

# DUAL Ports News



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11. edition of DUAL Ports News

Editor: Wim Stubbe, Lead partner / Josephine Petersen, Communication Officer

## Hydrogen production and storage in the maritime sector: a way to realise zero-emission ports within DUAL Ports?

Focus on establishing a hydrogen production and usage of this is the core element in one of the pilots within the DUAL Ports. The pilot investigates the business opportunity of producing and storing alternative fuels at ports and has a dedicated focus on analysing the potential of hydrogen. The initiative is one of several pilots that will contribute in the transition of ports towards zero-emission operations.

DUAL Ports seek to bridge the gaps between research, development, industrial policy and application to promote responsible growth through eco-innovative oriented development within small and medium sized Ports in the North Sea Region.

DUAL Ports is a transnational cooperation between the participating ports and research institutions that facilitate knowledge sharing on sustainable energy at Regional Entrepreneurial Ports (REPs). DUAL Ports is funded by the North Sea Region Programme and consists of 16 partners including Port of Oostende as Lead partner.



*Port of Oostende*

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## European Policy on Hydrogen

*By Wim Stubbe, Lead partner*

The European Union's objectives to a reduction of greenhouse gas emissions are very ambitious: 40% in 2030 and 80-95% in 2050.

This requires a deep decarbonization of the energy supply and consumption, and a major transition from fossil energy to renewable energy needs to be made. All industries need to contribute towards realising this transition and ports, shipping and the transportation sectors all has a great potential to make great contributions towards this objective.



*Wim Stubbe, Lead partner in DUAL Ports*

The potential role of hydrogen in this process is multiple:

- Clean hydrogen can contribute to the decarbonization of transport, industrial production, high and low calorific heat: These are all sectors where decarbonization is a huge challenge.
- Implementation of clean hydrogen in the chemical sector, combined with CO<sub>2</sub>-capture, will enable a decarbonization of the petro-chemical value chain.
- Clean hydrogen makes it possible to integrate renewable energy into the energy provision system in an efficient way and on a large-scale. Electrolysis can convert excess electricity into green hydrogen, when the supply of renewable energy is higher than demand. The flexibility of the actual electrolyzers is of major importance in this process.
- Hydrogen can function as a renewable and CO<sub>2</sub>-free storage facility on the long run.
- Hydrogen offers the opportunity to distribute energy over different sectors and regions. The transport of hydrogen, potentially connected to other molecules, will help in this process.

Considering the potential of clean hydrogen, several authorities, including the European Union, are defining the production, the storage, and the distribution of clean hydrogen as one of their priorities:

- In the communication of the European Commission on the European Green Deal, it is mentioned that the regulatory framework for energy infrastructure will need to be reviewed to ensure consistency with the climate neutrality objective.

This framework should foster the deployment of innovative technologies and infrastructure, such as smart grids, hydrogen networks, carbon capture, utilisation, energy storage and also enable sector integration. Some existing infrastructure and assets will require upgrading to remain fit for purpose and climate resilient.

- In the communication of the European Commission of 10.03. 2020, presenting the new European Industrial Strategy, the main objective is how to organize the transition of Europe's industry towards climate neutrality and digital leadership.

The Strategy sets out the key drivers of Europe's industrial transformation and proposes a comprehensive set of future actions, including a Clean Hydrogen Alliance to accelerate the decarbonisation of industry and maintain industrial leadership. Smart sector integration is a key part of the new strategy, as it aims to use all carriers of energy more effectively by linking different sectors. Clean hydrogen is a prime example of where this can have a real benefit. It is disruptive in nature and requires stronger coordination across the value chain.

The Clean Hydrogen Alliance will bring investors together with governmental, institutional and industrial partners, building on the successful template of existing industrial alliances, and on the work done within the framework of the FCH JU; Fuel Cells and Hydrogen Joint Undertaking which is a unique public private partnership supporting research, technological development and demonstration activities in fuel cell and hydrogen technologies in Europe.

