Interreg Atlantic Area

Co-funded by the European Union

H2YDEA

Boosting the hydrogen transition in the Atlantic Area ports

Deliverable D 5.1.2

HYDEA case studies for Ireland

EXECUTIVE SUMMARY

The objective of Deliverable D5.1.2 is to define the Irish case study developed within the framework of the HYDEA project.

HYDEA aims to accelerate the adoption of hydrogen technologies in Atlantic Area ports by supporting the integration of hydrogen into port and maritime operations. A key outcome of the project is the development of a Decision Support Tool (DST), designed to evaluate hydrogen applications and support strategic decision-making across a range of port scenarios.

The DST will be informed by data and insights gathered from a series of case studies conducted throughout the Atlantic Area. Building on the opportunities previously identified in Deliverable D4.4.1, project partners have selected case studies aligned with their technical expertise and the priorities of participating ports.

This document, prepared by HIVE Hydrogen in collaboration with the University of Galway, presents the detailed definition of the Irish case study focused on the SH2AMROCK Hydrogen Valley initiative at the Port of Galway. The study examines the deployment of a hydrogen refuelling station (HRS) to support hydrogen-powered mobility applications, including buses and heavy-duty vehicles, as part of the wider regional hydrogen ecosystem.

The report outlines the project location, participating stakeholders, proposed use cases, technical scope, implementation timeline, and the key economic, technical, environmental, and social indicators that will be assessed through the case study. The findings will contribute to the development and validation of the HYDEA Decision Support Tool and support future hydrogen deployment strategies within Atlantic Area ports.

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1. Introduction

HYDEA is funded by the European Regional Development Fund through the Interreg Atlantic Area Programme. The HYDEA project has been designed to carry out pilot tests for the application of hydrogen and methanol as an energy alternative in the fleet and vehicles of the ports of the Atlantic area, to achieve the integration of marine technologies and renewable energies in the maritime sector.

This document will outline the key parameters assessed in the HyDEA case study for a hydrogen refuelling station (HRS) in the port of Galway. These key parameters are:

- Where the case study is taking place
- Who the participating partners are and their roles
- What are the use case scenarios for the project
- What is the topic of the case study
- What objectives does the project hope to achieve and what is in scope for the case study
- How will the project be implemented and how long will key aspects and the project take as a whole

The case study will enable technical, economic, and operational details to be analysed using the Decision Support Tool developed by the University of Galway. This in turn will help in the assessment of hydrogen refuelling to be deployed at the Port of Galway as part of the SH2AMROCK Hydrogen Valley project.

Overview of the SH2AMROCK Hydrogen Valley

SH2AMROCK will deploy green hydrogen across key hard-to-abate sectors across the island of Ireland – including key infrastructure to enable the production, distribution, and use of green hydrogen. The 5 year-project, with a total investment of approximately €80m, will showcase the capacity of H2 to maximise penetration of RES through sector coupling, while facilitating widespread integration of renewable H2 into Ireland's energy system.

SH2AMROCK will realise this goal through the deployment of the country's first hydrogen valley and multi-modal H2 transport hub in Galway – accelerating the island of Ireland's energy transition and decarbonisation across multiple end-user applications. In particular the deployment of a hydrogen refuelling station at the Port of Galway is the relevant case study to be assessed as part of HyDEA WP5. This refuelling station will help Ireland to meet the EU's AFIR requirements. Galway is an urban node on the TEN-T network and as a result, there must be a publicly available hydrogen refuelling station operational in the city by the end of 2030.

2. Location

The location for the HRS in the Irish case study will be in the Port of Galway. The port is located within Galway city, located on the west coast of Ireland in the province of Connacht. It sits at the northeastern corner of Galway Bay, where the River Corrib flows into the Atlantic Ocean. Galway is ~190km (118miles) almost directly west of Dublin.

The City of Galway has a population of 84,414 people as of the 2022 census, with a geographical area of 50.00 km^2[1]. It is the 5th most populous city in Ireland.

Figure 1: Map of Ireland showing Galway, the location of the case study

In 2022, the Port of Galway handled 350 vessels carrying a total of 500,259 tonnes of cargo. Of this volume, 287,990 tonnes were imports and 212,269 tonnes were exports. This is about 1% of Irelands total weight of cargo handled each year[2].

