

Green is the colour for the future

A consortium of Shell, Mitsubishi Heavy Industries, Vattenfall and municipal company Wärme Hamburg has signed a Letter of Intent to build a green hydrogen production facility on the site of the former Moorburg coal-fired power plant – which was built just six years ago, but shut in December last year – in the port of Hamburg.

Subject to planning permission being granted and final investment decisions, a scalable electrolyser with an initial output of 100 MW could be in operation by 2025. The parties have applied for EU support under the IPCEI (Important Projects of European Common Interest) programme.

Moorburg is viewed as ideal for a 'Green Energy Hub' as it is connected to both the national 380,000V transmission network and the city of Hamburg's 110,000V network. It is also a useful distraction from the political controversy swirling around the Nord Stream 2 gas pipeline (*WorldCargo News*, August 2020, p20). Tensions between Germany and the US are running very high.

Michael Westhagemann, Hamburg's economy minister and port senator, said: "There is no better location in Hamburg for a scalable electrolyser. Via the 380,000V connection and the connector to Brunsbüttel, we have direct access to the supply of green electricity from wind power and can thus produce green hydrogen in relevant quantities."

In addition, Moorburg has deepwater quays that could be used for ships with FCEV propulsion for bunkering.

Ship fuel cells

In Bergen, Norway, Corvus Energy will produce large-scale maritime-certified green hydrogen fuel cell (FC) systems, in partnership with Toyota as the supplier of mass-produced FC technology.

Norwegian partners in the project are Equinor, shipowners Norled and Wilhelmshaven, ship design company LMG Marin, the NCE Maritime CleanTech cluster and the University of South-Eastern Norway. They will produce modularised PEM FC systems for the international marine market. The project has received the equivalent of €5.2M in funding from state agency Innovation Norway. "The development is scheduled to showcase its first marine fuel cell system on board a vessel in 2023, and the product will be

Investments in ports are increasingly tied up with the drive to lower carbon footprints

marine-certified and available for commercial delivery from 2024," stated Corvus Energy.

Corvus Energy's CEO Geir Bjørkeli commented: "Adding fuel cell modules to our product portfolio is a natural step for Corvus and advances our vision to be the leading supplier of zero-emissions marine solutions. Fuel cell technology has reached a maturity level where the scale-up of systems will be the next step. Toyota is in the forefront of the development and is by far the best

partner for us to make this a success."

Thiebault Paquet, director of the Fuel Cell Business Group at Toyota Motor Europe, said: "Decarbonisation is inevitable and at Toyota, we are convinced that hydrogen will play a central role in creating a better future, both environmentally and economically. Our recently established Fuel Cell Business Group in Brussels is looking forward to working with Corvus Energy and the consortium members to offer fuel cell solutions for marine applications."



Grimaldi is gradually rolling out its new GG5G ro-ros, such as ECO BARCELONA

Corvus Energy says its new dedicated fuel cell division will design and certify the marine fuel cell system using the Toyota fuel cell technology as a building block for larger systems. Furthermore, a specific marine control system uniting the battery and fuel cell operation will

be developed for easy integration with power management systems from a range of system integrators.

"Backed by strong owners in the form of Norsk Hydro, Equinor, Shell and BW Group, Corvus plans to scale up production to mirror its world-leading position

plant health, conformity and customs – can be carried out at one location, the Waltershof/Finkenwerder Strasse site, until now occupied by Hamburg Customs Authority.

This is a pilot project, part of the EU's 'Smooth Ports' programme, in which the ports of Livorno, Monfalcone, Nantes-St Nazaire and Varna are also taking part. Having a single Border Control Centre makes the handling of container imports, for example, more efficient and reduces the number of internal port transfers. The Hamburg Veterinary Office and the Import Office are closing their existing control points on Reierdamm and Altenwerder Kirchtal. IT applications will further boost efficiency. The project is supervised by the Hamburg Ministry of Justice and Consumer Protection.

Another element considered important by HPA is funding for alternative drives for container trucks, slot booking and digitally enhanced 'intelligent' EC management to minimise trucks travelling empty.

He believes that BOSS is tinkering at the margins of Hamburg's congestion problems, while futuristic solutions being entertained by HHLA, such as Hyperloop and drones, are far too long-term and energy-intensive.

Shore power

Germany's biggest exponent of shore power is Seehafen Kiel. The port's managing director, Dr Dirk Claus, has reported that with the commissioning of the €15M installation at the Ostseekai in 2020, which can also supply power to the Schwedenkai (Stena Line ferries), all the city terminals are now connected to shore power.

"We can cover 50% of the energy demand of the ships visiting Kiel in an emissions-free way and, thanks to the reduction of the EEG [green energy tax] apportionment, we can do so at competitive prices," said Dr Klaus.

"Our focus will now be directed again to the Ostuferhafen, where a shore-power connection and another ro-ro ramp are planned to be installed."

Kiel has long lobbied against the EEG levy as a major disincentive for ships to 'plug in' at German ports. Matters came to a head last year, when the federal government announced that it would support seaport installations to the tune of €140M. Unless the levy was addressed, many ship operators would simply shun shore power (*WorldCargo News*, May 2020, p44). To be clear, the EEG levy still applies to shore power, but at a reduced rate with effect from January 2021.

