Interreg North Sea Region DUAL Ports
European Regional Development Fund
EUROPEAN UNION

ORKNEY ISLANDS COUNCIL
Marine Services & Transportation

September 2021

# Training course package on hydrogen

DUAL Ports is co-funded by the North Sea Programme 2014-2021; Eco-innovation priority.
J-NO: 38-2-7-15

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# About DUAL Ports

DUAL Ports is an Interreg North Sea Region project started in December 2015, with a duration of 3 years. In December 2018, DUAL Ports was extended until 2021 with an increase in partners, pilots and budget. DUAL Ports is based on the operational pilots in Regional Entrepreneurial Ports REP's). DUAL Ports will be measured in the concrete success of the pilots and the pilots' renderability to other REP's.

DUAL Ports addresses the Interreg Programme objective of promoting resource efficiency and stimulate the adoption of new products, services and processes to reduce the environmental footprint of regions around the North Sea.

## A series of pilot reports

DUAL Ports consists of 16 pilot projects and 16 partners from the port industry, knowledge institutions and tech business within sustainable energy. In a series of publications, we are introducing each of the pilot projects highlighting the experiences, results and learnings from their work. Knowledge sharing is vital for the continuous development of sustainable energy and the publications of DUAL Ports pilot projects will be a source for further work.

For more information about the Pilot Project: Training course package on Hydrogen, please contact the DUAL Ports partner:

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## Summary of pilot

Orkney Islands Council Marine services joined the Dual Port project in 2015 as an observer status but also directly partnered with ITM power who were involved in a project to design a marine bunkering system for use in the port of Kirkwall. It was noted that Orkney Islands Council were separately involved in otherwise funded project on a number of Hydrogen development in the islands and it was likely a number of these aspects could be shared with other partners. One of the other projects that was active in the run up to the amendment was https://hydime.co.uk/ funded by innovate UK and also https://www.hyseas3.eu/ funded by funder by Eu Horizon 2020. Both of these projects required seafarers to be trained to operate the Vessel and machinery on Hydrogen as a propulsion or auxiliary fuel, and a there was a need to develop and get approval of a course from the regulators.
University of the Highlands and Islands (UHI), Orkney College marine School had already developed a basic hydrogen awareness course for information and updating knowledge for the sea transport of Hydrogen which our Ferries were carrying on other routes and were an approved maritime course training center.
The Dual Ports team identified that some funding could be helpful to get a hydrogen training course developed and through approval and develop the supporting documentation. A budget was submitted with this through Orkney Islands Council, as the Orkney College is funded through the Councils Department of Education and gained approval at the 2018 amendment.
The engagement with the regulator was protracted and training documents were submitted along with tuition plans during 2019. The first iteration of the complete training scheme documentation for Compressed hydrogen gaseous fuels was submitted to the regulator the Maritime and Coastguard Agency (MCA) in late 2019 and after deliberations decided that a new team needed to look at the materials and make the recommendations. During early 2020 it was indicated that previously discounted need for crews to sit the International Gaseous Fuels (IGF) basic and advanced course as prior learning before taking the Hydrogen course which would effectively become a conversion.
The Council arranged for the preliminary courses to be sourced and funded through other projects and a number attended these at approved training establishment outwith the Orkney islands.
Final approval for the training course was granted in early December 2020 after all the learning outcomes and teaching plans had been submitted. This included, in the training program, was a training operation manual for the Vessel developed for Project Hydime. Several variations to the training scheme had to be altered to cope with Covid regulations but these were approved including remote monitoring of the College presentations and video recording of the practical exercises.

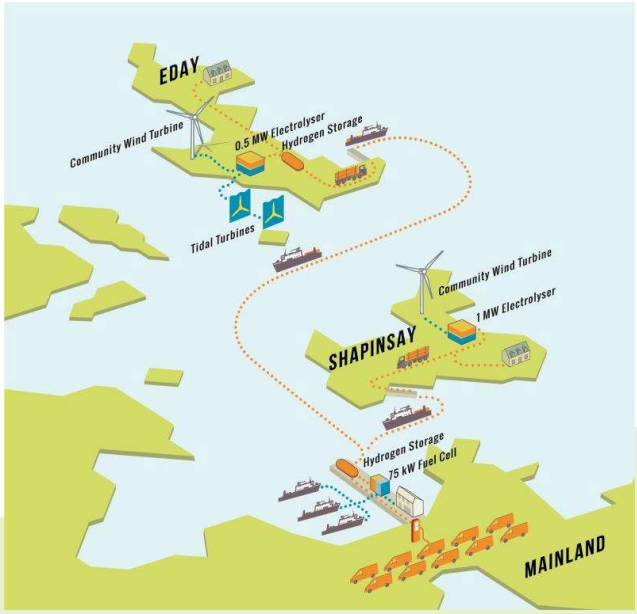
*A hydrogen trailer being transported from Shapinsay island. Crew held basic hydrogen awareness training. ( Photo Colin Keldie)*

