IAPH AWARDS 2026

Climate & Energy

CAPCO2 — ONBOARD CO2 CAPTURE WITH PORT-BASED SOLVENT REGENERATION

Context

The **CAPCO2 project** is **developed within the framework of the Blue Growth Vigo Strategy**, launched by the Port Authority of Vigo in 2016 and inspired by the European Commission's Blue Growth approach. The strategy is based on a collaborative governance model that brings together stakeholders from the quadruple helix—public institutions, academia, industry and civil society—to promote sustainable innovation in the port-maritime ecosystem.

Under this strategy, the **Port Authority of Vigo** acts not only as an **infrastructure manager but also as a facilitator of innovation**, identifying strategic challenges, mobilising stakeholders and creating the conditions for pilot projects capable of generating economic, environmental and social value. CAPCO2 is a direct result of this leadership approach and reflects the Port's long-term vision of positioning Vigo as a reference hub for maritime decarbonisation and climate resilience.

The challenge

Shipping must cut its greenhouse gas emissions, and onboard CO2 capture is one of the few levers available to vessels that will continue using carbon-based fuels during the transition. The obstacle is not the equipment aboard the ship. It is what happens when the captured CO2 reaches land. Today, almost no European port is prepared to receive, regenerate or evacuate captured CO2 at scale. The bottleneck of onboard capture sits in the port, not at sea.

The Port of Vigo has decided to act on exactly that gap. Rather than wait for a mature CO2 transport and storage chain to appear, the

Port is building the missing piece itself: the port-side infrastructure that turns onboard capture into a complete, verifiable cycle. CAPCO2 is the first demonstration of that ambition, and the starting point of a port-based CO2 logistics layer with Vigo as its first node.

A capture system whose defining innovation sits ashore

CAPCO2 is an onboard CO2 capture system based on amine (MEA) absorption. Vessels capture CO2 from their exhaust during normal operation. The distinctive design decision is that the energy-intensive regeneration of the solvent does not take place aboard the ship. It takes place in port, using industrial residual heat already available on land.

This port-centred approach represents a paradigm shift in maritime decarbonisation: instead of treating ports as passive recipients of emissions regulations, CAPCO2 transforms port infrastructure into an active decarbonisation service provider.

This single choice moves the heaviest energy burden off the vessel and onto port infrastructure, and it means that, from the shipowner's regulatory perspective, gross capture equals net capture.

Because regeneration happens ashore, the Port of Vigo can support two complementary logistics routes. The first, distinctive to this project, is solvent logistics: the CO2-rich solvent is offloaded in port, regenerated on land with residual heat, and the regenerated solvent is bunkered back to the vessel for its next voyage. The CO2 is released and managed on land, so the shipowner achieves verified net capture without depending on a mature liquefied-CO2 chain being in place. The second is the conventional liquefied-CO2

route: reception, storage and onward evacuation toward a permanent sink.

By enabling an operational pathway before large-scale CO2 transport and storage networks are fully developed, CAPCO2 demonstrates a practical and highly innovative route to accelerate shipping decarbonisation today rather than waiting for future infrastructure.

The system can be retrofitted onto existing vessels and equally designed as a catch-ready solution in newbuilds.

Demonstrated, not only designed

Between July and October 2025 the Port of Vigo hosted a certified pilot campaign of CAPCO2, **achieving 42 kg/h of net capture as a prototype in operation**. On October 30th the project was presented to the local maritime industry with a live demonstration of the system in operation. **The pilot received an Approval in Principle from Bureau Veritas**. The figures below summarize the demonstrated outcome to date.

Location	Port of Vigo, Spain
Date	July to October 2025; live industry demonstration on 30 October 2025
Net capture	42 kg/h (prototype in operation)

Capture method	Amine (MEA) absorption, port-side solvent regeneration with industrial residual heat
Certification	Approval in Principle, Bureau Veritas
Framework	PERTE Naval (Spain), maritime decarbonization
Deployment modes	Retrofit on existing vessels and native catch-ready design for newbuilds

This is a working prototype with a defined development path toward port-scale operation, not a finished commercial system. Presenting it as a measured benchmark, rather than a performance guarantee, is deliberate: the value of the Vigo pilot is that it converts a concept into a number that can be audited.

The project combines measurable operational results, independent technical validation, public demonstrations and supporting engineering documentation, providing a robust basis for future deployment and replication.

Contribution to climate goals and the UN SDGs

CAPCO2 turns regulatory pressure on shipowners into a service anchored in the port and aligns with the emerging direction of the International Maritime Organization on onboard carbon capture. The project contributes directly to:

Through the reuse of industrial residual heat that would otherwise be wasted

By building new port-side decarbonisation infrastructure.

By reducing CO2 emissions from vessels calling at Vigo

By cutting the carbon load that shipping places on the marine environment

Through its multi-stakeholder governance model and collaborative development framework involving public authorities, industry, technology centres, classification societies and the maritime community

A project built with partners

The Port of Vigo is developing CAPCO2 within the **Spanish PERTE Naval framework**, the national instrument for the decarbonisation of the maritime sector, co-financed by the European Union through the Recovery, Transformation and Resilience Plan (NextGenerationEU).

The technology is led by **Willbö Engineering** and developed together with **Astilleros de Santander, Astilleros Canarios, IDESA, Ership and the Soermar Technology Center**. Classification expertise is provided by **Bureau Veritas**, which issued the Approval in Principle. The Port is engaging local shipowners whose vessels operate short-sea routes where this solution delivers the greatest benefit.

Beyond the project consortium, CAPCO2 benefits from the stakeholder engagement mechanisms established through the Blue Growth Vigo Strategy, which facilitate dialogue between industry, research organisations, public administrations and civil society. This collaborative ecosystem has been instrumental in transforming a technological concept into a demonstrable port-based climate solution.

soermar

CAPCO2

willbö

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BUREAU VERITAS

IDESA

ASTICAN

Port of Vigo

Port Authority of Vigo

From Vigo outward

Having completed the PERTE Naval project with a certified pilot, the Port of Vigo and its partners are now evolving the system toward a pre-commercial stage.

The Port Authority's vision is to position Vigo as the first **operational node of a future European network of ports** capable of supporting onboard carbon capture, creating a scalable logistics layer for captured CO2 and accelerating the decarbonisation of maritime transport.

The approach is **replicable across European ports** with access to industrial residual heat, making Vigo a template rather than an exception.

Furthermore, the project has been **conceived from the outset as a transferable model** that can be adopted by other ports, encouraging future inter-port cooperation and knowledge sharing in support of common climate objectives.

The objective is to consolidate this first node into a port-based CO2 logistics layer and to position Vigo within the broader European CO2 corridor. CAPCO2 is the embryo of that larger ambition: the demonstration that the path to net-zero shipping can be built, quite literally, from the port outward.