Baltic transport 2023 highlights

by Przemysław Myszka

The past year was again rife with different kinds of green developments taking place (or at least announced) across the Baltic Sea region, on- and offshore. There was, however, a noticeable shift in where the focus was placed. Whereas liquefied natural gas (LNG) always supplied a sizeable portion of news bits, other future fuel candidates garnered more attention last year (and methanol called the tune here). The same holds for offshore wind energy, with all sorts of organisations – including, naturally, the regional seaports – deciding the time is ripe to put their money where their mouths are. Capturing, storing, utilising, and shipping carbon also became a topic in and of itself (likewise the uptake of electric trucks and charging them, leastways in the Nordics). At the same time, cold ironing is still very much a thing in the Baltic Sea, while ports and terminals harvesting themselves solar energy is increasingly becoming one (and some will harness wind, too). The latest round-up only justifies that the right time came for us to create the Baltic Green Map and the accompanying Catalogue, the go-to publications if you want to quickly get the lay of the (green Baltic) land (and sea).

Onshore power supply (OPS)

Last year kicked off with news that the **Port of Helsinki** made it possible for all liner traffic vessels visiting the Finnish capital regularly and mooring for longer to cold iron at its city centre harbours. As such, ships can now draw energy from the shore everywhere at the Port of Helsinki's newest ferry terminal. The port authority underlined, "Providing onshore power more extensively than before is one of the most important measures in the Port of Helsinki's carbon neutrality programme [making its operations climate-neutral by 2025]. The greatest positive environmental impact can be achieved with regular liner traffic in particular, but in the future, OPS will be provided in Helsinki to cruise ships and cargo vessels as well." Concerning the latter, the port began providing OPS in its Vuosaari Harbour for **Finnlines' Travemünde** traffic in 2023. According to the port's Head of Sustainable Development, **Andreas Slotte**, "Shore power reduces the emissions of berthed vessels by 50-80%. This figure is probably closer to 80%, but we're making a conservative estimate, as vessels are not heated with shore power during colder weather."

Later, in April 2023, **Tallink & Silja Line** shared that its *Megastar* ferry started drawing electricity from the shore in **Helsinki**. Specifically, the ferry cold irons while berthed at the West Harbour, meaning that the Estonian shipping line 'plugs' in Helsinki, **Stockholm**, and **Tallinn**. The ferries *Megastar* and *MyStar* connect to OPS during their overnight stays at Helsinki and Tallinn, respectively. During her daytime port visits, the cruise ferry *Baltic Queen* is cold ironing at Tallinn and Stockholm. The company's other cruise ferries, *Silja Serenade* and *Silja Symphony*, are connected to shore power during their daytime port stays at Stockholm and Helsinki. According to **Tallink Grupp**, drawing power from ashore decreases *Megastar* and *MyStar*'s monthly CO_2 emissions by 112 tonnes each (1,344t/year), *Baltic Queen*'s by 95t/1,140, and *Silja Serenade* and *Silja Symphony*'s by 154t/1,872t. The company's total yearly use of OPS spares the environment some 7,572t of CO_2 emissions, additionally lowering in-port noise pollution. "We are pleased that the significant effort made both by Tallink Grupp as well as our partner ports in Tallinn, Stockholm and Helsinki has got us to a point where our operations are increasingly environmentally friendly and sustainable. It has not been a simple project and has required significant investments both on our part in terms of retrofitting our ships with the necessary equipment meeting the EU standards, as well as the ports, but the end result is worth it and an important milestone on our journey of developing sustainable shipping in the Baltic Sea region," Captain **Tarvi-Carlos Tuulik**, Head of Ship Management at Tallink Grupp, commented.

But probably the brightest OPS highlight of 2023 made headlines in February, with the event's culminating point later in November.


Photo: Tallink Grupp


Photo: YIT

Photo: Terntank

Just before March, **Terntank** carried out the first connection to an OPS facility at the **Port of Gävle** with a tanker (though without any electricity running through the cable). The test was done with *Tern Fors*, whose crane was used to hoist the connector cable from Gävle's brand-new cold ironing installation. The test was performed to go through the connecting checklist, ensuring that safety is maintained throughout the whole process (incl. manual and automatic steps), as OPS-connecting a tanker differs from cold ironing other vessel types since the risk of explosion is ever-present when flammable cargo is being handled.

Then, on 16 November, the same *Tern Fors* drew electricity from the shore in **Gävle**, marking a new milestone for the development of OPS in (Baltic) seaports. The tanker was connected for over three hours, consuming 1,424kWh, and used the electricity to run its unloading equipment. To enable safe cold ironing, the containerised OPS unit on the quay was overpressurised with air so that no gases could enter it, while the connecting room on board the tanker was filled with nitrogen to keep the oxygen level below 5% to prevent any sparks from leading to explosion. Also, the vessel is equipped with battery packs, ensuring no blackout will occur if the OPS connection is lost.

Worth mentioning is that the **Port of Gävle** also partakes in the **Green Cable** project, led by the **Port of Gothenburg**, which is tasked with devising a global standard for tanker cold ironing in hazardous environments. Apart from Gävle, only the **Port of Long Beach** at **BP Terminal**'s Pier T offers OPS (8.0MW at 6.6kV) for tankers.

Two other regional seaports included OPS into their portfolios last year, **Naantali** and **Kapellskär**, but more about that in the passage on the launch of **Finnlines**' *Finnsirius* in the shipping part of this round-up.

Automation

In January 2023, the **PSA**-operated container terminal **Baltic Hub** from **Gdańsk** ordered 20 automated sideloaded stacking cranes from **Künz** (with **ABB** tech) for the under-construction 1.7 million TEUs/year T3 expansion. The machinery will offer a span of 32 metres and two cantilevers of 8.5 m in length each. The lifting height will be 1-over-6. The cranes' structures will consist of a double girder gantry with Künz's patented trolley, equipped with a 4-drum hoist with direct outgoing ropes to the headblock. The headblock will be, in turn, equipped with micro motion, allowing for fine positioning in the trolley and crane travel direction. The system also corrects a possible skew. ABB will supply the electrical equipment (incl. automation). The company's technology consists of 3D laser systems with cameras that allow load- and unloading automatically in the truck area and the container stack. The cranes will be delivered in several phases beginning in early 2024 (the manufacturer plans to go live on the terminal in Q2 of 2024). The final units will be completed by the end of H1 2025. "We selected Künz and its partner ABB for several reasons, such as their patented hoist and gantry design and tailored automation solution for Baltic Hub. Together with Künz, we will take great steps on our automation journey that will increase Baltic Hub's productivity while helping us achieve our ambitious sustainability targets," **Mustafa Doğan**, Technical Director at Baltic Hub, underlined.

Also in January last year, **HHLA Next** invested in the **FERNRIDE** tech start-up from Munich, with **HHLA** granting access to its sea container facility in **Tallinn**'s **Muuga Harbour**. Subsequently, FERNRIDE began trialling its solution (for the first time in a container terminal) for the gradual automation of trucking operations. Specifically, trucks and tractors were equipped with sensors and cameras for remote-controlling via mobile networks by

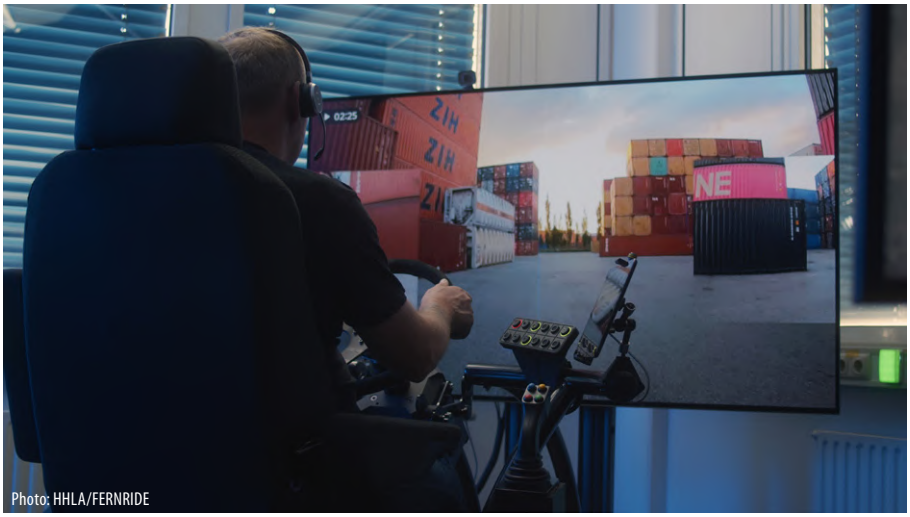


Photo: HHLA/FERNRIDE


Photo: Künz

Photo: APM Terminals Aarhus

operators at a computer workstation resembling a vehicle cockpit. FERNRIDE said the algorithms could be further trained using real-time operational data to roll out additional autonomous functions. "We at HHLA Next invest in digital and sustainable business models in maritime logistics. We see great potential in autonomous driving solutions, also because of the current lack of truck drivers. With FERNRIDE, we are investing in a company that has already implemented a viable solution with a partner network of respected companies from industry and logistics with very good results. In addition, the project highlights our focus on sustainable logistics," **Simone Lode**, Managing Director of HHLA Next, commented at the beginning of 2023.

Fast-forward to July 2023, and after ticking off the first phase of their joint remote/automated trucking project in Estonia, **HHLA** and **FERNRIDE** agreed to proceed. The yard truck that FERNRIDE equipped with sensors and cameras already transported containers between the quayside in the **Muuga Harbour** and the yard via remote control. With the start of the second phase, autonomous driving got integrated into operational processes. For this purpose, an additional automated yard truck was deployed at the terminal for container transport, with the goal of the follow-up to achieve a degree of autonomy of at least 80-90%. "Thanks to the joint project with FERNRIDE, we have been able to test the system directly in the operational business of HHLA TK Estonia. The implementation has proven itself in daily terminal operations, so that proof of concept could be achieved at an early stage. We will now continue our excellent collaboration with FERNRIDE and will work together to see how autonomous driving might work in the future. Our goal is to create work processes at our international terminals that are future-oriented and sustainable," said **Philip Sweens**, Managing Director of **HHLA International. Martin Isik**, FERNRIDE's CCO, added, "We are looking forward to the next phase of productive and successful collaboration with HHLA. Our mutual trust and the desire to positively transform the sector make us perfect strategic partners in the implementation of our platform for autonomous electric trucking in port areas. Our partners are impressed by the platform's advantages, including the increased efficiency and safety for our employees, the reliability of our operations and the easy scalability of the solution. HHLA shares our values and our ambitions of scaling this technology internationally, and the TK Estonia terminal offers ideal conditions to lay the foundation for this." Meanwhile, **HHLA Next** for the second time invested in FERNRIDE (Series A financing). The company's **Simone Lode** said on this occasion, "The successful project in Tallinn once again underlined FERNRIDE's professionalism as well as the immediate operability of the system. This strengthened our decision to expand our investment. With FERNRIDE, we are investing in a company that provides 'human-assisted autonomy.' This is already a functioning, reliable solution that is paving the way towards autonomous driving."

In June last year, the Chinese **ZPMC** delivered two hybrid (Li-ion batteries-diesel)

automated straddle carriers to **APM Terminals Aarhus**, which runs a container terminal in the Danish seaport. The new machinery joined the prototype Blue Bot that has been operating within a test area since 2022's start (performing over 6,000 lifts and driving 800 km till the news bit saw the light of day). The Blue Bots are part of ZPMC's automated straddle carrier programme and were built explicitly for APM Terminals Aarhus based on specifications and learnings from the initial operations in the reefer area and picking & placing containers to and from a test quay crane lane. "We are proud to be part of the development of these highly advanced GPS-operated automated straddle carriers. We have been testing the first straddle carrier in a small, enclosed area which has provided valuable learnings and insights for the development of the next models. With the new Blue Bots, we are now ready to expand our test area to 65,000 m² in order to further analyse and optimise the technology to fit our operation and enhance safety," highlighted **Mikael Gutman**, **APM Terminals Nordics**' Managing Director.

Wind #1 – offshore energy

Harnessing wind power was in all probability the trend that received the most tailwind in 2023. The year kicked off with the announcement that **PKN ORLEN**, a Polish state-owned energy company, received the permit to start constructing its offshore wind energy (OWE) installation facility in the **Port of Świnoujście**, due for commissioning in 2025. The terminal will feature two berthing places, each 250 m long. The facility's set-up will not only enable handling single OWE components but also make it possible to assemble larger elements (incl. 100-m-tall towers). PKN ORLEN's terminal in Świnoujście will assist in erecting the company's 1.2GW **Baltic Power** OWE farm some 23 km off Poland's coast near Choczewo and Łeba (a joint project carried out with the Canadian **Northland Power**). Baltic Power is planned to come online in 2026.