The first course was delivered and received MCA approval during January 2021 and is now available to be those who require this training by contacting the college directly- see the press release https://www.orkney.uhi.ac.uk/news/orkney-leading-the-way-with-hydrogen-seafarer-training.html

Despite the process being extremely laborious and some of the sister projects not concluding as fully desired one of the main outcomes is that the regulators are now becoming more organized to take on the challenges of the future fuels. Our projects may have been instrumental in getting the momentum started in otherwise extremely bureaucratic organizations who run on established processes and resources to facilitate other projects are limited.

## Project Description

The initial project was to observe and contribute information and experience from a number of marine Hydrogen projects which are running as well as other which involve marine transport of the produced hydrogen gas. Early projects such as Surf-n-turf provided a fuel cell rig at Kirkwall Pier giving an output of 75kw to supply cold ironing for two ferry berths; see https://www.surfnturf.org.uk/ . Big Hit would then provide further hydrogen to be transport for use with vehicles and building heat.
The Surf-n-turf fuel cell has a dedicated training facility incorporated into the fuel cell unit for hand on experience in the control and operation of such a type of plant.




*Combined Surf-n- Turf and Big Hit logo (Image from CES)*

Further projects began to come on stream with https://www.hyseas3.eu/ and https://hydime.co.uk/ to demonstrate getting a useful quantity of Hydrogen fuel on board one of Orkney Islands Councils internal ferries and then be operating a fuel cell powered zero emission ferry on the same route.
I became clear that bespoke training would have to be delivered as it was apparent that the present international Gas Fuel (IGF)Training syllabus covered only hydrocarbon fuels, as prescribed under International Maritime Organization (IMO)requirements. In addition, the operating documents and safety guidelines held would not be appropriate to be used with Hydrogen as a fuel.
When the existing Dual Ports project was coming up for amendment there was an opportunity to seek for funding to develop course materials and gain approval for presentation in support of the ongoing marine projects.

## The Project's Objective

The object of the involvement by Orkney islands Council in the Dual Ports project evolved into delivering a Training course package on Hydrogen. This was narrowed down to providing an approved course by the regulators to allow seafarers to sail on Vessels powered by compressed hydrogen gas.

## Problem Definition

At the time of this application there was a very limited number of projects globally looking to operate hydrogen Vessels and it was not possible to identify an approved sea-farers course in the UK or EU. The IMO had not issued any guidelines, so no learning establishments had made any attempt to start working on he subject or had the UK Merchant Navy Training Board considered training syllabus. Therefore, it was clear that to gain early acceptance on this we would have to start from basic principles and work with the UK regulator to develop course materials which at least initially would be valid for use in UK waters only- which is all we would need.

## The Process – From Concept to Completion

As was clear when the issues were defined the overriding legislator for seagoing qualifications were not ready to deal with the prospect of defining the requirements as these are normally dictated by international treaty through the IMO. A lot of enthusiasm was shown by leaders charged with innovation in the Maritime and Coastguard agency however those at operational level had some issues getting to grips with the subject matter.
When we did engage with the reginal MCA office a small team was tasked with working up the course materials and the Maritime School and the Orkney council staff started to build up the learning materials and teaching plan based on the course being bespoke and training on Hydrogen gas all through the delivery. However an early requirement came through that in fact the candidate trainees would have to attend an IMO approved IGF "basic training for service on ships using fuels covered by the IGF code" and also a standards of training and certification of Watchkeepers (STCW) tanker fire training course these running for two and one days consecutively. All of his being external to the budget in Dual Port the staffing and training would come from another project https://hydime.co.uk/ . The training provider did provide some flexibility in that they did minimize the amount of irrelevant natural gas training as far as the syllabus would allow and substitute Hydrogen.
These courses are:
https://streammarinetraining.com/arlo/events/29-stcw-basic-training-for-service-on-ships-using-fuels-covered-within-the-igf-code-bigf/
and
https://streammarinetraining.com/arlo/events/6-stcw-tanker-fire-fighting-tff/

*Crew fire training using a thermal image camera to detect small Hydrogen fires ( Photo Colin Keldie)*