Both policy and industry are preparing themselves for the major energy transition, based on, among other things, clean hydrogen. The small and medium sized (SME) ports within the DUAL ports project can play an important role as to the production, the transport, or the storage of clean hydrogen.

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## Hydrogen production in ports

### Dual Ports partner: Niedersachsen Ports (NPorts)

The Port of Emden is an excellent site for exploring the possibilities of hydrogen. The port is close to onshore and offshore wind-parks, which generates excess energy during certain periods of time. An ambitious project Wash2Emden is looking into how much hydrogen can be produced and how it can be used to reduce CO<sub>2</sub>-emissions in the port among other questions.

The project team wants to build a supply chain from producing sustainable energy to storage of hydrogen in order to be able to organize the distribution to end-consumers. The project examines different scenarios of hydrogen production and consumption with the aim of the investigation of a suitable hydrogen model for the seaport of Emden.



Dr. Matthäus Wuckowski, Sustainability  
Manager at NPorts

*"The seaport of Emden provides the optimal environment to implement an extensive and competitive hydrogen economy and to contribute to the global climate protection," says Dr. Matthäus Wuczkowski, Sustainability Manager at NPorts.*

The seaport of Emden consumes energy of about 688 GWh/year and emits more than 140.000 tons of CO<sub>2</sub> per year. About 13.000 tons of CO<sub>2</sub>-emission account for all vehicles that are used in the port. These vehicles include for example fork-lift trucks, cranes, and ships that are used in the port permanently. An extensive retrofit with hydrogen engines would have the capability of an emission reduction of more than 10.000 tons.

Simultaneously, more than 60 GWh of excess wind energy produced in the vicinity of the seaport remain unused. Based on the current potential of excess wind energy, more than 850 tons of green hydrogen could be produced and provided for moving the project theory into a future reality.

In order to make progress on their strategy, NPorts hosted an online video conference on 26<sup>th</sup> May 2020 where the results of the project and possible future steps were presented to the public and project partners.

[Please find access to the full presentation \(in German\) here.](#)



*Port of Emden*

### **DUAL Ports Partner: Port of Hvide Sande**

At the port of Hvide Sande, three onshore wind turbines produce sustainable energy for Hvide Sande District Heating, which is used to heat the city of Hvide Sande. This setup has enabled the Hvide Sande District Heating to cut their CO<sub>2</sub> emissions by 83% and the next step in this green transition is to reach a 100% cut in CO<sub>2</sub> emissions for its district heating. To achieve this goal the Port of Hvide Sande and Hvide Sande District Heating are investigating the possibility of producing hydrogen within the port

based on the approx. 20,000 MWh excess electricity from the three wind-turbines at the port area.



*Windmills at the Port of Hvide Sande*

Martin Halkjær Kristensen, operations manager at Hvide Sande District Heating, explains: *“The excess wind energy can be utilized for hydrogen production, which will be used locally. The residual product in hydrogen production is actually heat that can be used for district heating production, so we can achieve a sustainable, circular infrastructure where renewable energy is recycled.”*

The feasibility study within the Dual Ports project is focused on analysing the cost of supplying locally produced hydrogen, which can be used for a local dredging vessel in the Port of Hvide Sande. Therefore, different small-scale hydrogen production units are being reviewed for their feasibility in a theoretical 360 days production cycle to estimate the cost of hydrogen production. On basis of these tests, the most cost-effective hydrogen production unit will be chosen.

In addition to the production of hydrogen, the project partners are investigating if they can recuperate the heat that is produced from the hydrogen production process to develop a cost-effective circular infrastructure that can provide a CO<sub>2</sub>-neutral central heating setup to the residents of the town of Hvide Sande.

