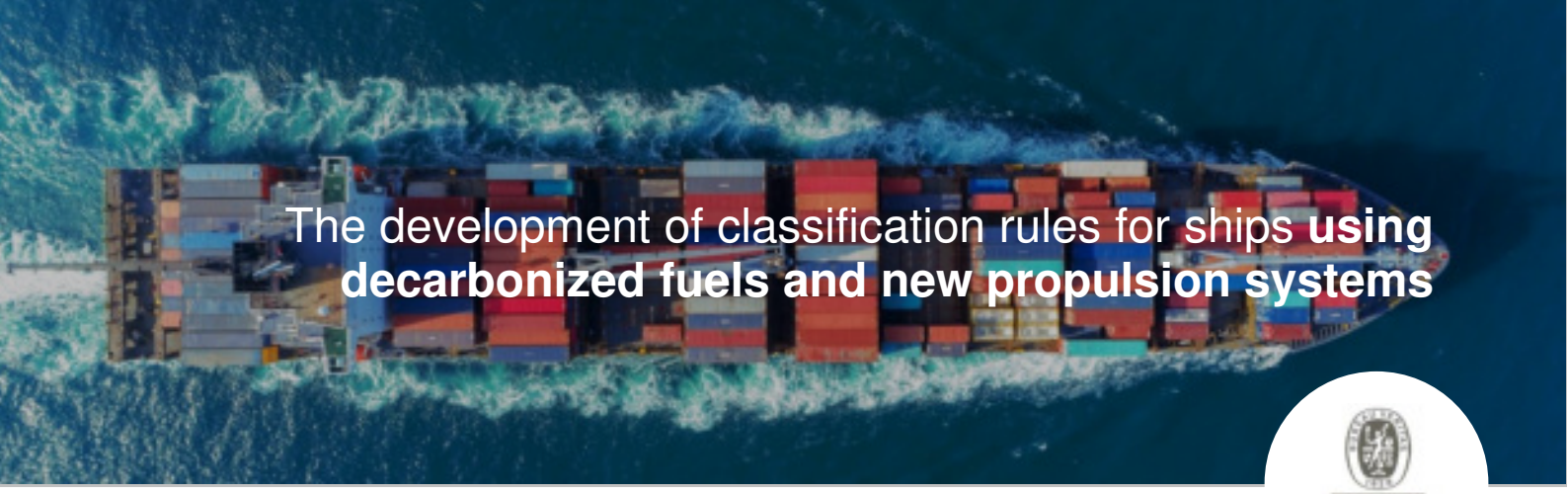

The development of classification rules for ships **using decarbonized fuels and new propulsion systems**

The use of decarbonized fuels produced from renewable energy and of alternative propulsion systems bring new challenges to demonstrate an equivalent level of safety when compared to conventional fuels and propulsion systems. Bureau Veritas contributes to address those challenges by developing classification rules and guidelines for ships using new fuels (such as methanol, ammonia or hydrogen) and alternative propulsion systems.