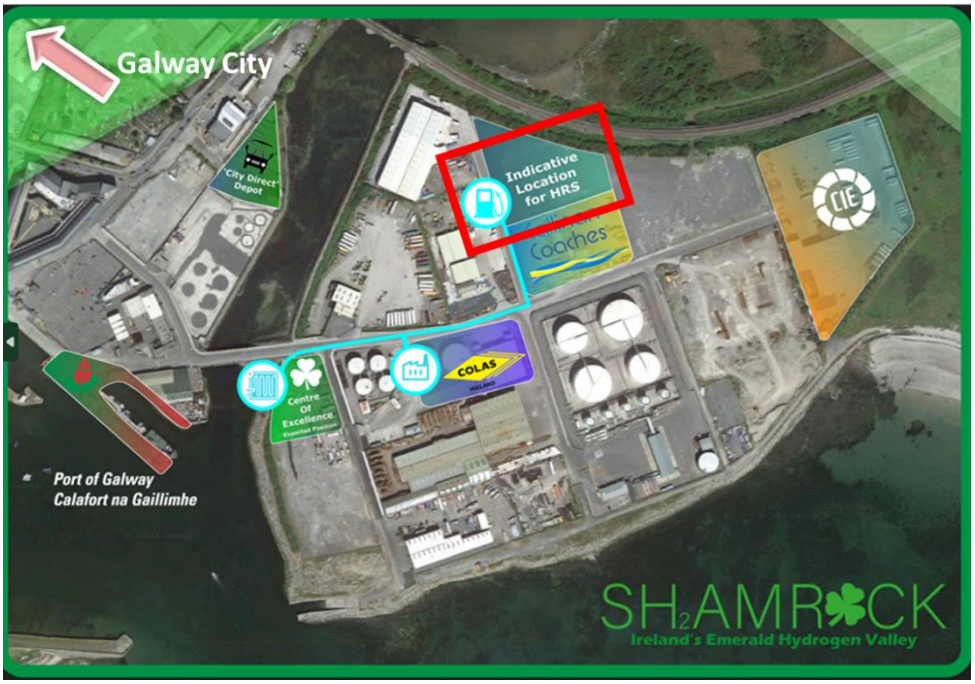


Figure 2: Birds-eye view of the Port of Galway showing the indicative location for the HRS, as well as relevant infrastructure and potential end-users as part of the SH2AMROCK Hydrogen Valley.

[1] https://www.citypopulation.de/en/ireland/admin/connacht/GC__galway/
[2] https://www.cso.ie/en/releasesandpublications/ep/p-spt/statisticsofporttrafficq4andyear2022/

Key imports included petroleum products, refuse-derived fuel (RDF), bitumen, and project cargo such as wind turbines. Exports primarily consisted of scrap steel, limestone, and project cargo[3].

The Port of Galway was specifically chosen for the case study due to the SH2AMROCK project and the regions hydrogen activity. Galway is progressing faster than other Irish cities when it comes to hydrogen activity. The indicative location highlighted in Figure 2, is in open space located proximally to Bus Éireann's Galway depot, making it an ideal location for refuelling its hydrogen fleet, which is set to be deployed in the SH2AMROCK project.

3. Partners

There are three levels of partners within the project: internal, associate, and external. Internal project partners are directly involved in the HyDEA project, receiving funding to carry out its project goals. Associate partners are also directly involved but are not receiving funding from the HyDEA project. They help facilitate key aspects of the project, such as location, planning, and public sector backing. The external partners in this case study are a part of the SH2AMROCK Hydrogen Valley and as such may provide input to the WP5 analysis where required and will benefit from its findings.

Internal - HIVE, University of Galway

Based on years of experience both within industry working for industrial gas majors and within the hydrogen consulting area - uniting the hydrogen and energy communities - HIVE Hydrogen participates by supporting the delivery of new, clean technical solutions for a sustainable future. Its goal is to ensure that the systems and technologies gain commercial acceptance by developing and delivering low cost, clean, onsite energy solutions and business models which compete with existing fossil technologies.

[3] https://theportofgalway.ie/port-of-galway-general-information/

Ollscoil na Gaillimhe University of Galway

The University of Galway was established in 1845 and has earned national and international recognition as a research-led university with a commitment to top-quality teaching. With over 19,000 students and more than 2,700 staff, Galway has a distinguished reputation for teaching and research excellence. The identification of priority research areas and subsequent investments in these areas have enabled the University to develop a critical mass of expertise which has led to significant success in securing competitive research funding, nationally and internationally to support our community. Within the University, the Erin Research Group conducts techno-economic and environmental modelling of renewable energy conversion systems and supply chains. UoG will develop a Decision Support Tool (DST) that will utilise this case study definition as a basis for its metrics and analysis framework. The tool will help analyse different hydrogen demand scenarios informing decisions on size, technical and operational requirements for the HRS in the Port of Galway.