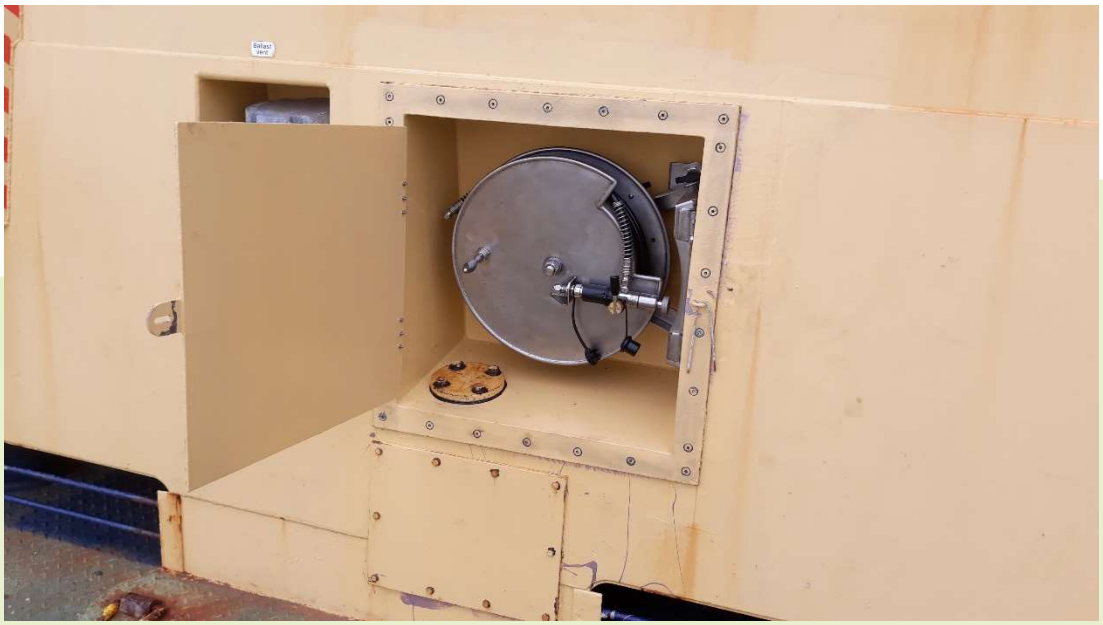
During all of this time Orkney College Marine School funded the course development from their own internal budget which had resources unsecured elsewhere and available.
However, during late 2019 the MCA decided that the original team which had indicated the materials were on the cusp of approval were replaced with an entirely new team. The new team decided that the whole training package needed to be reviewed and would revert back. No action was forthcoming during early 2020 then we ran into the beginning of the COVID pandemic, and no progress was made for some months. Materials were again reviewed, and some teaching delivery plans were updated. The major change as regarding expenses was the requirement for candidates to now hold "STCW advanced training for service on ships using fuels covered within the IGF code". This is an expensive course and requires a full working week off the Vessel roster; see https://streammarinetraining.com/arlo/events/135-stcw-advanced-training-for-service-on-ships-using-fuels-covered-within-the-igf-code-aigf/ There was funds within https://www.hyseas3.eu/ which allowed this to progress. Meantime the development of the Hydrogen conversion course continued, and it was agreed that this should not be presented until after all candidates had completed both IGF training courses to avoid confusion over fuel types! The Hydrogen course was set a four days length with practical fir drills and bunkering exercises on the final day. Exams papers were prepared, and an independent adjudicator had to be proposed and accepted by MCA. Full approval was given in late November 2020 but the MCA were then not allowing approval of new training courses due to Covid exposure risks. Further work required the approval of remote supervision arrangement by Microsoft teams and recording of the practical exercises, which was accepted prior to Christmas 2020 and the pilot course date was set for January 2021.

*Crew training for Bunker operations at the Surf-n-Turn fuel cell rig. (Colin Keldie)*

Five crew completed the training program and after deliberations by MCA the course was approved, and certificates issued. See press release https://www.orkney.gov.uk/News?postid=3796 and press coverage https://www.pressreader.com/uk/the-herald-1130/20210717/281904481190257 as an example.

## Results

As can be appreciated from the preceding text we have yet to utilize any of the budget set aside in Dual Ports to assist towards this outcome. As a result of the sluggishness within the regulatory system to get the various approvals completed the work has been slow but with determination and through the conglomeration of several projects the majority of the equipment to allow Hydrogen bunkering and Storage on MV Shapinsay is complete. All documentation has been developed, risk management workshops held and professionally reviewed as required by process.
In line with the original agreement, we have still disseminated the work done in pursuit of the original goal which was to develop a bunkering system for MV Shapinsay-by ITM power. The development subsequently was carried out by another group project Hydime outwith the scope of Dual ports but now remains part of how we achieved the training course approval!



