Making hydrogen a success for Inland Ports

24-05-2023

Hydrogen has gained significant attention in recent years as a potential solution to decarbonize various sectors of the economy, such as transportation, industry, and heating. In Europe, the development of hydrogen as an energy carrier is a key part of the European Union's strategy to **achieve carbon neutrality by 2050**. In its Hydrogen Strategy, the European Commission has set a goal of deploying at least 40 gigawatts of electrolysers, which produce **green hydrogen from renewable electricity, by 2030.** European countries have also announced ambitious plans to develop their own hydrogen strategies and invest in research, development, and deployment of hydrogen technologies.

Additionally, hydrogen has the potential to strengthen European energy independence by providing a versatile and sustainable energy carrier that can be produced domestically, using low-carbon and renewable energy sources.

As such, hydrogen is expected to play an important role in the transition to a sustainable, low-carbon energy system in Europe, together with other low-carbon energy sources.

What are inland ports

Inland ports are strategically located within the European network, connecting the hinterland with seaports. At their core inland ports are multimodal hubs, where different modes of transportation converge, including road, rail, and inland shipping. As one solution to reduce greenhouse gas emissions and air pollution, inland shipping is expected to shift towards using sustainable hydrogen as a fuel in the future. At the same time inland ports are major industrial and logistical hubs, both in the port area and its surrounding.

These characteristics are recognised at the European level as inland ports are featured in the Trans-European Network for Transport (TEN-T), which is a comprehensive network of roads, railways, inland waterways, airports, and ports throughout Europe.

Hydrogen in Inland Ports

Deploying sustainable hydrogen technologies in inland ports will help decarbonize industry and logistics in a cost-effective and sustainable way, while also promoting economic development and job creation.

Reduction of greenhouse gas emissions and air pollution

Hydrogen deployment in inland ports will reduce greenhouse gas emissions and air pollutants in several ways. Hydrogen is foreseen to serve as a fuel for low- and zero-emission vehicles such as inland vessels, trucks, heavy-duty vehicles, trains, and equipment. Suitable refuelling and swapping infrastructure will be needed there.

Simultaneously inland ports face high energy demands from their other users and the surrounding industry, such as manufacturers, recycling and construction enterprises and much more. These stakeholders require reliable and sustainable energy sources, and low-carbon hydrogen can offer a viable alternative to fossil fuels. By integrating these hydrogen technologies into the port infrastructure, the users can reduce their carbon footprint.

Creation of a Hydrogen Network

By incorporating hydrogen infrastructure and technology into operations ports can transform into an essential part of the hydrogen supply network. Inland ports can become local and hinterland suppliers of hydrogen coming from seaports or other primary production nodes.

These characteristics show that inland ports can be crucial components in the development of hydrogen valleys, which are geographic areas where hydrogen technologies are deployed at a large scale, creating a local hydrogen economy. The development of hydrogen valleys can help to accelerate the deployment of hydrogen technologies and infrastructure, while also promoting economic growth and job creation in the region. Given these advantages, the European Union has identified hydrogen valleys as priority projects.

As part of hydrogen valleys, inland ports can act as locations for the production, storage, and distribution of hydrogen. The excess renewable energy produced by e.g., residual heat and solar panels in the region can be used to produce hydrogen through electrolysis. At the same time inland ports are locations for the storage and distribution of hydrogen across Europe.

By being part of the hydrogen supply chain and the creation of hydrogen valleys, inland ports will become core components of the European hydrogen network.

Boost to local economies and industries

As hydrogen is deployed in inland ports, it will benefit existing and new industries in the region. For example, hydrogen can be used as a feedstock for the production of chemicals and other industrial products. In this way the development of hydrogen infrastructure and technologies can create new economic opportunities and jobs.

Challenges in Inland Ports

Inland ports have the potential to become hinterland hubs for the hydrogen energy transition. This will enable the reduction of emissions from logistics and industry while improving air quality. There are however several challenges impeding the deployment of hydrogen solutions in inland ports.

Infrastructure and storage limitations

Hydrogen storage and refuelling facilities require space, which is complex regarding the already crowded port environment. This is particularly challenging for ports that are in densely populated areas. Innovative technologies will be needed to face this challenge.

This is compounded by safety concerns. Hydrogen is highly flammable and requires careful handling and storage to prevent accidents. Safety protocols and standards must be established and followed to ensure the handling, storage, and transport of hydrogen. This will require significant investment in training, equipment, and infrastructure.

Cost and financing

The financing of hydrogen in ports can be challenging, particularly in securing initial financing as there is no current business model for ports to facilitate hydrogen production, storage, and distribution. The needed hydrogen infrastructures are new and relatively untested concepts, and there is currently no established market or revenue stream for hydrogen-based products and services.

This lack of a clear business model makes it difficult to attract financing from investors and financiers, who are looking for a clear return on investment. This factor adds to the challenge for ports of securing public funding or subsidies, as these are typically tied to specific business cases or projects that have clear economic benefits.

Another challenge is the high upfront costs associated with hydrogen infrastructure development and safety measures. The production, storage, and distribution of hydrogen require significant investment in equipment and infrastructure, which is a significant barrier to entry for ports and their customers, particularly ports with limited resources.

