

## Project summary

The Apollo project will mature and demonstrate in operational environment, the disruptive installation of a dual fuel ammonia engine in an offshore supply vessel to ammonia operation reducing emissions by 70%. The project is developed to closely answer the HORIZON-CL5-2022-D5-01-04 topic of transformation of the existing fleet towards greener operations through retrofitting (ZEWT Partnership).

### **The specific objectives include:**

- 1) Successful large-scale demonstration of the use of dual-fuel ICE (ammonia-based) in an existing vessel;
- 2) Complete first classification under DNV “Gas fuelled, Ammonia”;
- 3) 70% reduction of CO<sub>2</sub> emissions and NO<sub>x</sub> emissions below 2.4 g/kWh from vessel operations;
- 4) Complete retrofitting solution to operate on ammonia, through development of safe ammonia storage and operation, including both deck load or below deck tanks;
- 5) Demonstrate the retrofit in replicators in other two vessels with different use (dredging and offshore construction) and validate feasibility for scaling;
- 6) Support to the expansion of the ammonia bunkering network in the North Sea and beyond, obtain 100% green ammonia for the project’s needs;
- 7) Validated business case for ammonia as a ship fuel with operational expenditures <130% from baseline by project end.

The Apollo solution will be flexible, so ship owners, ship designers, shipyards, classification agencies and insurance companies can quickly adopt it into their decision-making processes. The consortium will prepare the business case for ammonia in the waterborne transport sector, from the production of green ammonia to its use in different ships on the European scale.

### **To achieve the specific objectives, the Apollo project is divided into 7 work packages:**

#### **WP1 - Project and innovation management**

The objectives are to:

1. Ensure a fast start and agile project organisation and processes;
2. Set-up and implement the management process to ensure a smooth running of the project and guarantee high-quality and timely project deliverables and results within the agreed budget;
3. Ensure effective coordination, communication and reporting with the European Commission (EC), Advisory Board (AB) and partners;
4. Comply with all administrative, financial and contractual obligations and requirements as stipulated in the grant agreement;
5. Formulate, implement and continuously evaluate a risk contingency planning.

## **WP2 – Dissemination, communication and stakeholder engagement**

The objectives of the WP2 are to define and implement a strategy for effective and integrated dissemination and communication of Apollo’s activities and results to all relevant and targeted stakeholders where the specific objectives include:

1. Establish a clear communication flow of project information and results inside and outside the project and develop and maintain the Plan for Dissemination, Exploitation and Communication (PDEC);
2. Develop appropriate tools and strategies to engage key stakeholders about the potential of Apollo for accelerating the achievement of climate neutrality of waterborne transport using ammonia as fuel for retrofit modifications in existing fleets.
3. Raise awareness and contribute to external EU initiatives on relevant topics, including industry and policy recommendations.
4. Contribute, upon invitation by the CINEA, to common information and dissemination activities to increase the visibility and synergies between HE/H2020 supported actions.

## **WP3 – Design development of vessel specific ammonia fueled power generation system**

Objectives of the WP3 are the installation specific adaptation of pre-developed TRL6 technology by WTS, modelling of CO<sub>2</sub> emissions with actual confirmation during operation (WP5), consultation to ship design, consultation to shipyard during installation, commissioning support and start-up, fine-tuning and ammonia component follow-up after 1000 running hours.

## **Work package WP4 – Planning and preparation for demonstration**

The objectives are to complete the necessary planning processes, risk assessment and safety analysis to ensure successful retrofit of the demonstrator based on the outcomes of WP3.

## **Work package WP5 – Demonstration of retrofitting on a vessel in operational environment**

The objectives are to convert a large offshore vessel to utilize a combination of Ammonia and MGO on a mixture of at least 70% ammonia and up to 30% MGO, and to demonstrate the technology in operation during a 6-month pilot period. The replacement of two WTS 6R32DF engines with one new W25DF engine and the installation of required fuel supply and safety system will be performed on board the demonstrator vessel based on the outcome of the WP3 and WP4. The WP5 will also perform testing and validation of the systems and safety approval of the retrofitted vessel.

## **Work package WP6 – Replication study for other vessel types**

The objectives are to ensure replicability and scalability of the Apollo ammonia fuelled ship solution by completing studies on operational, design and infrastructure requirements. Compile an up-to-date catalogue of solutions for a variety of ship types and operation scenarios.

### Work package WP7 – Exploitation planning

The objectives are to ensure the entire supply chain of Apollo is prepared to enable market uptake once the Apollo solution is introduced to the market. Specifically, we will:

1. Update the exploitation strategy and technology-to-market;
2. build an out-bound sales and delivery partner network to support our internationalisation objectives and maximise market uptake; and
3. validate and optimize matching local value propositions and price strategies to ensure new market uptake.

The deliverables are as follows:

Work Package No	Deliverable Related No	Deliverable No	Deliverable Name	Lead Beneficiary	Dissemination Level
WP1	D1.1	D1	Internal project management and communication strategy	MCT	SEN
WP1	D1.2	D2	Data Management Plan M6	MCT	SEN
WP1	D1.3	D3	Data Management Plan M18	MCT	SEN
WP1	D1.4	D4	Data Management Plan M36	MCT	SEN
WP1	D1.5	D5	Project risk log M12	EDV	SEN
WP1	D1.6	D6	Project risk log M24	EDV	SEN
WP1	D1.7	D7	Project risk log M36	EDV	SEN
WP2	D2.1	D8	Plan for Dissemination, Exploitation and Communication (PDEC) M6	MCT	SEN
WP2	D2.2	D9	Plan for Dissemination, Exploitation and Communication (PDEC) M18	MCT	SEN
WP2	D2.3	D10	Plan for Dissemination, Exploitation and Communication (PDEC)	MCT	SEN

			M36		
WP2	D2.4	D11	Project website, initial live version for continual update	MCT	PU
WP2	D2.5	D12	Report on Apollo demo day	MCT	PU
WP3	D3.1	D13	“As-is” vs “to-be” emissions comparison report	WTS	SEN
WP3	D3.2	D14	General Arrangement Specifications	WTS	SEN
WP4	D4.1	D15	Ship technical drawings and retrofit specifications.	EDV	SEN
WP4	D4.2	D16	Safety assessment study	EDV	PU
WP4	D4.3	D17	Report on training procedures and programmes	EDV	PU
WP4	D4.4	D18	Approval in principle for vessel integration	EDV	PU
WP5	D5.1	D19	Test report of conversion	EDV	SEN
WP5	D5.2	D20	Vessel safety assessment and approval report	EDV	PU
WP5	D5.3	D21	Report on 6-month operations	EDV	PU
WP5	D5.4	D22	Inspection report	EDV	PU
WP6	D6.1	D23	Technical specifications for replicators	VTT	PU
WP6	D6.2	D24	Operational patterns of selected ship types	VTT	SEN
WP6	D6.3	D25	Study of overall impact of ammonia as ship fuel	VTT	SEN
WP7	D7.1	D26	Business plan interim	BSD	SEN
WP7	D7.2	D27	Business plan final	BSD	SEN
WP7	D7.3	D28	GAP analysis towards	BSD	PU

			existing regulations, and relevant port infrastructure		
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