At the same time, news came from Denmark that the **Port of Esbjerg** will invest in the digital twin technology to triple its wind installation capacity. With the help of the California-headquartered **Moffatt & Nichol**, the Danish seaport is developing a solution thanks to which Esbjerg will be able to handle 4.5GW of offshore wind components by 2025. "This computer program is fed huge amounts of data, enabling it to analyse all port processes related to the shipping of offshore wind installations, using a 1:1 simulation of the port. Everything from storage locations of wind components and space requirements to the impact of high tide and much more," the Port of Esbjerg explained in a press release. **Dennis Jul Pedersen**, the seaport's CEO, underlined, "Working with the digital twin is a game-changer. We can make much better decisions using that tool. It means that we can triple our capacity at Port Esbjerg without expanding by a single square metre." He furthered, "We are now the first port in the world to have a digital twin for offshore wind. However, it could play a huge role in the deployment of wind installations across the whole of Europe in the coming years. There is a lack of space at most wind ports in Europe, so we need to pull the ports out of our spreadsheets and create more digital twins instead." Moffatt & Nichol's Marine Structure Engineer, **Joshua Singer**, who was also the Project Manager behind developing Esbjerg's digital twin, commented, "The ability to digitally develop the port and physically see the project happening gives you the opportunity to identify issues and efficiencies before any significant capital investments are made, and that's a hugely powerful tool for the offshore wind industry." Esbjerg's capacity will steadily increase from 1.5 to 4.5GW/year by 2025 when the required changes are completed (among others, rebuilding of various access roads). "There is no reason to think we'll stop at 4.5GW, and the same goes for increasing capacity in the rest of Europe. And that's before we even start expanding the ports," Jul Pedersen claimed.

Shortly thereafter, also in January 2023, the **European Offshore Wind Port Declaration** was signed in Esbjerg. The ports of **Cuxhaven**, **Eemshaven**, **Esbjerg**, **Humber**, **Nantes-Saint Nazaire**, and **Oostende** joined forces to speed up the green transition to meet Europe's offshore wind deployment targets. "[…] the six of us signed a declaration stating that we will do everything we can to support Europe's ambitious aims. In May [2022], the politicians set the framework with the original declaration, and today we've started to act on the challenge they gave us all by raising sky-high the targets for offshore wind," Esbjerg's **Dennis Jul Pedersen** commented. He was referring to the Esbjerg Declaration, which saw Belgium, Denmark, Germany, and the Netherlands pledge to deliver a minimum of 65GW of offshore wind energy capacity by 2030. "[…] In other words, Europe aims to install well over five times as much offshore wind in the next eight years as we have built during the previous 20 years. This target puts great pressure on European wind ports because there is currently not enough port capacity to install all these offshore wind farms by the deadline," said the signatories of the European Offshore Wind Port Declaration in a press brief. The parties will share best practices, e.g., using the digital twin to increase handling capacity without physically enlarging their harbours.

Photos: Port of Esbjerg


Photo: Port of Szczecin-Świnoujście


Photo: Port of Tallinn

Photo: Port of Kaskinen

They will also collaborate on getting around the issue of, among others, space shortages, such as when one port only has space for half a project, another may have room for the other. **Dirk Declerck**, the Port of Oostende's CEO, noted, "This collaboration is important, because we make each other stronger. Likewise, it is very important for the green transition that we exchange knowledge and experience and share professional information with all stakeholders in the offshore industry, so we can create a professional platform." The European Offshore Wind Port Declaration was underwritten in the presence of **Isabelle Ryckbost**, Secretary General of the **European Sea Ports Organisation**, who took this opportunity to underscore that "The importance of ports in Europe should not solely be calculated in tonnes, but should also be assessed in terms of their contribution in the deployment and supply of energy, in particular renewable energy. I am very excited to see these six important wind energy ports joining their efforts and leading the way in view of reaching the EU offshore goals. Through cooperation it will be easier to face the identified headwinds." According to **WindEurope**, 2023 saw the addition of a record 4.2GW of new offshore wind farms in Europe (of which 3.0GW in the EU, incl. the Dutch 1.5GW **Hollandse Kust Zuid**), up 40% on 2022. The EU built 17GW of new wind energy capacity last year. That was more than ever in a single year; however, WindEurope notes that it's still short of the 30GW/year of new wind that's needed between now and 2030 for Europe to align reality with its green ambitions. That said, wind energy accounted for a not insignificant 19% of all electricity produced in Europe's last year.

Next month, the **Port of Tallinn** and **Utilitas Wind**, an Estonian heat & energy producer, signed a memorandum of understanding to accelerate the regional OWE industry, jointly working on the development, construction, and maintenance of OWE farms in the Baltics. On its side, Tallinn intends to add an installation quay in its **Paldiski South Harbour**. The €53m investment will see the set up of a 310 m long quay and adjacent 10 ha yard. Meanwhile, Utilitas Wind is working on the **Saare-Liivi** OWE farm in the Gulf of Riga, to be ready in 2028. The first stage of development will include installing 80 turbines with 1,200MW total capacity (over 5.0TWh of expected annual electricity generation). "Cooperation between strategically important sectors is of key importance to ensure that new generation capacities are built as soon as possible, bringing down the price of electricity and

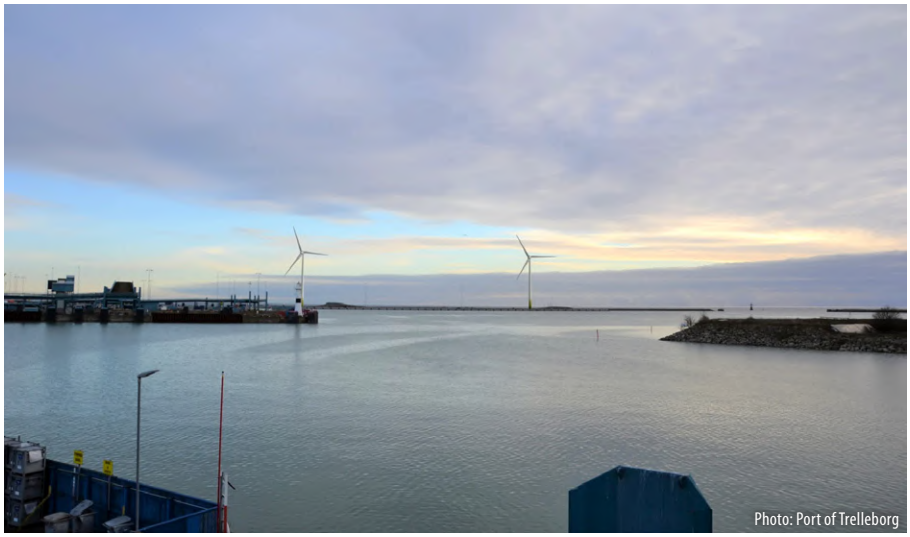


Photo: Port of Trelleborg

ensuring our energy independence through domestic production. Offshore wind farms are the best possible solution to achieve this goal," **Rene Tammist**, Board Member of Utilitas Wind, underlined.

In March 2023, **Van Oord** picked **Mukran Port** as the base for transshipping transition pieces (some 50 units) for **Iberdrola**'s 476MW **Baltic Eagle** OWE farm (located 30 km off the island of Rügen and scheduled to come online by this year's end). The transition pieces will come from the Spanish Avilés, while Baltic Eagle's turbines will be provided by **MHI Vestas Offshore Wind** (the MVOW V174 model of 9.53MW capacity). **EEW**'s mega-factory in Rostock will supply the monopiles. Van Oord's heavy-lift vessel *Svanen* will take care of the installation, while the company's *Nexus* and *Dig-It* will lay the cables (with **50Hertz** installing the offshore substation).

In April 2023, news broke out that the **Port of Gothenburg** earmarked SEK15m (about €1.32m) for purchasing 5% of the **Västvind** OWE farm and further partially financing the project costs. The 1,000MW offshore wind farm, situated in the Kungälv and Öckerö municipalities, will produce 4-4.5TWh/year (or what the **City of Gothenburg** currently consumes). **Eolus**, the project developer, expects to commence construction in 2027, completing the works two years later. "The Port of Gothenburg is facing a green transformation that will entail a sharp increase in the port's electricity needs already during the period up until 2030. The port's forecasts for future electricity consumption show a multi-fold increase in the need for power. There is already a severe deficit in electricity generation in the region, and demand for electricity is expected to double by 2035," the **Gothenburg Port Authority** (GPA) underscored in a press release. **Elvir Dzanic**, back then GPA's CEO, added, "The world's major ports will become energy hubs and centers for the manufacture of hydrogen gas and e-fuel for maritime traffic. The Port of Gothenburg's strategy is to lead the green transition of maritime traffic, but this position will not come about without some effort. Access to green electricity will be entirely crucial for the port's development and competitiveness. Investing in electricity production is therefore a strategic decision for us." **Per Witalisson**, CEO of Eolus, also highlighted, "Regional renewable electricity generation is an integral and necessary part of the green transition in both the transportation sector and industry in western Sweden. It is therefore both natural and strategically important that the Port of Gothenburg is part of Västvind." He continued, "Västvind could play a key role in western Sweden's ambitions of becoming northern Europe's center for the electric vehicles and battery manufacture of the future, and the world's most climate-smart port logistics. Access to green electricity is a decisive issue in this regard. In practice, offshore wind power is the only source of energy that can contribute such large amounts of new electricity generation in the timeframe up until 2035." More about e-invetsments in and around Gothenburg (and other sites across Scandinavia, too) in the section on charging stations.

In mid-June 2023, the **Offshore Wind Power & Ports in Ostrobothnia** project was launched. The **Regional Council of Ostrobothnia** selected **Ramboll** to assess the opportunities and needs associated with developing OWE via Coastal Ostrobothnia. The project is divided into three parts. The first is tasked with mapping how Ostrobothnian ports (**Kaskinen**, **Pietarsaari**, **Vaasa**, **Kasnäs**, and **Karhusaari**) stack against other seaports in the Gulf of Bothnia and the wider Baltic Sea as regards their preparedness for serving the construction of OWE farms. The second part is devoted to the division of labour and cooperation (also with Swedish harbours), as the investment scale of OWE off Finland's coast is too big for a single port to handle the entire demand. Lastly, Ramboll will look into what opportunities may follow thanks to erecting OWE farms, such as hydrogen and e-fuel production. In the project announcement, the Council said that a record number of wind turbines was built in Finland in 2022, and wind energy production rose by 41%. The country was at that time peppered with nearly 1,400 turbines (though mostly on land). Among others, **OX2**, a developer and seller of renewable energy solutions (incl. wind), initiated the development (environmental impact assessment and other studies) of the 100-turbine-strong 1,400MW/6.0TWh/year OWE farm **Tyrsky** in the Gulf of Bothnia (about 30 km northwest of Kaskinen) at the beginning of 2023.

Alike Gothenburg, the **Port of Trelleborg** also wants to produce its own OWE. To that end, a building permit was granted in July 2023 for erecting two 120-m-tall wind turbines in the Swedish seaport, expected to start swirling this year. The pair will produce about 15m kWh/year. Together with the port's 2.2k m^2 solar park, the turbines will deliver more green energy than it consumes. As such, electricity will also be used for the **Municipality of Trelleborg**'s hydrogen investment (**H2X** and **Trelleborg Energi** will deliver hydrogen buses and a waste truck for the Swedish local authority). "Together with Trelleborgs Energi, we are now working to find the best design and how to ensure green hydrogen for the upcoming truck traffic powered by hydrogen in the future," said **Jörgen Nilsson**, the Port of Trelleborg's CEO. The wind turbines are one of the activities in the port's **EU Green FIT 2025** project, co-financed by the EU. The Port of Trelleborg intends to reach net zero emissions by 2040.

In October 2023, the Spanish **Windar Renovables** and the **Port of Szczecin-Świnoujście** signed a preliminary land concession agreement towards establishing an offshore wind energy tower production centre in the **Port of Szczecin**. The deal was later signed & sealed in January 2024. The factory and its storage area will occupy 17 ha and the towers produced by Windar Renovables in Szczecin will be designed to support the new generation turbines with 20MW of installed capacity.

Just before the end of November 2023, the **Port of Halland**, **OX2**, and **Ingka Investments** signed a two-year agreement,

Photo: Mukran Port

following which they will scrutinise the conditions under which the **Port of Varberg** can function as a supply harbour for the **Galene** OWE farm. OX2 will set up an office and a warehouse in the Swedish seaport with quay access to serve the 400MW installation (21 wind turbines some 20 km off Halland's coast). "We are very optimistic about the agreement with OX2, which will create conditions for a long-lasting partnership that will contribute to electricity supply security and Halland's green transition. We will also get the opportunity to strengthen the operations in Varberg with yet another segment in addition to being Sweden's leading forest harbour," commented **Henrik Nanfeldt**, COO at the Port of Halland (the joint authority of the seaports in **Halmstad** and Varberg). **Emelie Zakrisson**, Head of Offshore Wind Development Sweden with OX2, added, "We are looking forward to contributing to the development of the Port of Varberg by establishing an office, warehouse, and operations. The port will play a central role in building and then operating Galene, which will produce a significant amount of cost-effective and renewable electricity in the region."

Nearing the end of last year, **Suomen Hyötytuuli** obtained the building and water permits for adding new turbines to the 42MW **Tahkoluoto** OWE farm off the coast of **Pori**. The so-called demonstration project, supported by **NextGenerationEU** funding, will see the addition of two at least 15MW strong turbines (the current ones, 11, have a capacity of 2.3-4.2MW). The project aims to demonstrate the construction of new-scale offshore wind turbines, likewise testing foundations capable of withstanding harsh sea conditions (Tahkoluoto is the world's first OWE farm erected in freezing waters). The entire expansion project assumes placing 40 new turbines, thus increasing the farm's capacity by 600-800MW by 2027-2029. "These are the first permits granted to offshore wind turbines of this size in Finland. When applying for permits for Suomen Hyötytuuli, it was important to ensure that the plans comprehensively took into account the understanding of the marine nature of the area and became more detailed during the environmental impact assessment and zoning. Of course, it is also important to monitor the environmental impact during construction and in the early stages of production," said **Juho Lappalainen**, Project Development Manager responsible for the Tahkoluoto OWE farm expansion.

