138/  
MWh for Year 2022«*

€115/MWh for Q2-22, €114/MWh for Q3-22 and €138/MWh for Yr-22.

**MARCUS:** When you're in the middle of a storm it is difficult to see when it is over. At the time of writing, European carbon and power prices closely follow the developments in an overheated gas market. Gas prices are at record highs as European buyers fear there is not enough gas in storage to get the region through the coming winter. High gas prices have caused the fuel-switch to turn in the wrong direction from a climate perspective.

*»High gas prices have caused the fuel-switch to turn in the wrong direction from a climate perspective«*

Meanwhile, power demand strongly recovered compared to 2020, but with fuel switch levels increasing significantly, hard coal and lignite are deep in the money again, while gas generation finds it harder to compete. As a result, the generation margins for hard coal and lignite plants for the first time since December 2019 convincingly stood above the gas plant margin. This caused the more carbon-intensive coal and lignite generation to successively push some of the gas-fired stations out of the market, supporting the bullish carbon and power price environment.

CO<sub>2</sub> prices of over 60EUR/tCO<sub>2</sub> cannot be explained by the gas price alone. Rather, speculative demand from investors has structurally raised the CO<sub>2</sub> price since the beginning of the year. This is happening in view of the significantly tightening political and regulatory environment in the coming years, reacting to Europe's emission reduction target of 55% by 2030 compared to 1990.

While the start of Nordstream II operations could entail some bearish risk for gas, I would see a partial decoupling of gas prices from carbon contracts in such scenario, with power prices being caught a bit in the middle. I expect this for the first quarter of 2022. Continued EU discussions on the Fit-for-55 package will keep interest in carbon allowances high while gas price fundamentals will play a minor role for setting the EUA price. Should gas prices correct, I'd expect the area between 50 and 60 €/t to attract significant support via dip-buying for European carbon and European power prices taking direction from this.

**What will be the effect of the North Sea link on Nordic power prices and price area differences?**

**TOR REIER:** We have made general simulation a couple of months ago and southern Norway is lifted with 10€ while system price is lifted 4€ as an average, but I guess this might be even more now with UK prices accelerating to a lot higher levels lately. We also have a constrained situation in the hydro reservoirs in southern Norway. Over time the expected export volumes would contribute to a constrained situation even with some precipitation delivered before the winter and snow accumulation starts.

**OLE TOM:** We expect there will mainly be exports from Norway (NO<sub>2</sub>) to Great Britain (GB) through North Sea Link (NSL) in Q4-21 and Q1-22 due to power prices in GB expected 2.5 times higher than in southern Norway. Still there can be shorter periods with low prices in GB due to high wind power output and low demand (some night hours, weekends) that could lead to imports to NO<sub>2</sub>.

*»NO<sub>2</sub> price lifted by 10-13 euros«*

In our price model the NSL exchange capacity is 700 MW for Q4-21 and 1400 MW from 1 Jan 22. Our mid-term price

price model suggests that without NSL in the whole forecast period until 2026, the price in NO<sub>2</sub> would have been 13 euros lower in Q4-21 and in Yr-22, and ~10 euros lower in 2023-2026.

Longer term we expect the prices in GB to fall, both due to lower gas prices and high build-out of offshore wind power capacity. We therefore expect gradually falling export volumes to GB, but Norway would still be a net exporter to GB.

**MARCUS:** The North Seal Link is landing in the southern part of Norway and connect Norway with Great Britain, which have higher prices than Norway. We therefore expect the interconnector to increase prices in southern Norway with 2 to 3 EUR/MWh, while the price effect in northern Norway will be rather limited. In the current situation with very low reservoir filling in southern Norway the price effect might be as high as 5 EUR/MWh for the coming months in southern Norway, while the effect in Northern Norway will be close to zero.

**Do you think there will be political intervention to stop further or future big increases in the power price? In which countries?**

**TOR REIER:** We might of course see political interest and attempt to find something that might help the situation. There is not much room to override the market legally. The TSO might limit the exchange capacity on several exchanges, but I believe the market will be able to regulate this internally.

*»Could see NVE limit consumption and control remaining resources in southern Norway«*

We could see capacity constrains in south of Sweden though and many scenarios

might bring NVE and other national government into action to limit consumption and control the remaining resources in southern Norway when we come closer to the spring culmination and melting season of the snow. In some extreme cases we might come close to a rational situation in some part of Norway.

**OLE TOM:** The most likely political intervention in Norway is a reduction in the tax on electricity consumption, which is currently at €21/MWh (incl VAT). However, there are no concrete decisions on this yet. There also seems to be political agreement that the level of housing allowance will be increased so that people with low income and high housing expenses due to high electricity bills will get support from the state.

Other European countries have introduced emergency subsidies and tax breaks in response to surging electricity prices (GB). Germany, on the other hand, has not. Another likely political intervention seems to be a price roof, prohibiting electricity prices for households to exceed a certain level until April 22 (Spain, France).

**MARCUS:** We have seen more and more calls from industry stakeholders as well as a selected number of policy makers »to take action«. The European Commission said it would present a toolbox of regulatory measures that member states can use to tackle energy price spikes without breaching the bloc's energy market rules. This will likely include suggest amendments to value-added tax (VAT) and excise duties or use direct support to shield consumers from high costs.

*»Fragmented approach by individual member states«*

At the same time, part of the current increase in power prices is a result of the high carbon prices, driven by gas

prices and the Fit-for-55 package. So the Commission will likely not want to work against the impact of its own high-climate-ambition framework. At the same time, the internal market rules need to be respected to not risking a fallout of the entire idea. That said, I am very sceptical that we will see a concerted European attempt towards a policy intervention which would fundamentally undermine the trust in the established market rules. We will rather see a fragmented approach by individual member states on the more »controllable elements« of the electricity bill.