*Hydrogen Bunkering station installed on board MV Shapinsay (Photo; David Hibbert)*

The high point within all the recent works has been the approval of the training scheme and the first five seafarers, possibly in the world, to have an accredited training qualification affiliated by UK MCA to the IMO IGF guidelines.
This point is not the end for us but we intend to keep going until we get a Vessel operating. We now have project HiMET to continue on the work on board MV Shapinsay with and also Project Hyseas 3 is currently running up the full-scale string test of the entire power plant for the Vessel design. All the previous learning will feed forward into these projects and eventual commercial use.

Certificate Number: 0001

MCA Approval Certificate Number: 5529

Department of Maritime Studies
Victoria Street
Stromness
Orkney
KW16 3BS
Tel; 01856 569401

Inquiries concerning this certificate should be addressed to the Issuing Authority at the address above.

CERTIFICATE OF ADVANCED TRAINING FOR SERVICE ON SHIPS USING COMPRESSED HYDROGEN GASEOUS FUELS

This is to certify that

Date of Birth

has successfully completed training including Hydrogen gas firefighting in the use of Hydrogen as an alternative fuel on ships as required by the IGF Code Part D(19.2) and has also met the additional criteria specified in the relevant STCW regulation and code, applicable to the issue of this certificate.

This certificate is issued under the authority of the Maritime and Coastguard Agency of the United Kingdom of Great Britain and Northern Ireland, an executive agency of the Department of Transport.

| | | |
|---|---|---|
| Signature of Principal or Authorised Representative of the Approved Training Centre | _____ | DAY MONTH YEAR |
| Signature of person to whom this certificate was issued | _____ | |

*Approved Hydrogen certificate for Vessel crews.*

## Deliverables and milestones

- Outline of training scope indicated by MCA spring 2019
- Summer 2019 Vessel crews sent to training center for basic IGF training and Tanker fire fighting
- Tentative approval of learning programmed November 2019
- MCA to review learning plan December 2019
- Requirements for advanced IGF training advised by MCA April 2020
- Crews to take advanced IGF course at training center October 2020
- UHI Orkney college receives course approval November 2020
- Work around to allow course approval through Covid restrictions December 2020
- First Hydrogen Fueled Vessel Course delivered January 2021
- MCA review course delivery and approve course for future instruction February 2021

## What makes this project sustainable?

With renewable fuel options now on the cusp of coming into the mainstream of use in shipping training materials of this type are going to become invaluable to allow sufficient safety and operational training to be carried out to seafarers who will need to come in as new entrants to the industry or be retrained to master the new technology and challenges. We are pushing ahead with marine development and the latest news on Hyseas 3 can be followed here https://www.hyseas3.eu/news-media/ . In addition we now are embarking on a new project to follow on some of the work left off by Hydime and is HiMet see http://www.emec.org.uk/press-release-maritime-decarbonisation-to-cruise-forward-in-orkney/ this will have full funding to get the more Orkney Ferries crew through training and in preparation for working on this project and for Hyseas 3 should the Vessel build get approved after completion of design early in 2022.

# Data, facts and figures

Exact figure is not available as to resource use.as several resource areas were drawn upon. The Key point is the UHI Orkney Collage marine School now can arrange and delivery a course approved for UK waters, meantime, for seafarers working on Vessels Fueled by compressed Hydrogen gas. We completed training of 5 seafarers serving on board MV Shapinsay Ferry. The course is approved and available to other on demand from UHI Orkney College.

# Conclusions & lessons learned

The primary lesson here is the preparation to have multiple setbacks from the regulators when no clear rules exist for what is being proposed. In addition, an awareness of the regulator's preparedness for change in the areas needed. Now we see in the MCA a future fuel team having been formed and project groups for dealing with regulatory issues that arise with new projects. However, these issues dogged the entire Hydime project, and we were commended by the project officers on sheer diligence and awarded several extensions to incrementally try and push the regulators on both technical design and training. The process adopted on risk-based design completed after several iterations and now has appeared in other marine class societies other than Lloyds Register. Whether our project was key or just as part of several around Europe and now the regulators have some momentum building to put in place systems to allow full delivery or reasoned scrutiny with practical timescales.

***Someone had to do it!***

# Partners

**Project Surf-n-Turf- Local Energy Challenge Fund**
Community Energy Scotland
Eday Renewable Energy
EMEC
ITM power
Orkney Islands Council

**Project Hydime -Innovate UK**
Ferguson Shipyard
HSSMI
ULEMCo
Lloyds Register
EMEC
Orkney Ferries

**Project Hyseas 3- EU Horizon 2020**
University of St Andrews
Ferguson Marine Engineering Limited
Ballard Power Systems Europe A/S
Orkney Isles Council/Orkney Ferries
The DLR Institute of Networked Energy Systems
Interferry
McPhy Energy SA
Kongsberg Maritime AS

## Contact information

For more information about the Pilot Project: [insert project name], please contact the DUAL Ports partner:

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