Meanwhile, the **City of Pori** – together with the **Port of Pori**, the city-owned company **Suisto Kiinteistöt**, as well as **Suomen Hyötytuuli**, **Enersense**, and the Dutch logistics service provider **Olmar** – are working on setting up an international hub for expertise and operations based on offshore wind power. The competence hub will be located on a 50-hectare plot in the Port of Pori's **Mäntyluoto Harbour**. In the initial phase, the area will be used for pre-installation services, assembly, and storage of offshore wind turbines. "There are several significant offshore wind power investments planned for the Gulf of Bothnia. Our goal is to build a competence hub that serves wind power projects in the region, both in Finland and Sweden. We already have one offshore wind park in operation, giving us a head start compared to competitors. We aim to develop Pori as a pioneer in clean energy solutions," highlighted **Lauri Kilkku**, Head of Administration at the City of Pori. According to the **Confederation of Finnish Industries**, the total value of planned offshore wind power investments in Finland exceeds €42b. Within a radius of 400 km from Pori, 15 larger wind power projects have been announced. **Seppo Ihalainen**, heading Suisto Kiinteistöt, also underscored, "The principles in green transition projects are similar to those in developing digital infrastructure. Expertise is crucial, and it is necessary to build strong ecosystems. Wind power expertise and port development provide a solid foundation for industrial investments related to solar power and green hydrogen production." Enersense is already constructing technically demanding foundations for offshore wind turbines in Mäntyluoto. Suomen Hyötytuuli and the Port of Pori have agreed to build a gravel loading dock at the **Tahkoluoto Harbour** to serve the construction of wind turbine foundations.

Wind #2 – propulsion

Here last year got off to a nippy start with the announcement that **Horizon Europe** granted €9.0m to the 11 project partners behind *Orcelle Wind*, the pure car & truck carrier (PCTC) to use wind as the main form of propulsion (hence the title of this section omits 'auxiliary' before 'propulsion' in contrast to the Baltic transport highlights from the previous years). Over the next five years, all aspects of planning, building, and operating the wind-powered vessel will be carried out. **Wallenius Wilhelmsen**, who will operate *Orcelle Wind*, expects to start commercial sailings in late 2026/early 2027. The 220 m long PCTC will offer 7,000+ vehicle capacity (she will also be able to transport other rolling cargo, likewise break-bulk). As part of the Horizon Europe funding, the project will also see the installation of a wing sail test rig on an existing Wallenius Wilhelmsen vessel in mid-2024 (more about that later). "The Horizon Europe EU funding shows the concept stood up to the scrutiny of the EU funding authorities and that they had the confidence to give it their support," **Roger Strevens**, VP Global Sustainability at Wallenius Wilhelmsen, underlined. He furthered, "The EU Funding project is based on a collaborative approach – we need strong partners to lead the way to zero emission as soon as possible. We are proud to have a group of the best technical, operational, and academic partners, as well as one of our key customers, for the project. All have committed to working together to help make *Orcelle Wind* a reality." His company also

Photo: Wallenius wilhelmsen

Photo: Oceanbird

Photo: Norsepower

highlighted in a press release, "The EU project is a solid opportunity to combine the investments needed for full-scale demonstration and data capture with advanced models and tools for wing propulsion vessels. Beyond the demonstrator vessel, the partners will use the models and tools to develop advanced conceptual designs and operational plans for multiple vessel types to apply the wing solution."

Naturally, the wind propulsion section just couldn't go without **Norsepower** (whose prototype of the modern Flettner rotor I had the opportunity to see with my very own eyes upon visiting the **Port of Naantali** in September 2023). First, in January 2023, the French shipowner and operator **Socatra** ordered the retrofitting of its medium-range (MR) tanker *Alcyone* with Norsepower's two 35 m tall and 5.0 m in diameter Flettner rotors. The 50k dwt, 2022-built ship, charter-working for **TotalEnergies**, will receive Norsepower's Rotor Sails in Q4 2023/Q1 2024 (the sails were provided by the manufacturer's new production hub in China in December last year). According to calculations, the Rotor Sails will lower *Alcyone*'s fuel consumption by an average of 8% on her crossing from South Korea to French Polynesia, "[…] with the potential for further savings using voyage optimisation reaching up to 2,000 tonnes of CO_2 per annum," said Norsepower in a press brief. "As the oil industry is moving towards a low-carbon future, it is everyone's responsibility to put forward tangible and economically viable solutions. We are pleased to be working with Norsepower to accelerate this transition and minimise our environmental footprint. The Norsepower Rotor Sail is widely recognised as a proven solution for sea-going vessels, and we believe that our MR tanker *Alcyone* will benefit from significant efficiency gains and help us reduce our CO_2 emissions," **Laurent Bozzoni**, Socatra's CEO, said. **Jérome Cousin**, SVP Shipping at TotalEnergies, added, "The installation of two Norsepower Rotor Sails on *Alcyone* contributes to TotalEnergies' Net Zero ambition by providing an immediate reduction of the carbon footprint of our shipping activities. We reaffirm our commitment to promoting innovative solutions for more sustainable shipping and actively support the deployment of the most promising technologies. The success of this project could pave the way for a broader adoption of wind-assisted propulsion for TotalEnergies' fleet." Another Finland-based company, **Deltamarin**, has been contracted to provide Socatra with a conversion basic design package for installing the two rotors. **Kristian Knaapi**, Sales Manager at Deltamarin, said in this regard, "We are delighted to execute this project together with Socatra and Norsepower, and we look forward to seeing the vessel with installed sails in operation early next year [i.e., 2024]. Wind is definitely a good technology for decarbonisation in both segments, in existing ships and newbuilds."

Second, in March 2023, **Norsepower** scored another order, this time for two sails for one of **MOL**'s 200k dwt dry bulkers.

The 35 m tall and 5.0 m in diameter Rotor Sails will be mounted in H1 2024 and are expected to lower the vessel's fuel consumption by 6-10% (when combined with voyage optimisation technology). The installation results from MOL co-op with **Vale**, for whom the ship carries iron ore under a mid-term contract. Third, later the year in July, the Finnish manufacturer of auxiliary wind-assisted propulsion was commissioned by the Japanese **Iino Lines** and **J-Power** to furnish *Yodohime* with a 24 m tall and 4.0 m in diameter sail. The installation will take place in Q3 2024. It will be Iino Lines' second Norsepower Rotor Sail, following an installation on board a very large gas carrier (and J-Power's second wind propulsion auxiliary system for a coal carrier).

As the promised throwback to *Orcelle Wind*, the Oceanbird Wing 560 received the Approval in Principle (AiP) from **DNV** in summer of 2023. The class confirmed that the rigid, tiltable sail designed by the JV of **Alfa Laval** and **Wallenius Marine** encountered no showstoppers and can be further developed toward Type Approval and prototype assembly. Oceanbird Wing 560 is 40 m tall and 14 m wide, offering 560 m^2 sail area. It consists of a main sail and a flap, optimising the aerodynamic forces by creating a camber. According to its developers, one wing sail on an existing ro-ro can, at normal speed, reduce fuel consumption from the main engine by 7-10% on favourable oceangoing routes, saving approximately 675k/year litres of diesel, which corresponds to about 1,920t/y of CO_2. "It is one of the first stiff wing sails that will tilt in hard winds as a safety feature that gets an Approval in Principle. Therefore, it is reassuring that DNV supports our safety philosophy since we are now going from vision into realisation. In just a few months, we will begin to assemble our first full-scale wing prototypes, which will be on board a [Wallenius Wilhelmsen] vessel in about one year from now," underlined **Niclas Dahl**, Managing Director, **Oceanbird**. "We're pleased to award Oceanbird the AiP for their wind-assisted propulsion system […]. Such systems hold promise in enhancing the efficiency of maritime operations, and partnerships like this play a significant role in moving the industry towards decarbonisation. With our extensive knowledge in this domain, DNV is eager to collaborate and foster the advancement of these innovations," said **Hasso Hoffmeister**, Senior Principal Engineer at DNV.

Liquefied natural gas (LNG)

In 2023, other energy carriers dominated the Baltic news feed, leaving the LNG market with but two major developments. In January, the floating storage regasification unit (FSRU) *Exemplar* got connected to the Finnish grid in the **Port of Inkoo**, ready to receive gas for distribution in Finland and the Baltics (more on the latter in a second). The 291 m long, 150.9k m^3 capacity (68kt of LNG when fully laden, translating to some 1,050GWh) *Exemplar* has been chartered for ten years from the Texan **Excelerate Energy**. The floating terminal has an annual regasification capacity of 40TWh, which according to **Gasgrid** exceeds the country's yearly demand (25.1TWh in 2021 per the company's data). The FSRU, operated by **Gasgrid Finland**'s subsidiary **Gasgrid Floating LNG Terminal Finland**, is connected to the bi-directional **Balticconnector** pipeline, the other end of which is in the Estonian **Paldiski**. The 1 January 2020-launched pipe (providing Finland with around one-third of its gas demand) became nonoperational on 8 October 2023 when the operators detected a sudden and significant drop in pressure (from 34.5 to 6.0 bars), forcing them to shut off the flow. The damage was in all probability caused by the anchor of the Chinese container ship *Newnew Polar Bear*. Consequently, Finland has had to turn to its LNG import terminals (**Hamina**, Inkoo, **Pori**, and Tornio) to make for the lost pipeline capacity (which could get back online in April this year at the earliest). As such, **Gasum** has been feeding *Exemplar* since October 2023, also with its *Coral Energy* bunker vessel following the FSRU upgrade to receive LNG from smaller vessels (but that was an event from early 2024; in total, by 10 January this year, Gasum delivered four large batches of LNG to *Exemplar* since Balticconnector went out of order). Upon welcoming *Exemplar*, Gasgrid underlined that no Russian gas will be handled at the Inkoo terminal; moreover, the investment would help Finland to permanently phase out its dependency on Russian gas.

Photo: Wasaline

An eye-catching move was put in motion by the Finnish-Swedish **Wasaline** in early autumn of 2023. The company connecting the ports of **Umeå** and **Vaasa** (the two **Kvarken Ports**) started sailing its gas-run *Aurora Botnia* ferry on bioLNG each Friday from 13 October 2023 (ending the so-called Green Fridays around Christmas). With certified climate-neutral bioLNG from **Gasum**, Wasaline said it intends to reduce its carbon footprint further: the company shared in an October press release that its 2023 emissions were already 22% lower than last year. Moreover, Wasaline covered the price spread between bioLNG and the standard version of LNG. "*Aurora Botnia* is the world's most environmentally friendly ferry today, but our efforts to reduce our climate footprint continue," underscored **Peter Ståhlberg**, Managing Director at Wasaline. He went on, "This is a pilot project to measure the interest of our cargo owners and passengers, and whether it is financially viable to continue biogas purchases. We would like to thank our loyal

Photo: Excelerate Energy

customers who have made this unique investment in climate-neutral transport possible for the first time in the Kvarken." **Jacob Granqvist**, VP Maritime at Gasum, commented, "This is a great initiative that we at Gasum are very happy to be a part of in our role as a biogas supplier. Biogas is one of the already available concrete pathways to reducing emissions in maritime transport and travel, and it's fantastic that Wasaline is now setting on this pathway to provide lower emissions services to its customers. Our goal is to continuously increase biogas availability to our customers in the coming years." **Ida Saavalainen**, CEO at **Ahola Group**, one of Finland's prime road hauliers, also underlined, "Sustainability and holistic environmental-effective solutions are a central part of our operations where we work actively to reduce our footprint. Our methods include real-time optimization of routes, high filling degree, energy-efficient driving, and the use of alternative fuels with lower emissions. We are pleased to reduce emissions even further with the help of biogas-powered ferry connections by Wasaline."

Future fuels

Also in January 2023, **Liquid Wind** shared the company conducted a feasibility study (together with **Umeå Energi**) on setting up a marine e-fuel production site at the Dåva cogeneration plant up in the Swedish far north. According to the study, there are "excellent conditions" for establishing Sweden's third electrofuel facility for the maritime sector in **Umeå**. All documents required for an investment decision are planned to be ready this year, with an expected production of 100kt/year starting in 2026. The plant will see some 230kt/year of CO_2 captured. "We are looking forward to our partnership with Umeå Energi and their future-oriented vision which results in the possibility to jointly establish the first electrofuel facility in Region Västerbotten. The Dåva facility will follow the Örnsköldsvik [50kt/y/online in 2025] and Sundsvall [100kt/y/possibly end 2025-beginning 2026] facilities already being developed in Västernorrland. The transition to electrofuels in the maritime sector which uses 300 million tonnes of fossil fuels every year is very urgent. With electrofuel replacing today's fossil fuels, carbon dioxide emissions can be reduced by over 90%," **Claes Fredriksson**, Liquid Wind's Founder & CEO, said. **Jan Ridfeldt**, CEO of Umeå Energi, underlined the synergies and wider benefits behind such investments, "As an energy company we play an important role in reducing both society's climate footprint and the footprint from our operations. Capturing the carbon dioxide from the Dåva cogeneration plant will allow us to take yet another step towards circularity. Umeå Municipality has pledged that the City of Umeå will be climate neutral by 2030, and the municipality itself by 2040. The establishment of an electrofuel production plant at Dåva could be an important step in that direction."