Associate – Port of Galway

Port of Galway
Calafort na Gaillimhe

The port of Galway is a key partner in this project as they have enabled the location of this project. The port is keen to decarbonise its operations both in maritime itself and its port-side infrastructure, viewing hydrogen as a key enabler of this.

External – Bus Éireann/CIE, BOC

Bus Éireann

Bus Éireann are a local bus operator running services out of and to Galway, its main depot at Ceannt Station and Eyre Square. Bus Éireann will be a main end user of the hydrogen out of the HRS located in the port of Galway, with plans to deploy an initial 10 hydrogen coaches as part of the SH2AMROCK Hydrogen Valley.

CIE

Córas Iompair Éireann (CIÉ) is Ireland's national public transport company, founded in 1945 and now operating as a semi-state holding group for Dublin Bus, Bus Éireann, and Iarnród Éireann (Irish Rail). It manages rail, bus, and port infrastructure, including Rosslare Europort, serving over 300 million passenger journeys annually with a workforce

of 12,000+. Working with the National Transport Authority and Department of Transport, CIÉ drives network integration, investment, and policy delivery. The company is advancing sustainability goals, piloting hydrogen-powered buses and other low-emission solutions while leveraging its extensive land and asset base to support urban development. CIÉ's scale, expertise, and infrastructure make it a strategic partner in Ireland's energy transition and projects like SH2AMROCK.

BOC
A Linde company

BOC is a leading industrial, medical, and special gas supplier, who have been in operation for over 135 years. As part of the Linde group, they are a key player in the hydrogen industry, producing, storing and distribution hydrogen in regions all over the world. BOC is also part of the SH2AMROCK project, where it will produce green hydrogen at Mount Lucas windfarm in partnership with BnM a renewable energy development company, as well as playing a role in the delivery of the hydrogen to the Port of Galway including to the HRS which they will build and operate.

4. Use cases

The HRS that will be located in the Port of Galway will service mobility of all sizes for commercial style vehicles in demonstration size projects. This will include:

- **Public:** Bus Éireann are set to deploy 10 fuel cell electric vehicle (FCEV) coaches within the SH2AMROCK project to run on long-distance, interregional routes to be deployed by 2027.
- **Private:** HIVE Hydrogen is positioned to deploy 5 fuel cell heavy-duty vehicles (HDVs) and 4 fuel cell light-duty vehicles (LDVs) by the end of 2026 within the SH2AMROCK project and its end-users will utilise the HRS deployed at the Port of Galway to fuel these vehicles.

These are the budgeted and targeted number of vehicles set to be deployed with the SH2AMROCK hydrogen valley. Initial deployment could be delayed or phased, starting with potentially lower number of vehicles by the forecasted time. On the other side of this, successful deployments could lead to end-users purchasing larger quantities of trucks and vans, with bus operators like Bus Éireann converting larger numbers of their bus fleets to hydrogen power, increasing the demand for hydrogen from the HRS in the Port of Galway. Other hydrogen vehicle demonstrations could see an uptake such as taxis, waste refuse or other special vehicles, further stimulating demand in the future.

5. Topic

The HRS set to be deployed in this case study is based on the SH2AMROCK project, where it will deploy the infrastructure. SH2AMROCK is a five-year, €80 million project focused on deploying green hydrogen across hard-to-abate sectors in Ireland by building infrastructure for its production, distribution, and use. The project will demonstrate sector coupling to increase renewable energy (RES) integration and embed hydrogen within Ireland's wider energy system. Central to SH2AMROCK is the creation of Ireland's first hydrogen valley and a multi-modal hydrogen transport hub in Galway, enabling decarbonisation across multiple end-user sectors and accelerating the island's energy transition.

The HRS will have its hydrogen supplied via a 2MW electrolyser based at Mount Lucas windfarm in Offaly, from where it will be truck on-site to Galway. The initial remit for this HRS, as mentioned previously is 10 coaches, 5 trucks and 4 vans, which were previously diesel powered, so there is direct fossil abatement.