So far, the feasibility study has presented relevant indications that a local small-scale hydrogen production can achieve feasibility in the context of the operations at the port and the city of Hvide Sande, on the condition that the local energy production from the local wind turbines can be used in the production of hydrogen, and insofar economic support is provided for the acquisition of the productions units.



*Bent Haumann, Business Development Manager at the Port of Hvide Sande*

*"The Hydrogen pilot project perfectly illustrates how small and medium sized ports can be an important part of the new green energy platform. And the strong cooperation between the port and the district heating company is essential for the pilot to succeed. I hope that our experience and the examples from Hvide Sande can inspire other regional ports around in the Northern part of Europe to engage in the transition of ports towards renewable energy production and use,"* says Bent Haumann, Business Development Manager at the Port of Hvide Sande.

[Read more about Hvide Sande's production of renewable energy and heat](#)

### **Developing a hybrid hydrogen-electric fuel cell propulsion system**

Nine partners including [Ballard Power](#), Hvide Sande District Heating and Port of Hvide Sande has joint a EUPD-project (Energy technological Development and Demonstration Program) that aims to demonstrate an alternative zero emissions solutions for shipping, by constructing a hybrid hydrogen-electric fuel cell propulsion system in a working vessel – the first of its kind in Denmark.

The new innovative dredger for the Port of Hvide Sande is set to replace the existing diesel-powered dredging equipment and provide efficient services for the end consumer, the Danish Coastal Authority.

The project is part of a larger local climate initiative in Hvide Sande by the Port of Hvide Sande, Hvide Sande District Heating and Hvide Sande Shipyard which aims at decarbonizing the port and port equipment through locally available renewable sources; such as the three windmills.

*“This EUPD-project is a very positive development seen from our DUAL Ports’ hydrogen pilot project. Our skills and knowledge to engage in this new project shows how important it has been for the Port of Hvide Sande and Hvide Sande District Heating to participate in the hydrogen pilot within DUAL Ports,” says Bent Haumann.*

The business and technical case will be developed during the next two years during which time the possibilities will be tested in practice.

[Read more about the project here](#)

### **DUAL Ports Partner: Haven Oostende - Port of Oostende**

On the 27<sup>th</sup> of January 2020 the Port of Oostende, DEME Concessions and PMV (a funding-company for promising business) announced a long-term cooperation in order to contribute to the decarbonization of the industries and the logistics, and the implementation of the EU Green Deal.

Together, they have launched the HYPOR project. The aim of this project is to open a green hydrogen production plant at the port of Oostende. The green hydrogen will be used as an energy source for heating or transport, and another part will be used as a resource that will be connected to CO<sub>2</sub> for the production of methanol.



Port of Oostende



During a first phase, the partners will make an overall feasibility study, a development-plan, and a test pilot. On basis of these plans, a demonstration-plant will be built, involving an electrolyser of 50MW, utilizing renewable energy (mainly offshore wind). This process should be realized in 2024. The plant should have a production-capacity of 6,000 tonnes green hydrogen per year and will also contribute to the carbon capture and carbon reduction.

On basis of the results of the demonstration-plant, the partners can decide about the upscaling of the capacity of the concerned electrolyser in a cost-effective way. All parties have particular expertise in order to contribute to the success of this project.

DEME Concessions is one of the pioneers in the installation of far offshore wind parks, and innovation is one of their key drivers. PMV has the experience of financing the construction and exploitation of the infrastructure of energy projects.

The Port of Oostende has great experiences in the offshore wind sector as well: at the end of 2020, approx. 400 wind turbines will be installed at sea off the coast of Oostende. The total production of this wind-park is an installed power of 2,26 GWh.

On basis of the renewed Belgian Marine Spatial Plan that has been approved in 2019, a second area for offshore wind farms has been approved, good for an installed capacity of 1,76 Gigawatt.

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## Hydrogen technology provider

### **DUAL Ports Partner: ITM Power**

ITM Power manufactures integrated hydrogen energy solutions to enhance the utilization of renewable energy that would otherwise be wasted. As a DUAL Ports partner, ITM Power uses its skills in hydrogen technologies for their work in the hydrogen pilot at Orkney Islands.