In May 2023, the Danish energy company **Ørsted** began constructing **FlagshipONE**, the abovementioned plant in **Örnsköldsvik** (sited on the grounds of the biomass-fired combined heat & power plant Hörneborgsverket, operated by **Övik Energi**). **Siemens Energy**, **Carbon Clean**, and **Topsoe** also broke the ground: the companies will deliver the electrolysers and control system, the carbon capture equipment, and the methanol synthesis gear, respectively. The e-methanol from FlagshipONE will be produced using renewable electricity and biogenic CO_2 captured from Hörneborgsverket. In addition, FlagshipONE will use steam, process water, and cooling water from Hörneborgsverket, and excess heat from the e-methanol production process will be delivered back to Övik Energi and integrated into their district heating supply. The **Swedish Environmental Protection Agency** supported FlagshipONE with SEK151m (about €13.1m) through its **Climate Leap** initiative. "The event in Örnsköldsvik focused on the need to decarbonise global maritime transport and on the large potential for Sweden to become a key market for the production of e-methanol, which is emerging as shipping's preferred route to zero emissions in the 2020s. Sweden has ample opportunity to develop renewable energy, like onshore and offshore wind, and has a world-leading forest industry to supply the

Photo: The Norwegian Ship Design Company

biogenic carbon needed to produce e-methanol. Örnsköldsvik is one of the centres of the Swedish forest industry, having a large commercial presence from advanced forest-based industries," Ørsted highlighted in a press release. According to the company, over 110 e-methanol vessels are on order or already operational, up from 80 at the end of 2022. **Anders Nordstrøm**, COO of Ørsted P2X, said, "FlagshipONE is a pioneering project that will open a new era for green shipping and for Ørsted. I'm very pleased that we've now started on-site construction together with other green fuel leaders from across the supply chain, and together with representatives from Örnsköldsvik, Västernorrlands Län and Sweden at large. FlagshipONE will be the first project in a new green industry in Sweden, which Ørsted intends to spearhead." His company also develops the 300kt/year **Project Star** in the US Gulf Coast and the **Green Fuels** for Denmark e-methanol projects. **Claes Fredriksson**, Founder & CEO of Liquid Wind (the enterprise that originally developed FlagshipONE), also commented, "FlagshipONE will soon become the largest commercial-scale electrofuel facility in Europe and at Liquid Wind we are thrilled that Ørsted is now starting the construction phase of the project. FlagshipONE is our first sold project and is just the beginning of our journey to become the leading developer of electrofuel facilities. This milestone will hopefully inspire many others to also contribute to the decarbonisation of shipping. Today is a historical day for Sweden as we put the country on the map as a developer and producer of green electrofuel. All with the intent of reducing the world's dependence on fossil fuels."

Fredriksson put his money where his mouth was in mid-November 2023, when **Liquid Wind**, **Alfa Laval**, **Carbon Clean**, **Siemens Energy**, and **Topsoe** strengthened their co-op to design ready-to-build core e-methanol plants (CMP). The partners said they would focus on reducing the time, cost, and risk of developing CMPs to get ten additional e-methanol facilities in the Nordics by 2027 and a total of 80 standardised, 100kt/year capacity e-methanol units by 2030 (estimated to yearly reduce CO_2 emissions by 14mt). The projects target the shipping business as the primary client for their (fuel) product. **Sundus Cordelia Ramli**, Chief Commercial Officer P-to-X at Topsoe, used the occasion to urge, "At Topsoe, we're thrilled to collaborate with other decarbonisation leaders on this project, driving a faster transition towards a sustainable shipping industry. The sharp rise of CO_2 emissions within the maritime sector (to 5% in 2022) is a stark reminder of the urgency of our collective mission. Inspired by Liquid Wind's visionary approach and united by the pioneering spirit of the project's leaders, we stand poised to demonstrate that, when harnessed, the technology available today can propel a swift transition to a more sustainable maritime future. The time for change is now. This endeavour exemplifies the accelerated progress possible through industry-wide collaboration, and we're deeply honoured to be at the forefront of this pivotal transformation."

On the intersection between LNG and future fuels came January 2023 news that a new bioLNG plant will be up and running in Sweden by Q4 2024. **Scandinavian Biogas**' SEK760m investment (around €68m) will have a production capacity of 120GWh, catering to the transport sector (maritime & heavy overland). The facility will be erected by the Portuguese **Efacec** and the Swedish **Multibygg** in **Mönsterås** in southeastern Sweden. The Swedish arm of **Wärtsilä** will provide the gas upgrade and liquefaction technology. Local farmers initiated the manure-fed biogas project in Mönsterås in 2016, with Scandinavian Biogas getting involved in 2021. The parties formed a jointly-owned company responsible for designing, building, and managing the planned biogas plant. The **Swedish Environmental Protection Agency**'s **Climate Leap** granted the project SEK154m (€13.8m) in economic support in 2021. "We have worked for many years to find a sustainable solution for our operations as the production of manure has become a limitation for us. The collaboration with Scandinavian Biogas brings us a solution that will manage the normal methane emissions, while simultaneously lowering the carbon dioxide emissions in the transport sector. There will be considerable environmental benefits from the local production of food, when taking the whole cycle into consideration," **Olof Boson**, farmer and Board Chairman of **Mönsterås Biogas**, said. **Matti Vikkula**, CEO of Scandinavian Biogas, also underscored, "The biogas project in Mönsterås will be the first in line of the projects that we will develop in collaboration with local farmers. We believe that local ownership is important, to make sure that parts of the future revenues also remain local. The benefits of liquefied biogas with manure as feedstock are obvious, and enable a green transition for locally produced food products as well as for heavy transports. This is another important step for us at Scandinavian Biogas towards our long-term vision of a total production capacity of 3.0TWh by the year 2030." **Michael Wallis Olausson**, Chief Growth Officer at Scandinavian Biogas, summed up, "It feels good to finally have everything in order and that we have received green light to start the project. The farmers need this biogas plant in order to be able to further develop their operations and our customers in Europe are in great need of fossile-free gas."

In February 2023, the **Långnäs Mega Green Port** project was announced. **OX2** and **Ålandsbanken Fondbolag**, the **Bank of Åland**'s fund management subsidiary, teamed up to conduct a 12-month-long feasibility study on setting up a green hydrogen production facility on the Åland Islands. The parties – supported by **Mærsk Mc-Kinney Møller Center for Zero Carbon Shipping**, **EuroMekanik**, and several other consultancies – will look into the practical, technical, and financial conditions for setting up the 3,000MW electrolyser facility. The inquiry will also see what business opportunities the investment will open: directly on the Åland Islands and beyond, as OX2 develops various projects in the north-to-south Baltic, including offshore wind energy farms (between Finland and Sweden), energy storage sites (in Poland), or a hydrogen pipeline (from the Nordics to southern Baltic, with potential branch pipes to Bornholm or Gotland). Apart from providing clean marine fuel, the facility could also cater to the needs of the agricultural and manufacturing industries. OX2 and Ålandsbanken Fondbolag are already working together: on the **Noatum South** and **Noatum North** offshore wind energy farms (3,000MW and 5,000MW capacity, respectively). OX2 has also initiated the development of the (already mentioned in the Wind #1 section) 1,400MW OWE farm **Tyrsky**. "Creating a Mega Green Port will bolster the Åland economy in many different ways. In addition to being an important part of the offshore wind power projects, it will generate jobs and produce e-fuel for the shipping industry – making Åland attractive for the establishment of large new businesses and enabling many new innovative projects in oxygenation of water and utilisation of excess heat in various manufacturing activities. The port will strengthen Åland's potential to become the leading green hub in the Nordic region,"

Photo: Maersk

Anders Wiklund, OX2's Country Manager Åland, said. **Peter Wiklöf**, Manager Director and Chief Executive of the Bank of Åland, commented, "The purpose of our planned wind power projects is green energy transition and enabling the general public to participate via our fund structure – but perhaps, above all, to create a new growth engine for the Åland business sector. The feasibility study for Långnäs as a Mega Green Port is an important step in understanding how Långnäs can play a key role in the future of the Åland business community, especially with reference to the growth of existing Åland companies and the establishment of new business operations." **Johan Byskov Svendsen**, Programme Manager at the Mærsk Mc-Kinney Møller Center for Zero Carbon Shipping, highlighted, "We are very much looking forward to being involved in this feasibility study, the vision for Åland and the role that Långnäs can play for shipping. The global shipping industry is clamouring for green e-fuel on a large scale, which makes the timing of this feasibility study perfect. It needs to get started as soon as possible."

There are voices in the industry, with the Brussels-based NGO **Transport & Environment** probably being the most vocal here, that European and international regulations aimed at curbing shipping's carbon footprint take much of the industry sailing with smaller vessels out of the green transition equation. But here, too, the Baltic works on solutions that move faster than the regulatory framework. In February 2023, **ScandiNAOS**, the **Chalmers University of Technology**, and the **Swedish Maritime Administration** (SMA) launched a project to develop dual-fuel kits for converting new and existing diesel engines (up to 1,000kW) to methanol operation. The two-year-long project will see ScandiNAOS develop and implement a dual-fuel kit in a pilot boat owned and operated by SMA (the organisation, which intends to remove

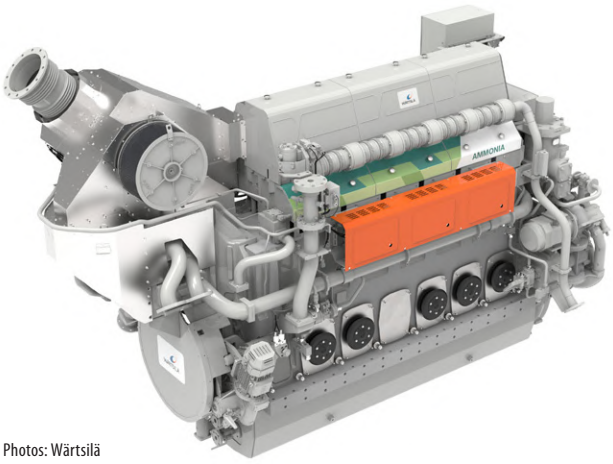

Photo: Scandinavian Biogas


Photo: Johan Gunséus/Liquid Wind

Photo: Liquid Wind

fossil fuels from its fleet by 2045, already operates a methanol-powered pilot boat equipped with a single-fuel compression ignited methanol engine which completed successful trials in December 2021, a conversion supported by the **FASTWATER** consortium). The pilot boat was expected to be ready for field trials in Q3 2023, a process which would go on for 9-12 months, during which the dual-fuel kit would be tuned and optimised based on operational experience and from the results of the research and laboratory tests carried out by Chalmers. "The adoption of dual-fuel kits will enable conversion of more ships and boats more quickly, since a conversion kit can be cost-efficiently applied to existing engines while maintaining the fuel flexibility to run on either methanol, MGO [marine gas oil] or HVO [hydrogenated vegetable oil]," the parties said in a press brief. The project has a budget of SEK8.6m (around €1.8m), half of which comes from the **Swedish Strategic Vehicle Research and Innovation** programme. The methanol producer **Proman** and the **Methanol Institute** provide industry funding. **Albert Hagander**, Technical Manager with SMA, commented, "The SMA is glad to be a part of the project that may open a new door towards fossil-free operation." Dr **Lucien Koopmans**, Professor, Head of the Division of Energy Conversion and Propulsion Systems at the Chalmers University of Technology, added, "A quick and powerful transition towards a decarbonised transport future starts with the conversion of the existing fleet."

Staying in Sweden, in March last year, **PowerCell** shared it'll deliver the world's largest marine (green) hydrogen fuel cells. The Swedish company's 6.0MW H_2 fuel cells will be fitted on two of **Torghatten Nord**'s ferries, saving the environment 26.5kt CO_2 emissions annually. The €19.2m order, won in a tender, will see PowerCell working with **SEAM**, a Norwegian systems developer and integrator of low- and zero-emission solutions for the marine industry (responsible for the electrical installations on the ferries). The final delivery is to take place in Q4 2024. Torghatten Nord and PowerCell also intend to enter into a long-term service agreement. "[The] announcement comes as part of a Norwegian government initiative that aims to see all ferries crossing the Vestfjorden between Lofoten and Bodø in Northern Norway be emission-free. With a long and demanding crossing of up to four hours, green hydrogen was deemed the most viable solution to supply the power these vessels require. The ferries – each with a capacity of 599 passengers and 120 cars – are scheduled to operate from October 2025 as part of a replacement programme for similar sized and operable fossil energy-powered ferries," PowerCell said in a press release. **Richard Berkling**, the company's CEO, added, "This is a groundbreaking project not just for PowerCell or Norway, but for the entire marine industry, and one that we are very happy and proud to be part of. Norway led the development in the introduction of liquefied natural gas in the marine industry and now the country is taking an important step to establish green hydrogen as a clean energy source for our hard to abate sector. Our solutions are perfectly suited for demanding applications where operational reliability, high power



Photos: Wärtsilä

density and compact format are important parameters." He furthered, "[…] In Norway alone, there are roughly 800 ferry lines and ferries are a segment where we can expect great interest in hydrogen-electric solutions. Starting next year [i.e., 2024], the maritime sector will be included in the EU Emissions Trading System, which will increase the demand for net zero, hydrogen-powered solutions."