Starting date of the project	January 2020
Project Localisation Places of implementation of the project at this stage and targeted geography if replicable.	Worldwide
Project objectives Type of climate innovation of the project with a description of the problem/issue addressed	The International Maritime Organization has defined a strategy for the shipping industry to reduce its greenhouse gas emissions by 50% in 2050 compared to the 2008 level. The development of industrial solutions is well underway to meet the IMO objectives and tackle the energy transition. New fuels and new propulsion systems will be key enablers providing an alternative to today's hydrocarbon based systems to decarbonize the shipping industry. New fuels being considered are, as follows: • Green hydrogen, produced by water electrolysis using renewable electricity; • Green methanol, synthetized by renewable electricity from green hydrogen and CO_2 coming from carbon capture or from biomass; • Green ammonia, synthetized by renewable electricity from green hydrogen and nitrogen from air New propulsion systems include: • Wind propulsion systems – rotors, sails, wingsails, kites • Electric-hybrid / battery systems • Fuel cells Design, production and onboard integration of innovative systems and components for wind propulsion and the use of new fuels represent significant industrial and regulatory challenges to ensure an equivalent level of safety when compared to conventional fuels and systems. The technical rules for safe bunkering, storage, handling and power conversion of new fuels onboard ships are to be developed while learning and gaining experience with technical innovations in order to accelerate their use. **Bureau Veritas contributes to the development of these decarbonized solutions by :** • **Developing classification rules and guidelines for the use of methanol, ammonia and hydrogen as fuel** • **Developing classification rules for wind propulsion and wind assisted propulsion.**
Detailed project description	Bureau Veritas is addressing the challenges of sustainability and the energy transition by providing solutions to the safety, risk and performance requirements for innovation in future fuels and propulsion systems. The role of Bureau Veritas is to provide support and in-depth knowledge to protect people, ships and offshore structures, going beyond the scope of individual projects to find new ways to anticipate and manage risk across the industry, promoting safety and health, and protecting the marine environment. We work with the industry to support innovation via new rules and tools. Flag State administrations worldwide rely on Bureau Veritas to verify the implementation of international and national regulations on marine safety and environmental protection (IMO SOLAS conventions for the safety of human life at sea and IMO MARPOL for the prevention of pollution from ships, for example). The development of technical rules is the cornerstone of classification societies. Classification and statutory certificates are essential for the operation of ships. Marine insurers require this type of certificates to insure

them, and port authorities regularly check their validity when a ship calls in a port. Likewise, it is essential for operators to ensure that offshore units comply with safety; quality standards and regulatory requirements.

Considering the current shipping world trends in terms of research and innovation to meet the challenge of decarbonizing the industry, we consider it is essential to bring technical expertise in the form of “Guidance Notes” or “Tentative Rules” as appropriate for:
- Methanol (and ethanol), ammonia and hydrogen as fuels, developing technical classification rules considering available statutory regulations. These technical rules include requirements for the general design of the ship and the associated safety assessment, the design and location of the bunkering systems, tanks, fuel pipes and associated systems, materials used, power conversion systems (engines, fuel cells), safety with regards to the risks of fire, explosion, toxicity, ventilation and the various monitoring and control systems.
- Wind propulsion by developing technical classification rules which include requirements for wind energy conversion systems (sails, rigid sails), their integration on board and their connection to the ship’s structure, safety of the vessel (stability, mobile systems) as well as the various monitoring and control systems.

Our rules are developed through a thoughtful and comprehensive process with input from different stakeholders. They are regularly assessed and updated to reflect the latest progress. The following rules and guidelines are/will be available

- Note for “Methanol and Ethanol as fuel”
- Note for « Ammonia as fuel »
- Note for « Fuel Cells » and « Hydrogen as fuel » (already available, being updated)
- Note for « Wind propulsion » (already available)

Main project's drivers for reducing the greenhouse gas emissions

Reduction levers	Details on the aspects of the project
☐ Energy and resource efficiency (including behaviour)	
☐ Energy Decarbonisation	Contribution to a regulatory framework to support the decarbonization of the shipping industry
☐ Energy efficiency improvements	
☐ Improving efficiency in non-energy resources	
☐ Emissions absorption: creation of carbon sinks, negative emissions (BECCS, CCU/S, ...)	
☐ Financing low-carbon producers or disinvestment from carbon assets	
☐ Reduction of other greenhouse gases emission	

Emission scope(s) on which the project has a significant impact and quantification of GHG emission reductions per emission scope

	Aspects of the project contributing to the reduction of emissions by emission category	Quantification of associated GHG emissions by emission category Please follow the quantification methodology used in the Afep guidelines.
Reduction of the company's carbon dependency		
Scope 1 *Direct emissions generated by the company's activity.*		
Scope 2 *Indirect emissions associated with the company's electricity and heat consumption.*		
Scope 3 *Emissions induced (upstream or downstream) by the company's activities, products and/or services in its value chain.*		
Increase of carbon sinks		
Emissions Absorption *Carbon sinks creation, (BECCS, CCU/S, …)*		
GHG emissions avoided by the company at third parties		
Avoided Emissions *Emissions avoided by the activities, products and/or services in charge of the project, or by the financing of emission reduction projects.*	Classification rules and guidelines help to develop and use new technologies that contribute to reduce GHG.	6,7 million tons of CO2 / year between 2025 and 2050, for shipowners classing their ships with Bureau Veritas.