The Hamburg government has delayed its plan to install cold ironing facilities for cruise liners and container vessels by several months. Nothing will be available at any container berths or the Steinwerder cruise terminal before the end of 2022 at the earliest, which means a delay of at least nine months according to the original timetable announced in October 2019. The Altona cruise terminal already has shore power available, using a turnkey Siemens SHarbor system, as also adopted by the Port of Kiel.

The city's plan was to supply regenerative current that would be converted at a central facility to normal shipboard 6.6 kV voltage and 60 Hz frequency, and fed to the connection points from there. However, to provide resilience, the Hamburg Port Authority (HPA) wants the conversion points to be at the berths, and this is the reason for the delay.

Explaining its preference, and why the original budget cost of €76M remains unchanged, HPA told *WorldCargo News*: "Switching from a centralised supply to a supply per terminal allows us to run a more stable and robust system. A potential technical failure will have a local impact only.

"Furthermore such a system will be able to supply more vessels simultaneously at higher peak power levels, which seems to be

dialogues with shipowners. Extra costs are partly offset by savings in cable laying and switching from conventional technical buildings to modular standardised technical components."

On board autonomy

In any event, shore power is not the only way forward. Grimaldi's new 'Green 5th Generation' (GG5G) Eco-class ro-ros are equipped with 350 m² of solar panels to charge lithium-ion batteries that provide the power needs while at berth. At the time of writing, three of the new vessels had been delivered into Grimaldi's services in the Mediterranean – ECO VALENCIA, ECO BARCELONA and ECO LIVORNO. Three new ro-ros with the same features, but also with Swedish/Finnish 1A ice class, are also being built for Grimaldi's Finlines affiliate.

According to Grimaldi, the ro-ros can run on battery power for up to four hours while in port, but emblazoning 'Zero Emission in Port' on the hull might be viewed as a risky thing to do.

The batteries are supplied by Corvus Energy, which in 2019 completed the installation of 5.5 MWh battery energy storage systems (ESS) on each of two large Grimaldi ro-paxes – CRUISE BARCELONA and CRUISE ROMA.

"The 'mega batteries' allow the cruise ferries to turn off the diesel engines and operate solely on battery power and with zero emissions for up to four hours during a port stay," stated Corvus Energy.

Roger Rosvold, SVP sales at Corvus Energy, said: "An ESS this massive has never before been retrofitted on board a cruise ferry. It's clear now that if shipowners are willing to go green, the technology exists." In 2018, Corvus Energy supplied an ESS for shore power to Stena Line's STENA JUTLANDICA.

Corvus Energy is continuing to work on alternatives for shipping companies. As reported in the January 2021 edition of *WorldCargo News* (p8), it has developed a containerised (10ft, 20ft) battery-on-board (BOB) ESS, which it says is available now, and for which it is seeking DNV-GL approval.

To improve trucking efficiency and lower its carbon footprint, HPA is setting up a 'Border One Stop Shop' (BOSS) whereby all checks on goods passing through the port – veterinary, food law,

plant health, conformity and customs – can be carried out at one location, the Waltershof/Finkenwerder Strasse site, until now occupied by Hamburg Customs Authority.

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Tinkering

Last year, Dr Ulrich Malchow told *WorldCargo News* (February 2020, p27) why his Port Feeder Barge (PFB) concept could haul containers within the port with unbeatable low energy consumption and low emissions.

He believes that BOSS is tinkering at the margins of Hamburg's congestion problems, while futuristic solutions being entertained by HHLA, such as Hyperloop and drones, are far too long-term and energy-intensive.

Malchow reiterated that almost 25% of the container throughput is transported within the port pre or post-shipping, mostly by trucks, and around half of those have to use the Köhlbrand Bridge. HPA has now pushed the date for replacing the ageing bridge with a tunnel from 2030 to 2034 at the earliest.

"One would think that every truck that could be taken off the bridge would be of high interest," said Malchow. "We have now clarified all operational aspects of PFB with HHLA. It is only an additional charge HHLA is claiming for accepting containers from the self-sustaining PFB that is preventing its stakeholders from starting the project." □

Solar power for ports



A section of the warehouse roof at Stockholm Norvik Port

Ports around the world are taking advantage of roof space on terminal buildings and warehouses to install solar panels. In Stockholm Norvik Port, a large warehouse roof will be almost entirely covered with solar cells covering 3,500 m², enough to provide 570 MWh per year, once fully operational in 2022. The turnkey contractor for the project is Idola Solkraft, which is installing a total of 1,620 panels, with a maximum output of 600 kW.

Ports of Stockholm Ltd already has five solar cell system facilities operating. The first and largest of these went live in 2013 and is on the roof of a building at Frihamnen in the city centre.

In the UK, Portsmouth City Council has selected Custom

Solar to install a total of 1,670 solar panels on the roofs of various buildings in the port, along with a large battery and solar canopies. When complete, the power produced by the 1,670 solar panels will contribute around 30% of the site's power, it is stated. Peak power is 750 kW. The canopies can shade vehicles waiting to board ferries and they provide the infrastructure to support EV charge points.

The 1 MW battery will work in conjunction with a forthcoming battery storage pilot, to supply power to the national grid and to store power during lower pricing periods. When complete, it is estimated that 98% of the energy consumed by the port will come from solar and battery power, combined.