Still in Scandinavia, but this time in Denmark, the **Port of Aalborg**'s **East Port** got a new tenant in August 2023: a new 3,000 m^2 future green fuel acceleration test facility of **Aalborg University** (with space for potentially adding four more test facilities). "The project will be the backbone of our future development projects that are crucial for realizing large-scale production of, for example, hydrogen and e-methanol. With the Port of Aalborg, we will have the optimal conditions for developing our research and technologies in practice, in order to scale up production in the future. At the same time, we also make it possible for commercial players to test the facilities in order for us to realize the enormous potential of CCUS [carbon capture, utilisation, and storage], which will be crucial for achieving national and international climate goals in the coming years," explained **Lasse Rosendahl**, Head of Department and Professor at **AAU Energy** at Aalborg University (on that note, **Fidelis New Energy** and the Port of Aalborg have announced the construction of up to 4.0mt/year CO_2-receiving facility, up and running from 2026). **Kristian Thulesen Dahl**, the Port of Aalborg's CEO, added, "We are very pleased to facilitate the space for the facility as well as our collaboration with Aalborg University and its world-leading research environments within CCU and P2X [power-to-X]. A project like this fits well in the area, where we already have a strong cluster of companies working with the technologies in different ways." **Lasse Frimand Jensen**, the Port of Aalborg's Board Chairman, also commented, "By collaborating with AAU on the test facility, we look forward to also work with actors from CO2Vision [a consortium gathering diverse parties from Denmark] and across the value chain to help translate the university's world-class research into a tangible product, which both contribute to the green transition as well as growth and new jobs in the area." Worth bringing up is that in 2022 the Port of Aalborg and **European Energy** signed a letter of intent to establish a P2X plant with an e-methanol-producing capacity of up to 75kt/year.

Just at the start of summer 2023, **Stena Line** contracted **Wärtsilä** to convert an undisclosed number of its ferries to use methanol as fuel. The conversions – scheduled to take place in 2025 – will include the fuel supply system and engine modifications, as well as integrating the new installations with the ships' existing systems. The full scope of Wärtsilä's supply package will include fuel tank instrumentation and valves, transfer pumps, low-pressure pump skid, fuel valve trains, methanol fuel pump units and the automation of the system, engine conversions, and automation upgrade for the engine control room. "Converting ferries for methanol fuel will enable them to be compliant with various existing and upcoming regulations, including the Carbon Intensity Indicator (CII), FuelEU Maritime, and the IMO 2050 GHG reduction target," Wärtsilä highlighted in a press release. "As we continue to implement our strategy to decarbonise all our operations, we see methanol as a viable alternative fuel that will help us achieve this ambition. Wärtsilä has proven its capabilities to carry out the necessary conversions. This was shown eight years ago when they converted *Stena Germanica* to operate with methanol, and our experience from this ground-breaking innovation has been very positive," commented **Ian Hampton**, Stena Line's Chief Operating Officer Fleet and Government Affairs. **Roger Holm**, President of Wärtsilä's Marine Power business, said, "We have had close cooperation with Stena Line for many years and we are pleased to be supporting them again in this important conversion project. Like Stena Line, Wärtsilä is committed to making decarbonised shipping operations a reality, and we have invested heavily in developing our engine portfolio to be capable of utilising carbon-neutral and zero-carbon fuels."

As such, in November 2023, **Wärtsilä** introduced the marine sector's first commercially available 4-stroke engine-based solution for ammonia fuel. In addition to the engine, the full solution includes the company's AmmoniaPac fuel gas supply system, the Wärtsilä Ammonia Release Mitigation System (WARMS), and the Wärtsilä NO_x Reducer (NOR). According to the manufacturer, Wärtsilä 25 ammonia can reduce greenhouse gas emissions by more than 70% compared to a similar sized diesel solution. **Stefan Nysjö**, Vice President of Power Supply, Wärtsilä Marine Power, claimed, "This is only the beginning. The Wärtsilä 25 is the first Wärtsilä engine to run on ammonia as a fuel, and this is an important milestone, but we do not stop here. While we are planning for additional ammonia engines in our portfolio over time, we are also committed to continue development and testing of technologies and solutions that can continue to support the industry with reducing greenhouse gas emissions even further in the future."

Earlier the same month, a letter of intent for the Wärtsilä 25 ammonia engine solution was signed between **Wärtsilä** and **Viridis Bulk Carriers** (a JV between **Amon Maritime**, **Mosvolds Rederi** and **Navigare Logistics**). The signing of a commercial

contract is expected in early 2024, making the shipowner the first to use Wärtsilä's ammonia engines (Viridis Bulk Carriers intends to become the world's first zero-emission shipping company, offering to that end carbon-free transportation with a series of ammonia-powered newbuilds). **André Risholm**, Viridis Bulk Carriers' Board Member, commented, "The maritime industry must significantly reduce its emissions if we are to succeed in reaching the goals set in the Paris Agreement. The adoption of new technologies and ammonia as a carbon-free fuel is central to this. We are delighted to partner with Wärtsilä on another important milestone for our ammonia-powered short sea bulk vessels."

In August 2023, **Svitzer** shared that it will complete, with the help of naval architects and marine engineers from the Canadian **Robert Allan**, the design of its next-gen tug – the world's first methanol fuel cell tug (to be deployed in H2 2025 and operate from the **Port of Gothenburg**). The newbuild will use an electrical propulsion system with methanol fuel cells and batteries, delivering a self-sustained tug with longer endurance and fewer operational constraints than a purely battery-powered vessel. Secondary methanol-fuelled generators will provide backup power if required without the need for a secondary fuel. Svitzer's calculations indicate that the methanol hybrid fuel cell tug running on green methanol would prevent emitting approximately 1.3kt of CO_2 annually vs a fossil-fuel-based vessel of the same dimensions within the company's global fleet. The Port of Gothenburg put forward operational regulations for methanol bunkering in 2022, and next year **Stena Line**'s *Stena Germanica* became the world's first to undergo vessel to a non-tanker methanol bunkering. "Svitzer has been delivering safe and efficient towage services to customers in the Port of Gothenburg for decades. In addition to its ambitious emission reduction targets, the Port of Gothenburg has already gathered valuable experiences regarding the safe and convenient bunkering of methanol. The port's experience and position as an emerging methanol bunker hub, combined with our long-standing collaboration and relationship, make the Port of Gothenburg an obvious location for us to deploy the world's first methanol hybrid fuel cell tug," **Mathias Jonasson**, Managing Director for Scandinavia & Germany at Svitzer, said.

Still in the topic of methanol, September 2023 saw the introduction of **Maersk**'s first feeder to run on this fuel. The 172 m long container ship of 2,136 TEUs capacity got the name *Laura Mærsk* from her godmother **Ursula von der Leyen**, the EU Commission President, in the **Port of Copenhagen**. The freighter is the first in an overall 25-big order of container carriers able to run on methanol, the last of which will be delivered in 2027. *Laura Mærsk* and the others will help Maersk reach its 2040 zero GHG emission target. The company plans to transport at least a quarter of its ocean cargo using green fuels by 2030. Maersk has also invested in e-methanol production capacity in Spain, some 2.0mt/year. *Laura Mærsk* serves the Rotterdam-London-Felixstowe-Gothenburg-Aarhus rotation. **Vincent Clerc**, Maersk's CEO, commented on the name-giving occasion, "*Laura Mærsk* is a historic milestone for shipping across the globe. It shows the entrepreneurial spirit that has characterized Maersk since the founding of the company. However, more importantly, this vessel is a very real proof point that when we as an industry unite through determined efforts and partnerships, a tangible and optimistic path toward a sustainable future emerges. This new green vessel is the breakthrough we needed, but we still have a long way to go before we make it all the way to zero."

Shipping

Laura Mærsk can serve as a segue to talking about Baltic ships in 2023 in general. Last year kicked off here with the introduction of ***Stena Ebba*** onto the Gdynia-Karlskrona service. She joined her sister ship *Stena Estelle* on 2 January, with each of the two 240 m long E-Flexer newbuilds of **Stena Line** offering room for 1,200 passengers and 3,600 lane metres for freight.

Also in January 2023, **CRIST**'s shipyard in Gdynia delivered *L-317*, the third hybrid for the Finnish domestic traffic ferry operator **Finferries**. The 70.2 by 13.9 m ship offers room for 200 passengers and space for 52 private vehicles (or a smaller number of trucks) across the **Nauvo-Korppoo** route. The newbuild primarily sails on batteries, recharged in a manner of minutes while berthed. Previously, CRIST constructed for Finferries *Elektra* (2017), named EU first and the world's second hybrid ferry, and *Altera* (June 2022).

The month of January came to its shipping conclusion when after 53 days of voyage from the Far East, **TT-Line**'s *Peter Pan* called to **Travemünde**'s **Skandinavienkai** on 23 January 2023, from which she departed for Trelleborg on the night of 31st. The new *Peter Pan* is a sister ship of the April 2022-introduced GT 56k *Nils Holgersson*. The gas-run ro-pax newbuilds, nicknamed by the owner Green Ships, offer room for 800 passengers and 4,000 lane metres for cargo. The duo also features several emission-reduction solutions, including energy-saving air conditioning, heat recovery, LED lighting, and an AI algorithm that advises the crew on the optimal parameters of operating the ferries. On her way from **Yantai**, *Peter Pan* carried construction machinery to **Zeebrugge**. In the Belgian port, she took 750 cars for unloading in **Rostock**. Interestingly, it's the sixth *Peter Pan* in TT-Line's fleet's history (the previous one was renamed *Tinker Bell*).

The following month **Bore** could share the successful completion of its tonnage renewal programme with the introduction of *Bore Wind*, the third vessel for carrying containers and ro-ro cargo units ordered by the Finnish shipping line. The 120 by 21 m, 7,000 dwt ship offers 435 lane metres for wheeled freight and space for 264 TEUs. Like her sister ships, the latest addition to Bore's fleet has the Ice Class 1A. The dual-fuel (LNG) trio – *Bore Way* (delivered in spring 2022), *Bore Wave* (January 2023) and *Bore Wind* – were constructed by **Wuhu Shipyard**. All three serve **UPM**'s (paper cargo) traffic between the ports of **Rauma** and **Rostock** under a long-term charter.

In March 2023, **Gotland Company** purchased the cruise ship *Birka Stockholm* (for about €38m) from **Eckerö**, with plans to offer intra-Baltic voyages as of spring 2024. Fast forward to August and Viking Line joined the project by acquiring 50% stake in *Birka Stockholm* (later renamed *Birka Gotland*). The Gotland Alandia Cruises JV is seated in Stockholm, offering as of 20 March 2024 every-evening **Stockholm-Mariehamn** trips and occasionally also stopping in **Visby** (*Birka Gotland* will also make calls to the Baltic ports of **Härnösand**, **Riga**, **Rønne**, and **Ystad** throughout this year). **Marcus Risberg**, CEO of Gotland Company's subsidiary **Destination Gotland**, said, "Visby has become an increasingly attractive cruise port, and we see a splendid chance to develop our operations and create new reasons for visiting Gotland. For the island's dwellers, it means more departures for those having more time and are without cars – or who want to pleasure cruise." According to the seafarer labour union **Seko**, the Swedish-flagged *Birka Gotland* can provide up to

150-250 job posts depending on the season. The 2004-launched as *Birka Paradise* ship is 177 m long and 28 wide, offering room for 1,800 passengers. The Ice Class 1A Super vessel was providing cruises from Stockholm till the outbreak of the coronavirus pandemic. She plied in the colours of **Birka Cruises**, a daughter company of the Mariehamn-based Eckerö.

In June 2023, the first hybrid vessel (1.0MWh battery pack) of the Swedish **AtoB@C Shipping**, part of the Finnish **ESL Shipping**, was launched at the **Chowgule Shipyard** in India. The 90 by 16 m, 5,350 dwt, Ice Class 1A ship offers 7,650 m^3 of carrying capacity in the Baltic (as of mid-December 2023). *Electramar* opens a series of 12 newly built green coasters, with the second in order, *Stellamar*, launched on 1 October 2023. The order book is planned for completion by Q2 2026. All newbuilds, able to connect to an onshore power supply among others, are said to halve their carbon footprint vs the company's present generation of vessels. "We are proud to be at the forefront of green shipping with these innovative vessels that combine high efficiency, flexibility and sustainability. *Electramar* is the first of many vessels that will help us achieve our vision of being the most responsible and reliable partner for our customers and stakeholders," highlighted **Mikki Koskinen**, Managing Director of ESL Shipping and Chairman of the AtoB@C Shipping's Board.

In the middle of August last year, **Wallenius Wilhelmsen** signed a letter of intent with **Jinling Shipyard** (**Jiangsu**) to build four dual-fuel methanol/ammonia-ready PCTCs, with an option for eight more. The first 9,350 CEU-capacity Shaper Class vessels will start being delivered from H2 2026. "The process of developing our new design started over 1.5 years ago, and the Newbuidlings team have been working in close collaboration with the designer (Deltamarin) and internal & external stakeholders during this period to ensure the vessel design meets safety requirements and is well suitable for our future short term & long-term operational needs. Energy efficiency & reducing GHG emissions is a top priority, and a lot of effort has been put into ensuring the new vessels will significantly contribute to meeting our emission reduction targets [net-zero by 2027]!" **Lars Ekren**, Senior Manager – Newbuildings and Conversions, Wallenius Wilhelmsen, commented. **Xavier Leroi**, the company's EVP & COO – Shipping Services, added, "To secure our number one position, we will continue to deliver great services with a competitive fleet, offering sustainable supply chain services both on land and at sea. We are already partnering with our customers on reducing emissions through biofuel, and with the new vessels, we can accelerate this towards net zero. This requires new and more expensive fuels, but both we and our customers are committed to securing this as soon as it can be made available."