ITM Power has been strengthening its position in the marine fuel bunkering market by offering the go-to green hydrogen production technology for large scale adoption of hydrogen fuel bunkering for the maritime industry. Its proven electrolyser platform architecture is designed to be scalable.

ITM is preparing itself for the second phase of the GIGASTACK project, a renewable hydrogen project that will be realized in the Humber region. The GIGASTACK project, led by ITM Power, Orsted, Phillips 66 Limited Humber Refinery and Element Energy (consulting) will show how renewable hydrogen, derived from offshore wind (Hornsea wind park) can support the net zero greenhouse gas emission target in the UK in 2050. During the first phase of this project, ITM Power has developed designs for a low-cost

modular 5-Megawatt electrolyser stack, whereby Orsted has investigated the potential synergies with offshore wind farms. During the second phase, the partners will detail the actual design of a hydrogen production system, connected to an offshore wind farm and an industrial off-taker, utilizing ITM Power electrolyser stack technology.



*Electrolyser from ITM Power*

The continuing innovation in ITM Power's technology, the scale of products alongside the improvements in manufacturing and production volume, position ITM Power to offer products that provide its clients with the best opportunity to make renewable green hydrogen. This green hydrogen will be able to compete on cost with fossil fuel derived hydrogen, and even natural gas by 2050, as forecast by Platts, Bloomberg New Energy, The Hydrogen Council, and Hydrogen Europe. Therefore, it is essential to meet the large-scale green hydrogen production and cost targets that will be essential for shipping.

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## Hydrogen training and exchange of experience

### **DUAL Ports Partner: Orkney Islands Council Marine Services**

Orkney Islands Council Marine Services is one of the UK's most diverse commercial ports with 6 different sectors from Passenger & Freight and Fishing, to Oil & Gas and Renewable Energy. Orkney is at the forefront of marine renewable energy research and development and ensures this position as a partner in DUAL Ports working on the hydrogen pilot.

Orkney Islands Council Marine Services is working on The Capacity Building Program that is set to expand the port staff's know-how on low carbon solutions and technologies through DUAL Ports. Orkney Islands Council Marine Services discovered the need for developing a proper training to handle the bunkering of hydrogen for transport.



*The MV Shapinsay - subject of the first training course*

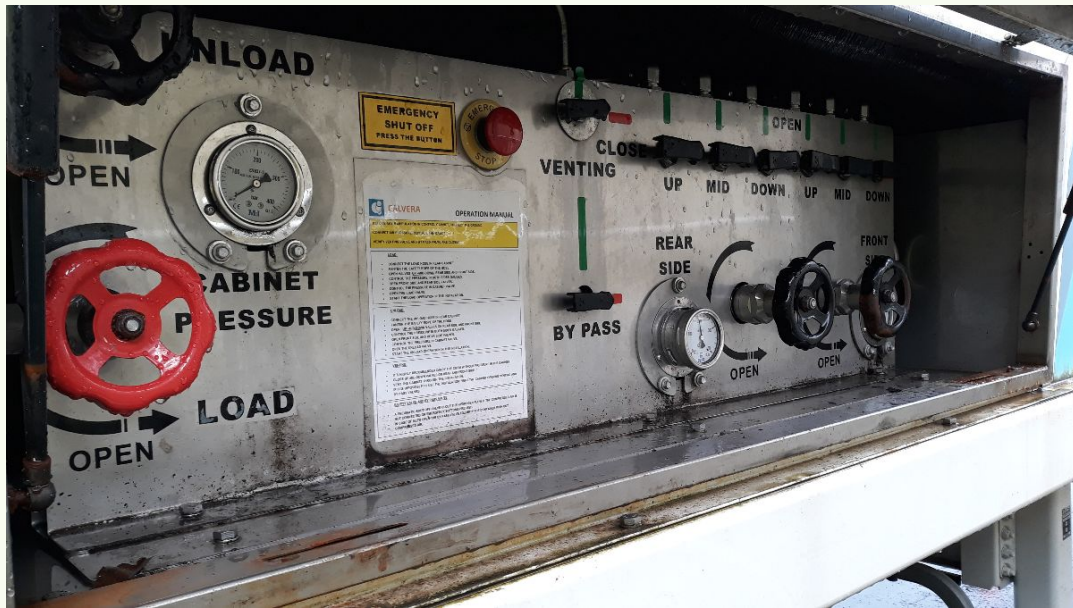
In cooperation with Orkney College Marine Studies, Orkney Islands Marine services has created a Hydrogen training course to ensure that marine crews are able to bunker and to operate hydrogen-powered vessels. To be more specific, attendees who complete the training course, will be skilled to operate the world's first hydrogen dual fuel RoPax ferry – a part of [the HyDIME project](#). Among other training subjects, attendees will also be trained in responding and dealing with ships fire on a hydrogen-powered vessel as well as detecting gas.