Legislative uncertainty

For the hydrogen transition to be a success, private partners will be essential to operate hydrogen-related businesses. Inland ports will be the platforms on which they can do this. However, this development in ports is often impeded by unclear or undefined regulatory and legislative frameworks on hydrogen production, storage and distribution, which feeds uncertainty and makes it difficult to attract private partners. Another challenge is the lack of harmonization of regulations and standards across different countries and regions in the EU but also with non-EU Member States.

Permitting procedures

Public permitting processes are long and cumbersome and this creates significant challenges for hydrogen in ports. To develop hydrogen infrastructure, the process of obtaining the necessary permits and approvals from multiple agencies and stakeholders, including local, regional, and national authorities, as well as environmental groups and community organisations, is time-consuming and complex, requiring significant coordination and communication between different parties. This results in delayed deployment and adds to costs.

One of the primary challenges associated with public permitting processes is the need to comply with a range of regulatory requirements, including environmental, health, and safety regulations. These regulations are often complex and require detailed environmental impact assessments and other studies, which takes significant time and resources to complete.

Finally, there may also be political and social factors that further delay the approval of hydrogen infrastructure. For example, local communities may have concerns about the safety and environmental impacts of hydrogen technologies.

Challenge of Scale

The above-mentioned challenges are exacerbated by scale limitations. In ports these can be found in two ways. Firstly, ports in heavily urbanised areas or otherwise facing space constrictions lack the access to new land. Give the increased volume and safety area associated with hydrogen infrastructure deployment, this proves to be a substantial barrier in certain ports. Even if there is some availability of new land, there could still be expressions of “not in my backyard” arguments.

Secondly, port authorities have various sizes and some do not have the necessary resources to manage an energy transition. Especially smaller ports with lean administrations have difficulties taking on new responsibilities associated with hydrogen developments.

Therefore, a comprehensive system-wide approach is needed in which all ports are incorporated.

Recommendations

In order for the hydrogen transition to be a success for Europe we give the following recommendations.

1. Ensure a coherent legal framework

A legal framework is a primary need to make the hydrogen transition a success in inland ports. This means that CESNI, the European Commission, EUROMOT, ADN Safety Committee and classification societies should ensure that standards and legislation are aligned to enable the use of hydrogen in ports. National governments must ensure that their representatives in these international entities prioritize the development of necessary standards. This includes standards for:

- Easy authorisation for hydrogen storage in port areas;

- Streamlined land granting rules for hydrogen projects;
- hydrogen tanks for all industries;
- requirements for compressed and liquified hydrogen;
- revision of the non-road mobile machinery (NRMM) to recognise hydrogen as a fuel;
- safety requirements for hydrogen in combustion engines;
- European Standard on Technical Requirements for Inland Navigation vessels (ES-TRIN) brought up to date where necessary.

2. *Develop a comprehensive strategy for hydrogen deployment in inland ports*

For inland ports to develop their role within the hydrogen economy, the roll-out of infrastructure and services has to be done in a targeted and planned manner. No single actor can lead this transition on their own nor can they operate in a vacuum.

The roll-out of hydrogen infrastructure should be planned considering the needs of the various industries, modes and geographic and economic realities. It should also take special account of the interplay between seaports and inland ports.

In order to ensure network cohesion and alignment, corridor coordinators should be empowered to facilitate the cross-border planning process of national plans. This strategy should be led by national competent authorities but realised in close cooperation with sea- and inland ports.

3. *Support public-private partnerships*

Inland ports are not hydrogen industry experts. As such, private energy and hydrogen companies are needed to act as catalysts that can launch the hydrogen transition in a port. Attracting those companies to inland ports is not always necessarily evident. Only through these public-private partnerships can hydrogen be deployed in ports as they bring the relevant expertise, supply chain and reliability to the ecosystem.

Inland ports should start planning and envisioning how their position and existing industries can be adapted to welcome hydrogen-related enterprises and initiatives. At the same time local and national governments should act as a facilitator to expedite the creation of these partnerships by ensuring that the relevant actors are put in contact with the right ports.

4. *Ensure reliable avenues of investment in facilities*

European and national authorities must ensure reliable and accessible financing avenues to ensure that ports and their partners have access to funding to realise hydrogen projects. Given the high upfront investment costs and untested business cases, these funding avenues should consist of grants and state-aid schemes. They should also look at smaller scale projects which will prove vital in creating the foundation for hydrogen development.

5. *Promote and support innovative solutions*

The use of hydrogen in transport modes such as inland shipping and trucks requires new business models and solutions. This can include, amongst others, the containerisation of hydrogen in order to quickly refuel inland vessels. These solutions are new and, currently, there are no standard ways of storing and transporting hydrogen. Inland ports have to open their activities to these innovations where possible to enable their uptake. European and national authorities should promote and support these types of solutions in order to improve their uptake and make further safety gains.

The members of EFIP adopted this document to formulate a common position of the European inland ports regarding their role in H2 supply. The contents of the position paper were developed with the involvement of numerous experts in a workshop series, organised by EFIP and Hafen Wien GmbH together with thinkport VIENNA.