Photo: Przemysław Myszka

Photo: TT-Line

Photo: Wallenius Wilhelmsen

Also in August, **Erik Thun** ordered four hybrid ships for cargo traffic in the Swedish Lake Vänern. The Dutch **Shipyard Ferus Smit** will deliver the 89 by 13.35 m, Ice Class 1B, 206k ft^3 capacity, 5,100 dwt freighters starting September 2024. The energy from the battery packs will be used for peak shaving and power smoothening, reducing the reliance on auxiliary engines for electricity generation (or even turning them off at anchor). The Lake Vänern Maxes will also be equipped with connectors for drawing electricity from the shore, thus shutting off all engines to lower in-port emissions, likewise cancelling noise pollution. "At the heart of the Lake Vänern Max lies a propulsion system designed for superior performance with a large diameter propeller operating within a nozzle. This configuration delivers increased thrust, particularly at lower speeds, resulting in reduced power demand during challenging seaways like Göta Älv [the Göta River] and icebreaking operations. As a result, the installed main engine power can be minimised while maintaining optimal performance and meeting the stringent requirements of Ice Class 1B. With the combinator mode and variable propeller, the fully automatic system constantly selects the optimal load point, maximising propeller

Photo: ESL Shipping


Photo: Arild Vagen/Wikimedia Commons

efficiency and reducing fuel consumption," the shipping company shared in a press release. Other measures to reduce electrical consumption aboard the Lake Vänern Maxes will be implemented, too, such as harnessing excess energy with cooling water heat exchangers in the main and auxiliary engines. Two weeks into 2024 and Erik Thun upped its overall order book (with **Ferus Smit**) to 15 by ordering another another two Lake Vänern Maxes and two (atop six) coastal tankers within the R-Class family (through **Thun Tankers**, part of the Erik Thun Group; *Thun Resource*, the first in the series, was already handed over). An intermediate product tanker in the Vinga series complements the order book, scheduled for completion over 2024-2027. Meanwhile, in May 2023, Erik Thun said it would invest SEK36m (about €3.1m, with **Climate Leap** covering 40% granted that the retrofitting is done and dusted by 30 June 2024) to retrofit nine dry bulkers with battery systems.

Then, in September, a real firecracker boomed in **Naantali**, where **Finnlines**' newest ferry of the Superstar class started sailing between the Finnish seaport and **Kapellskär** via the Åland Islands' **Långnäs**. The *Finnsirius* ferry, offering room for 1,100 passengers and 5,200 lane metres for cargo, replaced *Europalink* (554/4,215). *Finnsirius*' sister ship, *Finncanopus*, will substitute *Europalink*'s sibling, *Finnswan*, this year (on her way to the Baltic, *Finncanopus* met the battered, broken-mast *Fuji* sailing boat out in the Indian Ocean. Believe it or not, but it was another Finn, **Ari Känsäkoski**, a Global Solo Challenge sailor! He was in urgent need of diesel, which he received along with provisions. But it wasn't a random encounter, as Känsäkoski wasn't off the grid and could spot a news bit about *Finncanopus*' westwards journey. He contacted Finnlines' Cargo Superintendent **Timo Vanhala**, who helped to set up the rescue party – which meant *Finncanopus* had to take a detour. It was all possible because Känsäkoski and Vanhala already knew each other: in the fall of 2023, *Fuji* was transported from **Kotka** to **Bilbao** on Finnlines' ro-ro *Finneco II* to take part in the Global Solo Challenge, of which Finnlines was a partner). The 235.6 by 33.3 m Ice Class 1A Super newbuilds feature several emission-reduction technologies, such as air lubrication, batteries, scrubbers, and waste heat recovery. They also have ballast water treatment plants. *Finnsirius* and *Finncanopus* will also take advantage of auto-mooring and draw power from the shore while berthed (thanks to the multi-million investments made by the ports in Naantali and Kapellskär). **Antonio Raimo**, Line Manager at Finnlines, underline, "*Finnsirius* is Finnlines' new eco-efficient flagship, designed specifically for the fast-paced freight transport route between Finland and Sweden. At the same time, *Finnsirius* offers upgraded services and more travel comfort than the previous generation of ro-pax vessels. Freight is Finnlines' core business, but it is a genuine pleasure to introduce our new service concept to our passengers."

In October 2023, two brand-new vessels for carrying LNG, *Saint Barbara* and *Ignacy Łukasiewicz*, joined the fleet of the Polish state-owned energy company **PKN ORLEN**. The carriers, each capable of transporting 70kt of liquefied gas, joined their sister ships, *Lech Kaczyński* and *Grażyna Gęsicka* serving long-term as well as spot contracts. Knutsen Shipping operates the fleet under a long-term charter. Once completed, PKN ORLEN's fleet will consist of eight such carriers.

Next month, **Langh Ship**'s first in a series of three 7,800 dwt multipurpose vessels, *Lovisa*, was handed over by the Chinese **Wuhu Shipyard** and soon began serving **Outokumpu**'s traffic between **Tornio** and **Terneuzen**. The Ice Class 1A vessel features dual-fuel engines for sailing on marine gas oil or LNG (or its bio version). *Lovisa* is also equipped with **Langh Tech**'s ballast water management system. The freighter of the Finnish shipping line are capable of transporting containers. The trio will transport finished steel products as well as semi-finished for further processing. On the backhaul, the vessels will carry steel scrap (the primary raw material of Outokumpu's stainless steel).

Also in November 2023, **Scandlines**' *Futura* was launched at the Turkish **Cemre Shipyard** (after which tugboats took her to the outfitting quay). The 147.4 by 25.4 m double-ended ro-pax will serve the **Puttgarden-Rødby** crossing as of this year, offering room for 140 passengers and 1,200 lane metres for vehicles and wheeled cargo. The €80m investment will feature a 10MWh battery system for zero direct emission sailing. "With *Futura*, we make it possible to travel without any direct emissions, as the ferry runs entirely

on electricity. At the same time, we have a sharp focus on making the entire journey worth the time – so we have also worked to make the experience on board even better," said Scandlines' CEO **Carsten Nørland**. He furthered, "[…] We believe in a future for ferries. We invest in a multi-million euro electric ferry because we have a responsibility to the world around us and because we are convinced that there is a need for journeys that don't just take place behind the wheel on the motorway. This applies to freight drivers, families on holiday and those who just want to go border shopping."

The biggest (quite literally!) shipping news took place just before November's end in **Turku**, where *Icon of the Seas* set sail. It was then that the world's largest cruise ship, owned by **Royal Caribbean**, left the **Meyer Turku** shipyard after 900 days of design & construction. She afterwards headed for the east coast of the US via **Cadiz** (where she received the finishing touches). The 248,655 gross tonnage vessel is bigger than **MSC**'s six siblings that can currently carry the most TEUs (24,346 twenty-footers at GT 233,328)! *Icon of the Seas* will offer 7,600 maximum passenger capacity (served by a crew of 2,350) across 20 decks for cruises in the Caribbean out of the **Port of Miami** as of early 2024. The 350 by 50 m cruiser has dual-fuel (LNG) engines from **Wärtsilä**. It also features fuel cells for producing electricity & fresh water and a waste-to-energy plant. Hull assembly of the series' second ship, *Star of the Seas*, commenced at Meyer Turku last December.

Time for a very personal opinion here. It is extremely hard to keep your head cool when looking at this, in my humble opinion, abomination. When heading to welcome *Finnsirius*, I had the unquestionable "pleasure" to see this pinnacle of kitsch with my very own eyes. At the same time, construction & logistics-wise, all the credit should go to Meyer, the company's employees and partners for piecing together this 'thing.' The installations are nothing but impressive – in the sense that somebody managed to produce, transport, and assemble such enormous structures. At the same time, with the owner's story-spinning about how much green the *Icon of the Seas* is, one couldn't but raise the question: why? Why does the world, which is supposedly on the brink of climate catastrophe, need such overgrown floating hotel/amusement park chimera? After all, the offered cruises will be, in all probability, sybaritic feasts of consumption, with a fig leaf dandling here and there for the purpose of, I guess, nothing more but greenwashing. Ugh!

Carbon capture, utilisation, and storage (CCUS)

Then again, maybe somebody will come up with super-efficient CCUS technology that'll make it possible to mass-produce 'XYZ of the Seas' without the need to worry about the state of our planet. Fatalistic jokes aside, a few projects emerged in the Baltic last year, with the regional players (incl. seaports) posed to play a key role in handling captured CO_2.

In March 2023, **Wärtsilä** shared that is received the first order for its CCS-ready scrubber. Specifically, four 8,200 TEUs container ships will be equipped with the Finnish tech company's open loop 35MW scrubber systems, prepared for upgrading to capture and store carbon. At the moment of the announcement, Wärtsilä was testing its CCS system at a 70% capture rate, with the pilot installation expected to occur within 12 months. "The scrubbers are termed CCS-ready because, as part of their installation, Wärtsilä will perform additional design and engineering work to ensure that future retrofits for a full CCS system on the vessels have already been accounted for during the newbuilding construction stage," the manufacturer said in a press brief. The company also explained, "Wärtsilä will take measures to ensure adequate space for the future installation of the CCS system, incorporate considerations for minimising idle load and optimising utilities, and prepare the control and automation system accordingly. CCS-ready scrubbers will also be designed for integration with a particulate matter filter." **Scott Oh**, Director at Wärtsilä's Exhaust Treatment Asia, also said, "We are very excited to announce this world-first order for our CCS-ready scrubber solution. By investing in a CCS-ready scrubber, shipowners will future-proof their assets and enable a smooth transition to CCS adoption once the technology is mature in the very near future. CCS is one of the key solutions to enable maritime decarbonisation in a short time frame, and we look forward to progressing our technology further."

Also in March, the **Ports of Stockholm** said they'll conduct a feasibility study on setting up in **Norvik** a node for captured CO_2. The **NICE** project (Norvik Infrastructure CCS East Sweden) will follow an initial general proof of concept study designed with participating stakeholders to clarify the prerequisites and conditions for establishing an interim, third-party access storage facility at the Ports of Stockholm's harbour in Norvik. The feasibility study aims to develop a proposal for a systemic approach to CCS, including a solution for transport and handling between source emission facilities and the end capture site, as well as carry out risk analyses, devise business models and clarify permit issues. **Clara Lindblom**, Chair of the Ports of Stockholm's Board, underlined, "Stockholm Norvik Port has large potential to become a carbon dioxide hub. The proposed transport solution would be able to handle a significant proportion of the carbon dioxide transport from Sweden, potentially around nine million tonnes per

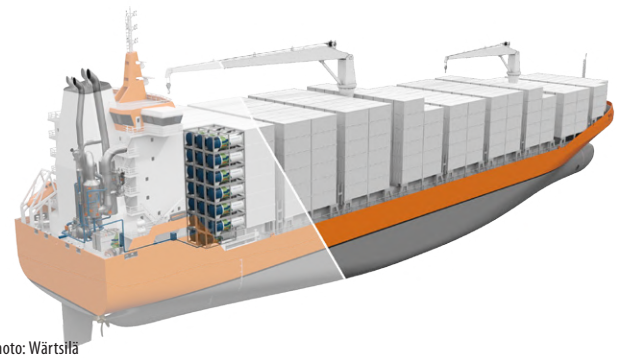


Photo: Wärtsilä

Photo: Greenport Scandinavia

year, with a potential to become the largest of all similar projects in Sweden." The Swedish port authority added in a press brief, "The work will also inspire others to establish similar regional collaborations with regard to carbon dioxide infrastructure." The feasibility study will be conducted in collaboration with **Stockholm Exergi**, **Mälarenergi**, **Söderenergi**, **Vattenfall**, **Heidelberg Materials**, **Nordkalk**, and **Plagazi**.

In mid-November 2023, the **CNetSS** project, led by **Växjö Energi**, selected the main alternative for interim storage of CO_2 before transport to final depot: **Copenhagen Malmö Port**'s (CMP) **Norra Hamnen**. "Malmö is the most efficient and flexible alternative, both for receiving large amounts of carbon dioxide from various locations in southern Sweden and for loading and transporting it to the geological final storage," said **Ghazale Nilsson**, Project Manager for CNetSS at Växjö Energi. She added, "We are now continuing our dialogue with various actors in the transport chain. Interim storage requires a great deal of work in terms of permits, risk analysis, coordination of logistics and infrastructure expansion, such as new roads and train tracks. There are many factors to consider." **Sune Norup Christensen**, CCO, CMP, also commented, "CMP sees the establishment of an intermediate storage facility for CO_2 at the port area in Malmö as a natural extension of CMP's sustainability strategy and as an essential track towards a green transition. With Malmö's location, the opportunity to allocate land, and the close local collaboration among emitters, infrastructure partners, CMP, and the City of Malmö, we also see CCS as a potential positive commercial opportunity. We are dedicated to realising the ambition in an 'open access' hub for CO_2." The CNetSS project, which the **Swedish Energy Agency** awarded SEK2.5m (around €220k), gathers ten actors who work on establishing a transport, liquefaction and storage infrastructure in Southern Sweden, with the potential to capture two million tonnes of CO_2 per year. Works in 2023 centred around a feasibility study in which various alternatives for CO_2 storage were analysed. Apart from CMP and Växjö Energi, **E.ON**, **Höganäs**, **Kemira**, **Kraftringen**, **Nordion Energi**, **Stora Enso**, **Sysav**, and **Öresundskraft** take part in the initiative. Since mid-2022, **Växjö Energi** has been testing new CCS technology developed by the **University of Lund**'s Faculty of Engineering, which is said to require noticeably less energy than previous solutions. The new method will capture biogenic carbon, resulting in negative emissions. Växjö Energi intends to capture some 200kt in the near future.