*“There are no specific rules for utilising hydrogen at sea, so this needs to be made up from whatever experiences have been gathered in this field. In order to produce a training course, experience and learning from all areas involved in hydrogen operations, are brought together and the final training product has been passed to the UK maritime transport authority, the MCA, for approval,”* says David Hibbert, Technical Superintendent at Orkney Islands Council Marine Services.



David Hibbert, Technical Superintendent at Orkney Islands Council Marine Services

“Given the COVID19-issues of physical distancing, the earliest anticipated first presentation of the training will take place in September 2020. We need to train eight core crew members as well as some shore support staff. This should allow the vessel to be permitted to load hydrogen fuel and start the operations at sea. Major interest in the training-sessions has been noted in Norway that is also looking to get a Hydrogen power passenger ship at sea soon” says David Hibbert.



The gas panel on a hydrogen tube trailer

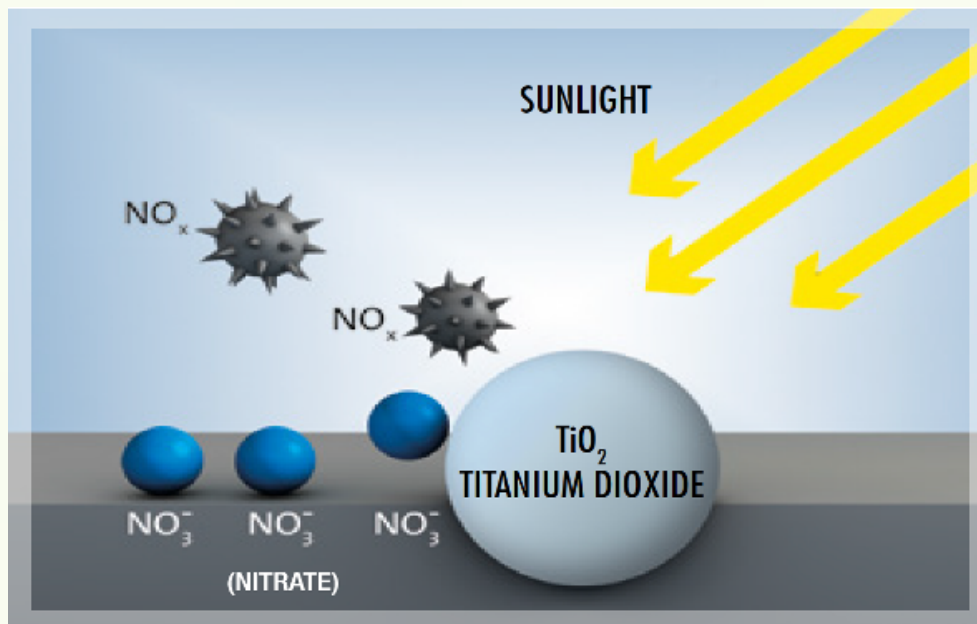
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**Additional updates from DUAL Ports**

## Surface pilot in Skagen, Denmark

**DUAL Ports Partner: Port of Skagen**

In 2020, the Port of Skagen will lay NOx absorbing asphalt on a part of the port area. The pilot project is a live test of a new technology – a photocatalytic surface that helps reduce pollution by turning NOx into harmless NO<sub>3</sub>.