**There are continuous industry announcements of projects leading to much higher power consumption. How do you use this in your long-term forecasts? What do you take into account?**

**TOR REIER:** Discussing this we obviously do have large uncertainties from when and how fast the different technologies are available for the commercial market. We take hydrogen into our long-term forecast to a large extend looking beyond 2025. It will at start have higher effect in the industrial processes before we, at a later stage, find renewable production, batteries and hydrogen flexibility to create new markets and changes the total dynamic and flexibility in this power market.

*»26 + 11 TWh of consumption related to hydrogen in 2030«*

In our base scenario for 2030, we take into account 26TWh consumption related to production of hydrogen and in addition 11TWh consumption in the production of green steel, also related to hydrogen.

**OLE TOM:** We have a quite modest expectations of demand increase ahead. In the Nordics we have approx. 0.5 % yearly demand increase the next 5 years. In Germany, France, Netherlands, Belgium, Austria and Great Britain, we assume

zero yearly growth in consumption from 2021 to 2025 for all countries.

This assumption is based on the premise that the increase in power consumption coming from electrical vehicles and production of green hydrogen will be offset by increasingly energy efficient households and industry in this period. Going forward from 2025 towards 2030, the increase in consumption stemming from the electrification of the transport sector and an increase in demand from energy intensive industries such as battery production and hydrogen production from grid-connected electrolyzers outpaces the efficiency gains from industry and households. The result is a net increase in power consumption.

*»1% consumption growth in 2026–2030«*

With this as a backdrop, we have assumed a one percent yearly growth in the period 2026 to 2030. The consumption numbers reflect the public grid demand, which excludes transmission, distribution losses, self-consumption and demand from pumped hydro, but includes embedded generation.

**MARCUS:** We follow project announcements closely and try to keep track of all the potential new consumption. The challenge is that only some of these announced projects will be realised. We therefore evaluate all project before we choose to include them in our analysis. As we focus on long term analysis in THEMA, the longer trends are important. We see that electrification of new sectors will increase power demand significantly in order to bring emissions down. We further model sector coupling and have an investment model that invests in electrolyzers for hydrogen production based on cost developments and income potentials.

**If and when do you think Nordstream II will be commissioned?**

**TOR REIER:** I have no concrete date on the commission of this connection, but the market situation should bring it on as soon as available. In my head the realistic date might be during December this year.

**OLE TOM:** Our base case is that Nordstream 2 will be commissioned in Q1-22. The certification process of the pipeline is a lengthy process.

**MARCUS:** Even though the Green party will likely be part of the next German government, a party that has fundamentally opposed the Nordstream II project, the current situation in energy markets and the high upfront investments will result in an opening of the pipeline.

With Nord Stream 2 becoming operational over the next few months, capable of shipping 55 bcm of gas from Russia to Germany per year, European gas prices are likely to relax. Completion of the pipeline was reported early September. However, some missing formal approvals as well as technical tests will have to be run before it can enter into service. Germany's energy regulator (Bundesnetzagentur) indicated that the four-month period for the certification of the pipeline began on 8 September. The regulator has four months from this date to produce a draft decision and transmit it to the European Commission which would then pass its opinion back to the regulator for a final decision. This process could take up to four months as well. It seems likely that the first flows will not happen until early next year.

**Can you say anything about your estimated Nordic power price for 2030 and 2040 and which input has changed most your estimates a year ago?**

**TOR REIER:** The strongest uncertainties in the input are connected to the CO<sub>2</sub> prices. We always see adjusted assumptions for consumption growth and investments in new renewable production to meet

Nordic and European goal for the climate ambitions. I believe both consumption and investment of new renewable have seen significant lifts. Our price estimates bring European and Nordic price areas a lot closer together and we land at a rather flat price level for 2030 to 2040 at just above 50 euros.

*»Just above 50 euros for 2030-2040«*

**OLE TOM:** Unfortunately, 2025 is the year furthest into the future we give a price estimate for. The last price estimate we have for 2025 is €30/MWh. One year ago, the estimate for this year was ~€32/MWh. Higher wind power output expectations compared with one year ago is the variable that has changed the most and is the main explanation for the somewhat lower price estimate today.

**MARCUS:** To cover the increased demand and replace nuclear power, a lot of new generation capacity is needed. From the late 2020s and throughout the forecast period, power prices decrease slightly across all region as new RES capacity partly compensates the effect of decommissioned thermal generation and demand increases. As power prices remain comparably high and technology costs continue to fall, market-driven investments in renewable energy generation become more attractive.

*»In the medium to long term, price levels are primarily determined by the cost of RES generation, corrected for the cannibalization effect.«*

In the medium to long term, price levels are primarily determined by the cost of RES generation, corrected for the cannibalization effect. In our best guess, a significant share of new offshore wind installations in the North Sea is expected to be built as hybrid offshore assets, combining generation and transmission capacity and thereby increasing the interconnectivity of countries. We expect a shift towards offshore wind power, as it becomes economically viable on merchant terms in the 2030s. We expect the same developments in all Nordic countries. Particularly Norway and Denmark build up a generation surplus in this period.

*»Nordic system priced at 51,6 euros in 2030, 47 euros in 2040 and 42 euros in 2050«*

We expect the Nordic system price at €51.6/MWh in 2030 with investments in new wind power capacity contribute to stabilising Nordic prices at 47 €/MWh by 2040 and 42 €/MWh by 2050. All prices are in real 2021 terms. ■



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