The last carbon capture news to capture Baltic news headlines came in mid-December from Denmark. It was revealed that the EU **Just Transition Fund** supported the establishment of a CO_2 storage and shipment hub in the **Port of Hirtshals** with DKK109m (€14.6m). The facility can be up and running in 2025/2026, with an initial capacity for handling 0.5mt/year for permanent storage in empty oil & gas fields in the Greensand area of the Danish part of the North Sea. If provided with a pipeline for transporting CO_2 to the Port of Hirtshals, the CCUS project of **Greenport Scandinavia** would be able to take care of 3.0mt/year of CO_2 in 2029, up to beyond 15mt/year in the early 2030s should the Danish and European infrastructure be integrated. "We are naturally pleased that the Just Transition Fund prioritises supporting the ambitious project, which aims to make the Port of Hirtshals one of the most important focal points for the storage and shipment of CO_2 in Europe. The support means that we can, among other things, start establishing the facilities needed. We see the support as evidence that we are working on a unique project that can contribute to solving the enormous climate challenges facing the world," **Per Holm Nørgaard**, the Port of Hirtshals' CEO, commented. **Søren Smalbro**, Mayor of the Hjørring Municipality and Vice-Chairman of the Port of Hirtshals' Board, also underlined, "There is no doubt that the establishment of a CO_2 hub at the port is of great importance – not only for Hirtshals but also for the Hjørring Municipality and the rest of Northern Jutland. The CO_2 hub plays a central role in the economic development of the Hjørring Municipality and will undoubtedly create new jobs in our area in connection with the construction and operation of facilities at the port. In addition, the Port of Hirtshals will attract new companies working on the green transition in the coming years, creating even more jobs." Greenport Scandinavia – whose partners apart from the Port of Hirtshals include **INEOS Energy**, **Wintershall Dea**, **Evida**, **Biocarb Solution**, **Aalborg Portland**, **Greenport North**, **EUC Nord**, **Hydrogen Valley**, and **Energy Cluster Denmark** – now proceeds with planning the physical facilities to be established at the Danish seaport.

E-trucks & charging stations

More and more electric heavy-duty trucks are being deployed in the Baltic, chiefly across the Nordic region. To facilitate this trend, several of the regional seaports invested in bays where truckers can charge their drives.

At the beginning of 2023, **Hirtshals** announced it'll be one of the first two places in the country where heavy-duty lorries running on batteries could be recharged (**Høje Taastrup** is the second). To that end, **E.ON Drive Infrastructure** picked the **Hirtshals Transport Center**, located next to the **Port of Hirtshals**, for establishing a facility with three 400kW fast chargers into which six trucks can plug (with the possibility to upgrade the loading bays to 1.0MW). The facility went online by 2023-end.

Not long after, in February 2023, **Göteborgs Lastbilcentral** (**GLC**) commissioned with the help of the Finnish **Kempower** and **Soltechs E-Mobility** a fast-charging facility in **Gothenburg**. The SEK8.0m investment (about €710k) offers 1.0MW of capacity across 15 points. GLC, which operates a fleet of 350 vehicles, will use the charging station to reduce its CO_2 emissions by 70% by 2026 (vs 2010 levels; the Swedish transport company intends to become climate-neutral by 2035). "It is terrific that these charging stations are operational as they will reduce CO_2 emissions and make it easier for companies to switch to an electric fleet. I want to thank Kempower and E-Mobility for a smooth cooperation and welcome our co-owners, drivers and partners to our new charging hub," **Martin Salenius**, GLC's CEO, commented. **Tomi Ristimäki**, CEO of Kempower, added, "We are delighted to see this project go live. Commissioning one of Sweden's largest private e-truck charging stations highlights the power of bringing ambitious Nordic companies together. We see the electrification of buses and trucks developing fast in the coming years and projects such as this are meaningful ways to electrify transport." **Martin Götesson**, E-Mobility's CEO also said, "It feels great that we have completed this project for GLC, which is investing heavily in charging infrastructure. Working together with Kempower was outstanding, as it provides a technical solution that is both powerful and intelligent, which this type of large-scale charging station requires."

Staying in **Gothenburg**, **APM Terminals Gothenburg** joined **Gothenburg RoRo Terminal** and **Stena Line** in prioritising the flow of heavy-duty electric trucks (the

Photos: Port of Gothenburg

trio accounts for about 90% of the Swedish seaport's truck traffic). As of 1 March 2023, such vehicles are being granted priority passage and handling by the container terminal at the Port of Gothenburg to award haulage companies that have already invested in electrification as well as to encourage those considering it. Specifically, the new solution means that e-trucks are fast-tracked through APM Terminals' gate 4 via a reserved lane (also enjoying prioritised handling within the terminal area). "This creates efficiency gains and planning ability that is particularly important for electric trucks, as there are strict demands on optimisation given the limited range of electric vehicles," explained the Port of Gothenburg in a press release. **Brian Bitsch**, Commercial Manager at APM Terminals Gothenburg, added, "We are seeing more and more haulage firms starting to electrify parts of their vehicle fleets, and we know that more are considering investing in a green transition of heavy goods traffic. We hope that supporting these initiatives by offering the fastest possible passage and handling will serve as an incentive and be one small step along the way." **Johan Söderström**, Chief Commercial Officer at **Skaraslättens Transport**, noted, "Electric trucks are a major investment, so the fact that we now have priority in the container terminal is really important to us. It means that we can perform more assignments every day, which benefits both us and our customers. It also means that we can recoup the investment more quickly." As such, Söderström's company decided to up its e-truck fleet from three to five following the favourable treatment of e-trucks. "It is a really important initiative by the terminal operators, which literally paves the way for the transition. With a priority system in place for the terminals that handle the most trucks, and the growing infrastructure for charging in the area around the port, the conditions for electric trucks are better here than at any other port. This is a development we're incredibly proud of, but there's still work to be done," said **Martin Adeteg**, the Port of Gothenburg's Vice President Decarbonisation, Health and Safety.

Still in southwestern Sweden, the Danish shipping & logistics company **DFDS** added 20 Volvo FM Electric lorries to its Arendal depot in **Gothenburg** at the start of March 2023. The e-trucks can carry a combined total load of 44t, having a range of up to 300-380 km when fully charged. The commission formed part of DFDS' plan to have 125 e-trucks in its fleet by the end of last year. Overall, the company intends to have 25% of its trucks battery electric by 2030, a step

Photo: GLC

Photo: Öresundslinjen

Photo: Port of Gävle

towards achieving carbon neutrality by mid-century. "Replacing our conventional, diesel trucks with alternatives like the Volvo Electric truck will have a significant impact on our carbon emissions. But it requires much more than financial investment. It is important to collaborate with energy experts and industry leaders, like Volvo Trucks, to make our climate ambitions a reality. The transition requires the right infrastructure and cooperation across various areas of society. It cannot be achieved working alone," **Niklas Andersson**, EVP and Head of the Logistics Division at DFDS, commented. **Edvard Molitor**, the **Gothenburg Port Authority**'s Head of Sustainability, also underlined, "These vehicles represent a massive step in the electrification of land-based transport in the port and the surrounding area. From having been a rare occurrence, this will mean that electric trucks will be a common sight in the port area; this is bound to cause ripples and inspire others." **Roger Alm**, Volvo Trucks' President, also underscored, "The need to accelerate the transition to fossil-free transport is becoming increasingly clear. Therefore, I am very proud of the partnership we have with DFDS and this important step that they take […] in Gothenburg. Together, we are showing the world that electrified heavy truck transport is already a viable solution today."

Moving north, the **Port of Gävle** and **Gävle Energi** first announced (summer 2023) and then finalised (autumn) the project of setting up a new six-charging-bay-facility for e-trucks. The 350kW maximum loading effect infrastructure, located next to the Swedish seaport's main gate, is said to spare the environment around 4.0kt of CO_2-equivalent emissions over five years. The parties received support from the **Swedish Energy Agency** (SEK12m/€1.0m).

In mid-November 2023, **Öresundslinjen** (formerly known as **ForSea**) shared that the company's battery-driven *Aurora* and *Tycho Brahe* ferries are now equipped with four 150kW chargers, which can provide eight vehicles with green electricity. According to **Molslinjen**, the parent company of Öresundslinjen, it's the first time in the world that e-vehicles on board a ferry can be charged with renewable electricity. The energy is drawn from *Aurora* and *Tycho Brahe*'s battery packs, which are only charged with certified green power coming from sun, wind, or hydro. Öresundslinjen says that up to 260k e-vehicles per year can now be charged when going over the **Helsingborg-Helsingør** sea bridge (however, hybrid cars cannot use the new equipment due to its high charging capacity).

Also in the middle of that month, the **Port of Gothenburg**'s second e-vehicle charging station started serving clients. The Swedish seaport and **Göteborg Energi**, with the support of the **Swedish Energy Agency**, set up four charging spots with up to 350kW capacity. "On the land side, a faster sustainable transition of truck traffic is a crucial factor. From the port's perspective, we need to ensure that the infrastructure meets the needs and ideally stays ahead. The charging station at Port Entry fits very well into that puzzle," **Viktor Allgurén**, Head of Innovations at the **Gothenburg Port Authority**, said. He furthered, "The fact that we now have two separate public charging stations in the port is significant in itself [the other being **Circle K**'s at Vädermotet]. It provides redundancy in the infrastructure while, in the long run, it can keep prices down for those who charge." Allgurén also underlined, "We have seen a rapid increase in the number of electric trucks in the port, which is incredibly exciting to see. Concrete incentives and a rapidly introduced charging infrastructure in the port have definitely contributed to this development." **Malin Flysjö**, Business Manager for electricity and gas trading at Göteborg Energi, also commented, "The use of fossil fuels must decrease if Gothenburg is to meet its environmental goals [cutting port-related GHG emissions by 70% by 2030], especially in truck traffic. Therefore, it feels really good to now offer much better opportunities for trucks to charge at charging stations specially designed for large and long vehicles."

Solar energy

With electricity prices having their ups and even more ups lately, it's no surprise that Baltic seaports began to turn long unused assets such as roofs into installation spaces for photovoltaic systems.

In June 2023, **HHLA TK Estonia**'s solar park got up and running. **HHLA**'s subsidiary operating in the **Port of Tallinn**'s **Muuga Harbour** had back then two installations atop two warehouses, with a total capacity of around 240kWp that generates an average of 720kWh/day. On sunny days, HHLA TK Estonia shared, the energy production fully covers the electricity consumption of the warehouses' cooling and ventilation equipment, plus the needs of a nearby workshop and an office. Additionally, surplus green energy is delivered to the port's power grid. At the same time, HHLA TK Estonia started preparations to install two additional power parks on the roofs of other warehouses. The 100kWp power park would supply the main office building and container maintenance & repair workshop. Another 400kWp plant would support the Container Yard Electrification project with green energy. The future combined annual electricity production of the completed solar plant would be an estimated 640MWh. "With the completed solar installation, we aim to generate up to more than half of our total electricity consumption ourselves in a sustainable way. Combining the daytime loading operations of our dual power hybrid crane [**Mantsinen** 120 DER] with the solar power, we are operating already CO_2 neutral in peak hours," highlighted **Riia Sillave**, HHLA TK Estonia's CEO. She further underlined, "With this project, HHLA TK Estonia is contributing to the HHLA Group's goal of being climate neutral by 2040."

Before the month's end, the **Ports of Stockholm** announced they'll increase its solar-electricity production by 55%. To that end, the Swedish port authority will invest in six new rooftop photovoltaic systems, increasing its yearly capacity from 995MWh to 1,545MWh by the summer of 2024. The new installations are planned for Stockholm (**Frihamnen** – one, **Värtahamnen** – four) and **Kapellskär** (one). Once commissioned, the port will dispose of 11 sun energy-harvesting farms. "The Ports of Stockholm's investment in solar electricity is fully aligned with our environmental goals. This decision means that in future almost one-tenth of the electricity we use will be generated by our own solar cell systems," said **Jens Holm**, Chairman of the Ports of Stockholm's Board. The port authority also underlined in a press brief, "The company previously set a goal to increase the proportion of solar electricity by 50% by 2026. According to the time plan for the new solar cell installations, this goal will be achieved already in 2024."

Also in June 2023, the **Port of Södertälje** was granted money from the EU's **Connecting Europe Facility**: SEK11m (about €940k) will help to scrutinise what it will take to improve and green their transport & logistics. On that note, the Swedish port also said it's investing to increase its annual solar energy harvesting capacity – from 255,000kWh to 410,000kWh by the end of 2023 (an amount that will cover 30-35% of the seaport's electricity consumption).

Next month and news came from Poland that **OT Port Gdynia** put in place its first PV installation. The Polish stevedore active in the **Port of Gdynia** launched a 50kW system for harvesting solar energy. The company also revealed that it plans to add four more installations by end-2023,


Photo: Ports of Stockholm


Photo: HHLA/Mihkel Notta

increasing the system's capacity to 225kW. The stevedore would use the electricity for its own needs, including powering the electric cargo handling equipment it intends to purchase (forklifts, gantries, and reachstackers). "The PV installations are a response to client expectations, whose planning actions incorporate the carbon footprint of the entire logistics chain. OT Port Gdynia gains a competitive edge while improving the state of the environment," underlined **Jerzy Majewski**, the company's CEO.