*Illustration of AirClean Pavers from FCN Betonelemente*

The shipping industry is dependent on fossil fuels but the exhaust gases from vessels and vehicles contain large amounts of Nitrogen oxides (NO<sub>x</sub>) and Sulphur oxides (SO<sub>x</sub>). The air-purifying concrete/asphalt contains titanium dioxide, a photocatalytic material that reacts with the nitrogen oxides in the air and converts it with the aid of sunlight into harmless nitrate. The nitrate is then rinsed away by rain. A 15% to 20% reduction in nitrogen oxides (NO<sub>x</sub>) over the special road is expected.

The asphalt is produced environmentally friendly. 95 % of asphalt is sand, gravel, stone and fine material which can be replaced by recycled material without it affecting the quality. The most important recycled material is crushed asphalt which not only ensures 100 % usability as the crushed and reused asphalt replace new stone material 1:1. The asphalt production method will reduce CO<sub>2</sub> emissions by 25%.

*“Our motivation for being a part of DUAL Ports’ Surface pilot is not only to reduce CO<sub>2</sub>-emissions. The Port of Skagen is both a commercial port and a tourist attraction that welcomed more than 73.000 cruise guests in 2019. Air pollution has a significant negative effect on people’s health and we therefore consider it our responsibility to create a healthier environment for the ports’ workers and guests,”* says Jesper Rulffs, Business Developer at Port of Skagen.

The Port of Skagen expects to lay the asphalt in the SURFACE TREATMENT pilot in September 2020. The port of Oostende has tendered for the installation of a similar kind of asphalt on one of their terminals. A cooperation between the engineers of the port of Skagen and the port of Oostende has been set up in order to evaluate both the costs as well as the environmental effects.

## Contact information

You are welcome to contact us if you have any questions about DUAL Ports or the hydrogen pilot project. Please find contact information of the mentioned project partners below.

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## Upcoming activities



### **Breakbulk Europe, 29<sup>th</sup> September – 1<sup>st</sup> October 2020 in Bremen, Germany**

The world's largest event for the project cargo and breakbulk industry has set a new date due to COVID-19. In September, DUAL Ports, and the Port of Vordingborg will travel to Bremen in Germany to attend Breakbulk Europe. Together, we have booked a stand to be exhibitors. We hope to see you for two exciting days of networking, business transactions and lead generation with industry professionals and key decision makers from around the world. The conference and networking hub will welcome more than 600 exhibitors, 9,600 visitors and 400 cargo owners – the industry professionals include ports and terminals, cargo owners, freight forwarders,

equipment companies, among others.

[Read more about Breakbulk Europe 2020 here](#)

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Kind regards,  
DUAL Ports Partners

Port of Oostende  
Business Vordingborg  
Port of Vordingborg  
Port of Skagen  
Orkney Islands Council Marine  
Services  
ITM Power  
Fair Winds Trust  
Niedersachsen Ports GmbH & Co.  
KG Branch Emden

Port of Zwolle  
Hamburgisches Welt-  
Wirtschaftsinstitut (HWWI)  
Port of Hvide Sande  
Hvide Sande Fjernvarme A.m.b.A.  
Laminaria BVBA  
Uppsala University  
Celtic Cruises  
Seabased

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To learn more about DUAL Ports, visit [www.dualports.eu](http://www.dualports.eu)

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