Clarification on the calculation or other remarks:

	- Emissions 2018 : Worldwide emissions of international maritime transport in 2018: 1056 million tons of CO2 • Worldwide fleet ratio classed with Bureau Veritas : 8% (fleet ratio giving 85 million tons of CO2 in 2018 for the fleet classed with Bureau Veritas) - Emissions 2050 : Projection of worldwide CO2 for international maritime transport in 2050 (Source: International Maritime Organization – IMO): • 2500 million tons of CO2, « business as usual » scenario, or • 397 million tons of CO2, meeting the IMO objectives - Contribution of fleet classed with Bureau Veritas : Worldwide fleet ratio classed with Bureau Veritas in 2050 : 8%, which gives: • 200 million tons of CO2, « business as usual » scenario, or • 32 million tons of CO2, using new fuels and technologies meeting the IMO objectives Ships built with onboard technologies for decarbonized energy will be deployed significantly from 2025, with a gain for BV classed ships estimated at 168 million tons of CO2 for the period 2025-2050, or the equivalent of 6.7 million tons of CO2 per year.
Modality of verification of the quantification.	**Calculation standard used (ADEME base, GHG protocol, etc.):** GHG Protocol **Verification of the calculation (internal or external):** Internal verification
Other environmental and social benefits of the project	Through this, BV contributes to the following SDGs : • SDG 6 – Clean water and sanitation • SDG 7 – Affordable and clean energy • SDG 13 – Climate action
Project maturity level	☐ Prototype laboratory test (TRL 7) ☒ Real life testing (TRL 7-8) ☒ Pre-commercial prototype (TRL 9) ☐ Small-scale implementation ☐ Medium to large scale implementation **Remarks**: Technologies involved indirectly are currently at TRL levels from 7 to 9
Capacity and conditions of the project reproducibility, with associated climate impact mitigation potential	Reproducibility is unlimited as classification rules are applicable worldwide.
Amount of investment made (in €)	700 k€ investment per year, project started in 2020 with an initial phase up to 2023. Subsequent phases will be focused on revisions and maintenance of technical rules developed during the initial phase.
Economic profitability of the project (ROI)	☒ ST (0-3 years) ☐ MT (4-10 years) ☐ LT (> 10 years) **Remarks:** The availability of technical classification rules will allow BV to win ship classification contracts. In 2025-2030, a significant part of new ships will be built with power conversion technologies using new fuels (methanol, ammonia, hydrogen). About half of the turnover of BV Marine & Offshore activity comes from activities related to the new construction of ships (around 150M €). If 20% of new ships integrate these new technologies by 2027, this would represent for BV a turnover of around € 30 million generated by the availability of classification rules useful for the maritime industry.
Engaged partnerships	Several partnerships have been engaged: • Collaborative projects in France and in Europe: o PACBOAT project funded by ADEME with Chantiers de l'Atlantique, CEA and Entrepose to develop and integrate a fuel cell onboard a cruise ship; o Project « Silentseas » with Chantiers de l'Atlantique • Participation to WATERBORNE European technology platform to contribute to the preparation of european R&D programmes
Open comments from the project owner	/
More about the project	
Contact the company carrying the project	Please visit https://marine-offshore.bureauveritas.com/contact-us
Project URL links	https://marine-offshore.bureauveritas.com/expertise-sustainability

Illustrations of the project