Honourable mentions – digitalisation, electrification, HVO, and hydrogen

When it comes to making the transport & logistics industry more digital, the Finnish tech company **Seaber** won a few major customers in 2023. First, it was entrusted by **Neste**, the also from Finland fuel producer, to eco-optimise their logistics. Neste uses Seaber's software to plan maritime logistics activities such as shipping schedules and port calls. "Seaber's intelligent technology provides data-led decision support that optimises fleet TCE (time charter equivalent) and reduces costs per tonne-mile, bringing down shipping's environmental impact. In addition to single cargo voyages, it supports multi-parcel and multi-port voyages, where unnecessary ballast voyages and low utilisation rates are common," the tech company explained in a press release. **Paavo Kojonen**, Shipping Asset and Sustainability Manager at Neste, added, "Neste's goal is to become a global leader in renewable and circular solutions. In order to achieve this, we need to find new ways to reduce the amount of carbon released into the atmosphere. New solutions and partnerships like Seaber are needed to help us optimise maritime logistics, which is one step towards reducing emissions." **Sebastian Sjöberg**, Co-founder & CEO of Seaber, also highlighted, "We are thrilled to see that Neste has taken this important step to optimise their shipping scheduling through further digitalisation. This collaboration enables Neste to optimise their processes, increase vessel utilisation and reduce emissions and cost per tonne-mile. Our partnership allows Seaber to further develop our solution for the benefit of the industry."

Next, the Norwegian shipping line **Wilson**, disposing of a 130-big fleet, commissioned the Finnish tech company to digitalise its vessel scheduling to drive efficiency, likewise, reduce costs and emissions. "Our aim is to move cargo safely, on time, and maximise efficiency and sustainability of European sea transport. We were looking for software solutions that could support our mission and believe that Seaber is the best tool to help us further digitalise our operations. It is important for us to improve collaboration and the service we provide to our customers. This is a pioneer project and we expect to set a new standard for how the entire industry manages scheduling in the future," **Jostein Bjørgo**, Commercial Director at Wilson, underlined. **Seaber**'s **Sjöberg** commented on the co-op, "Seaber integrates with existing technologies used by Wilson and makes the planners' work easier and more efficient. Replacing spreadsheets means less planning mistakes with improved data ergonomics, data integration and automation. This ultimately leads to reduced costs and emissions via better utilisation of the fleet. It is great to see Wilson taking this step, so they are better positioned when industry changes happen and new regulations emerge."

Photo: CMP

Next-next, the Danish Nørresundby-headquartered **Alba Tankers** shared they'll would use the Finnish maritime tech company's solutions to optimise the chartering process. This, in turn, would help the company maximise fleet utilisation, hence lower its environmental footprint. Additionally, Alba Tankers would use **Seaber**'s tools to estimate the impact of including the shipping sector in the EU Emissions Trading System. Alba Tankers' fleet comprises 20 vessels, trading petroleum products, chemicals, and vegetable oils across Northern Europe and the Western Mediterranean. "As any tanker company, we aim to make sure we operate as environmentally friendly as possible. With current and emerging emission regulations, the whole planning process becomes more complex. With Seaber's software, our team can quickly make decisions by following KPIs [key performance indicators] and compare multiple scenarios in no time," **Håkan Kalmerlind**, Head of Commercial Operations at Alba Tankers, underlined.

Speaking of tankers, in late February 2023, the **Port of Gävle** said that through its new digital queuing system **Time Slot Gävle**, it was abandoning the 'first come-first served' scheme for vessels calling to one of its energy harbour's seven terminals. From that month, vessels can apply for queue slots in the **Port Activity App**, which verifies the scheduled times with automatic ship positioning data. "With the app, we optimised the vessels' turn-around in the port area. The cool thing about Time Slot Gävle is that we can influence the entire journey to the port from, for example Netherlands, Poland, or the Swedish west coast. We make it possible for all vessels on their way here to choose eco-driving," **Niklas Hermansson**, Head of Traffic and Safety at the Port of Gävle, highlighted. **Claes Möller**, CEO at **Tärntank Ship Management** (one of the companies initiating Time Slot Gävle), also underscored, "We already use slow-steaming between Preem's own terminals. Through the Time Slot project, we can also reduce emissions when traveling to ports with quays shared between several terminals. It enables great environmental benefits!"

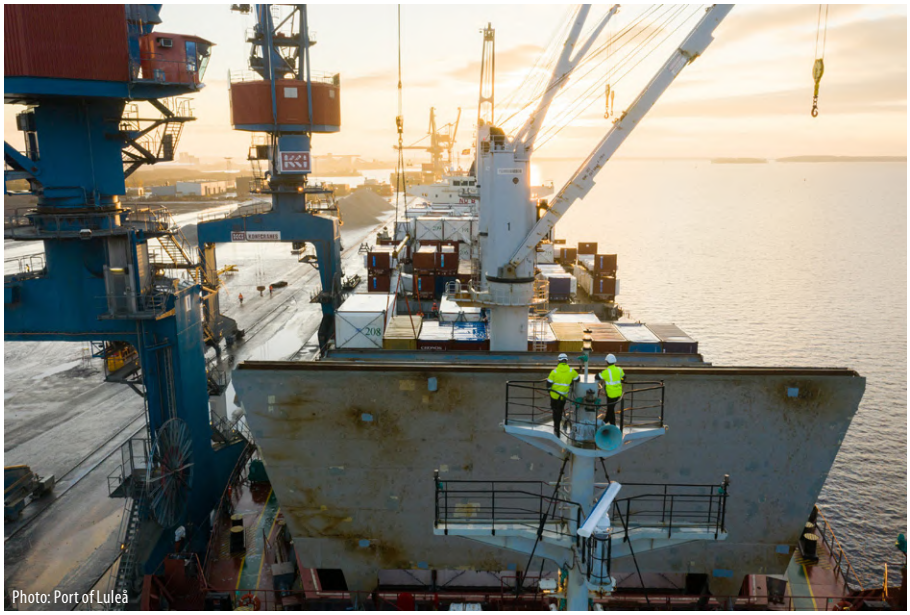


Photo: Port of Luleå


Photo: Gardar Johannsson/Wilson

It is worth remembering that since 2017, the **Port of Gävle** and its partners have been working on making vessel calls more efficient and sustainable. This work has led to one of the first mobile apps for real-time data exchange between organisations that collaborate around vessel calls. The **Port Activity App** was developed with the **Swedish Maritime Administration**, the **Port of Rauma**, **Satakunta University of Applied Sciences**, and the **Finnish Transport Agency**. The app has now been used for almost two years by the actors in the Port of Gävle. Time Slot Gävle is a continuation of that work, with the Swedish seaport developing the vessel queuing system for over three years in close cooperation with the port's seven energy terminals, with the support of the **Swedish Energy Agency**, and in partnership with Tärntank Ship Management, **Preem** and the **Swedish National Road and Transport Research Institute**. "We hope to inspire more ports to introduce similar systems. Shipping is a good example of how important it is that we work with interfaces between organisations and system connections. Everyone wants to change, but we need to work together to remove the obstacles. We have learned a lot through the cooperation within Time Slot Gävle. Together, we have also come a small step closer to our shared climate goals," **Linda Astner**, the Port of Gävle's Head of Sustainability, encouraged others to take action.

In August 2023, the **Port of Helsinki**'s new smart check-in gate system got rolling. With the help of **Visy**, the Finnish seaport put in place a solution that weighs, measures, and photographs passenger cars and trucks at the **West** and **Katajanokka** harbours. The system – consisting of scanner-based preliminary vehicle identification points, automatic barriers, and display panels guiding drivers to the right lane – identifies the vehicles using a camera and automatically checks their permits when they approach the check-in area. All vehicles are measured, while lorries are also weighed and have their condition recorded. The Port of Helsinki has received EU financial support for implementing the project, with the funds used for planning, placing the infrastructure, developing the system, and procuring & installing the required hardware. "Particularly with heavy vehicles, it is also important to verify dimensions and weights. Accurate and up-to-date information improves the efficiency of both the port and shipping companies," **Arto Satuli**, Traffic Manager at the Port of Helsinki, underscored. **Jenni Anttila**, responsible for heavy vehicle booking and operations at **Eckerö Line**, also commented, "[…] I already see great potential in these types of new gate arrangements. The measurement data and smooth information exchange make it possible to streamline check-in tasks. More accurate measurement data also supports the balanced loading of ships, which in turn translates into more efficient fuel consumption, for example. In the end, it's all about cost efficiency."

At the beginning of fall 2023, two seaports from Sweden's north, **Luleå** and **Piteå**, together signed a contract with **Grieg Connect** to digitalise their operations. Digitalisation would help them improve data exchange for better quay and resource planning. The transition would also see the ports' operational areas visualised with different map views and GPS points to monitor how the port infrastructure is used over time. Additionally, work orders would be conveyed digitally likewise back reporting. **Anders Dahl**, CEO of the Port of Luleå, commented, "Our port grows in step with the region of Norrbotten's unique opportunity to be a world leader in the green transition. A condition for that is the close partnership with the Port of Piteå, and the joint digital ecosystem is an important piece of the future's puzzle."

In October last year, the **FIN-EST Green Corridor** initiative kicked off. The ports of **Helsinki** and **Tallinn**, **Rederi AB Eckerö**, **Tallink Grupp**, **Viking Line** and **Estonia's Ministry of Climate**, with support from the **Finnish Ministry of Transport and Communications**, teamed to reduce GHG emissions from transport & logistics. The memorandum of understanding aims at making the **Tallinn-Helsinki** and **Vuosaari-Muuga** crossings climate-neutral for passenger and cargo traffic, on- and offshore. "It is important that the connection between Helsinki and Tallinn is environmentally even more sustainable in the

Photo: Port of Gävle

future. More than the mandatory steps need to be taken to ensure that. It is vital that all major players participate in this activity, so this is a day of great importance and a turning point for working together with all partners in favour of climate and nature," said **Valdo Kalm**, CEO of the Port of Tallinn. **Ville Haapasaari**, the Port of Helsinki's CEO, also commented, "We look forward to the co-operation this project offers between all parties. I'm convinced that we can find smart and better solutions to tackling the climate change in this area of ours and to ensure the future growth and welfare of the two countries." Around nine million passengers and two million vehicles are carried between Helsinki and Tallinn yearly.

In November 2023, the **Port of Kalundborg** shared it would electrify all cranes in its deep-water container terminal, operated by **APM Terminals**, within several months (the facility's gantry fleet consists of three **Konecranes Gottwald** mobile harbour cranes, two capable of lifting 100t and the third – 150t). In the interim, **APM Terminals Kalundborg** committed to using hydrotreated vegetable oil (HVO) as fuel, which is said to reduce CO_2 emissions by up to 90%. The announcement was made on the occasion of *Laura Mærsk*, Maersk's first methanol feeder, calling to Kalundborg. "With the measures we are taking, we can offer a green gateway to the Zealand market," underlined **Mikael Gutman**, CEO of **APM Terminals Nordics**. The 50k TEUs/year capacity Kalundborg thus joined **Gothenburg** and **Los Angeles**, the two other sites in the APM Terminals family that use biofuel.

Also in November, **Copenhagen Malmö Port** (CMP) began switching its **Copenhagen** container terminal's fossil fuel machinery to run on HVO. The facility's newer terminal tractors, rear loaders, and industrial trucks would be the first to phase in the green fuel. The move would avoid consuming 60k litres of diesel per year, reducing CMP's footprint in Denmark by some 130t of CO_{2e}/year. The new battery-hybrid straddle carriers CMP ordered in April 2023 would also tank HVO (the terminal's ship-to-shore gantries and other work vehicles run on green electricity). In 2025, the container terminal in Copenhagen will move to **Ydre Nordhavn**, and CMP expects that all fossil fuels will be phased out at all facilities by that time. In Malmö, CMP's other seaport, phasing in HVO reduced emissions by approximately 840t CO_{2e}/year. CMP intends to make its operations CO_2-neutral and climate-positive by 2025 and 2040, respectively (in accordance with the **Science Based Targets initiative**). The Danish-Swedish port authority cut its scope 1 and 2 GHG emissions by 57% in 2020-22, thus avoiding the release of 1,231t of CO_{2e}. "The green transition of CMP's operations is not something we are only planning for in the future – it is already happening now, and the phasing in of HVO100 at the container terminal in Copenhagen is a very important and natural step in our efforts to be one of the world's most sustainable ports," underscored **Povl Dolleris Røjkjær Ungar**, CMP's COO. He also underlined, "The phase-in of HVO100 follows the replacement of CMP's machinery and means that CMP can also support our customers' demand for fossil-free and CO_2-neutral transport chains."

Still in November last year, and news surfaced that the **Port of Ventpils** and **PurpleGreen Energy C** hydrogen struck a co-op. Specifically, the Latvian seaport and the Riga-based company will conduct research into setting up a green hydrogen factory in Ventspils. The agreement also included granting PurpleGreen Energy C the building rights on a ten-hectare plot for erecting the facility. "Ventspils has all the advantages to develop into a future energy production and export hub, which in turn would be a great competitive advantage for establishments to start and expand their operations here. Currently, the Freeport of Ventspils is purposefully developing the renewable energy cluster in Ventspils, and the production of green hydrogen is one of the most important cornerstones in this complex of diverse activities. We are satisfied that PurpleGreen Energy C chose the Freeport of Ventspils as a place for the development of its project, and we are ready for active and effective cooperation," **Igors Udodovs**, Deputy CEO of the **Freeport of Ventspils Authority**, commented. **Māris Daniševskis**, Lead P2X Project Manager, PurpleGreen Energy C, added, "We see great potential for Latvia to become a renewable energy export country. One of the most suitable ways to export renewable energy is to convert it into the form of renewable electricity molecules and further export this energy using the existing infrastructure of the Freeport of Ventspils, as well as by collaborating with businesses operating in Ventspils – for instance, in the form of e-methanol or green ammonia. We thank the Freeport of Ventspils for the successfully initiated cooperation, and we are working on the realization of this project with great optimism." ■