6. Objectives and Scope

This study will investigate the effect of different demand volumes on HRS requirements and the knock-on effect on the deployment location at the port.

Aim

The study will compare a number of different demand scenarios for a HRS deployed at Port of Galway and investigate the effects across a number of economic, social, and environmental indicators. These indicators will help make informed decisions about economically viable HRS options in the port of Galway and how the use of hydrogen in various mobility will have an effect on the environment, and the understand the social benefits.

Hydrogen-based technology such as fuel cells have zero tail pipe emissions other than water, resulting in cleaner air, improving public health and not contributing to the greenhouse effect. Hydrogen produced by RES powered electrolysis will also have zero upstream emissions, creating a low-emissions value chain for mobility in the West of Ireland.

Objectives – the following key indicators will be assessed as part of this case study:

Economic

- Calculate the CAPEX, OPEX, LCOH dispensed for each demand scenario. This will help analyse the entire financial implications of purchasing, owning and building a business case around the HRS deployed in the Port of Galway.

Technical

- Evaluate the footprint, utility and safety requirements for each scenario. Different demand scenarios will require different numbers of compressors, storage requirements and dispensers having an effect on space requirements, utility like water and energy, which can all effect safety protocols and requirements to be put in place.

Environmental

- Calculate CO_2 emissions savings for each scenario. This will help identify the sustainability of a HRS in the Port of Galway and assess its impact to what would otherwise be diesel equivalents at port operations and the similar use cases.

Social

- Employment and effect on local community. Assessing how many jobs are either created or saved by opening a HRS that requires employees. This will not only include day to day workers, but training and upskilling that might be required.

Scope

The boundary for the work is hydrogen refuelling including on-site storage (quantity, pressure and type), compression (compressor type, pressure, number of units and stages) and dispensing (number of dispensers and dispenser pressures). Production, bulk storage and distribution, whilst part of the SH2AMROCK project, is outside the scope of the case study to be assessed as part of HyDEA, and will be represented by inputs (e.g. estimated price for hydrogen supply).

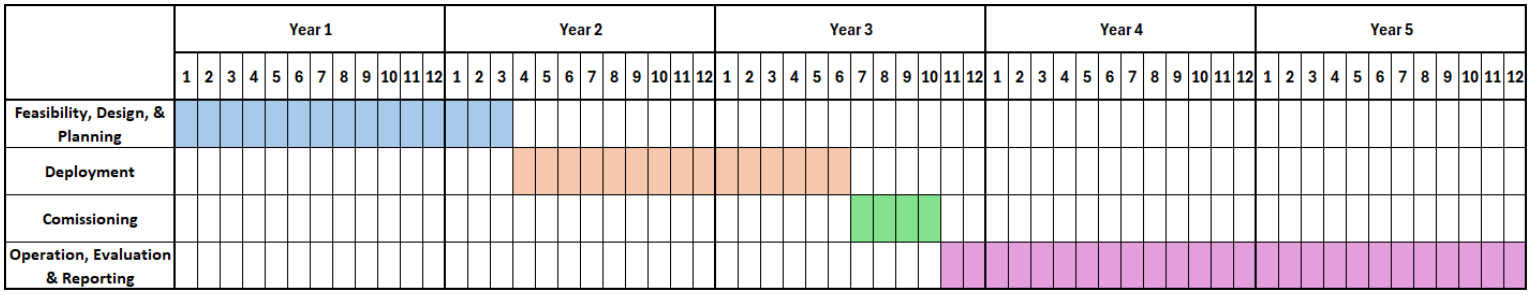
7. Implementation Timeline

The case study will follow the approximate timelines of the SH2AMROCK project, as the refuelling station is being deployed as part of this project. The SH2AMROCK project began in 2024 with deployment and operation set to take place from 2025-2028.

The **Feasibility, Design & Planning** stages of the HRS, which include technical design and regulatory approvals, has already begun and will be completed by **2026.** Feasibility study is the initial research and data gathering around deploying a HRS, with design and planning being more technical and engineering based, whilst getting regulatory approvals.

Implementation – Infrastructure **development and deployment** of H_2 technologies. This involves site works, electrical interconnection, and hydrogen refuelling station deployment will be conducted between **2025-2026.**

Operation, Evaluation & Reporting - performance monitoring and real-time data analysis will continually be done for two years post commissioning of the HRS, starting from the commissioning date at the end of **2026** taking until the end of the timeline in **2028**.



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