CHINESE ACADEMY OF ENGINEERING

PORTUGUESE ACADEMY OF ENGINEERING

# FORUM ON MARINE TECHNOLOGY AND OCEAN ENGINEERING

**2 – 3 September 2026**

**Lisbon, Portugal**

# Local Organisers

- **Prof. Carlos Guedes Soares**

  Member of the Portuguese Academy of Engineering (PAE)
- **Prof. Sebastião Feyo de Azevedo**

  President of the Portuguese Academy of Engineering (PAE)

# Scientific Coordinators

- **Prof. Xinping Yan,** Wuhan University of Technology

  Member of the Chinese Academy of Engineering (CAE)
- **Prof. Carlos Guedes Soares**, Técnico, Universidade de Lisboa

  Member of the Portuguese Academy of Engineering (PAE)

# Organisation with the support of

ORDEM DOS ENGENHEIROS

TÉCNICO UNIVERSIDADE DE LISBOA

CENTEC

CENTRE FOR MARINE TECHNOLOGY AND OCEAN ENGINEERING

**Chinese Embassy in Portugal**

# Sponsor

HUAWEI

# Meeting Plan

## I. Overview

- **Title:** CAE-PAE Forum on Marine Technology and Ocean Engineering
- **Date:** 2-3 September 2026
- **Place:** Lisbon, Portugal
- **Venue:** Auditório Ordem dos Engenheiros, Avenida António Augusto de Aguiar, 3D, 1069-030 Lisboa
- **Participants:** 14 speakers and audience

## II. Agenda

### September 1: Technical Tour

| | |
|---|---|
| 14:00 - 15:30 | Visit to CENTEC |
| 15:30 - 17:00 | Visit to LNEC |

### September 2: Forum Agenda

| Schedule | CONTENTS |
|---|---|
| 09:00 - 09:30 | Registration |
| **Opening Ceremony**<br>**Chair:** Sebastião Feyo de Azevedo, President PAE | |
| 09:30 – 10:10 | • Welcoming and Opening remarks by Sebastião Feyo de Azevedo, President PAE,<br>• Opening remarks by Jianfeng Chen, Vice-President of CAE<br>• Remarks by Jorge Liça, Vice-president of the Portuguese Association of Engineers<br>• Remarks by Ambassador Yang Yirui, of the People´s Republic of China in Portugal (by video)<br>• Remarks by Profs Xinping Yan and Carlos Guedes Soares, Scientific Coordinators |
| 10:10 - 10:15 | Signing of MoU |

| Sessions<br>**Chairs:** Carlos Guedes Soares and Xinping Yan | |
|---|---|
| 10:15 - 10:30 | *Presentation 1*: Ocean Engineering in China: Innovations and Future Prospects<br>*Speaker*: Huajun Li |
| 10:30 – 10:45 | *Presentation 2*:<br>Decarbonization and intelligence as the main trends in the ship industry<br>*Speaker*: C. Guedes Soares |
| 10:45 - 11:00 | *Presentation 3*: Latest developments on intelligent and green ports in China<br>*Speaker*: Xinping Yan |
| 11:00 - 11:30 | **Coffee break** |
| 11:30 - 11:45 | *Presentation 4*: Present situation and prospects of implementation of green and intelligent technologies in the Portuguese Ports<br>*Speaker*: Pedro Ponte |
| 11:45 - 12:00 | *Presentation 5*: Development and application of hydrodynamic experimental techniques in ocean engineering<br>*Speaker*: Jianmin Yang |
| 12:00 - 12:15 | *Presentation 6*: Shipbuilding and Ship Repair activity in Portugal<br>*Speaker*: Carlos Silva and Tiago Carvalho |
| 12:15 - 12:30 | *Presentation 7*: Green and Sustainable Development of Deep-Sea Mineral Resources<br>*Speaker*: Jiabiao Li |
| 12:30 - 13:00 | Panel Discussion |
| 13:00 - 14:30 | **Lunch break** |
| 14:00 - 14:30 | **CAE-PAE leaders bilateral meeting**<br>at Ordem dos Engenheiros |

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|---|---|
| 14:30 - 14:45 | *Presentation 8*: The role of technology in offshore oil and gas production<br>*Speaker*: Marco Ferraz |
| 14:45 - 15:00 | *Presentation 9*: Development of Fendouzhe, the Full-ocean-depth Manned Submersible for Routine Operations<br>*Speaker*: Cong Ye |
| 15:00 - 15:15 | *Presentation 10*: Principle Power's WindFloat®: Scaling to Industrial Production<br>*Speaker*: Carlos Bicho |
| 15:15 - 15:30 | *Presentation 11*: Innovation and Practices of Floating Offshore Wind Power Technology in China<br>*Speaker*: Qiying Zhang |
| 15:30 - 16:00 | **Coffee break** |
| 16:00 - 16:15 | *Presentation 12*: Prospects for offshore fish farming in Portugal<br>*Speaker*: Pedro Pousão |
| 16:15 - 16:30 | *Presentation 13*: Recent Advances on Ocean Waves Modelling and Forecasting by Using Deep Learning Methods<br>*Speaker*: Limin Huang |
| 16:30 - 16:45 | *Presentation 14*: Wave modelling and operational safety of ports<br>*Speaker*: Liliana Pinheiro |
| 16:45 - 17:15 | Panel Discussion |
| **Closing Ceremony** | |
| 17:15 - 17:30 | Closing remarks by Profs Xinping Yan and Carlos Guedes Soares |
| **Evening Programme** | |
| 19:30-22:30 | Cruise on the Tagus River |

**September 3: Technical Tour**

| | |
|---|---|
| 8:30 - 12:30 | Visit to LISNAVE shipyard in Setúbal |

# III. Abstracts and Speaker Profiles

**Huajun Li**

Ocean University of China

## Ocean Engineering in China: Innovations and Future Prospects

### Abstract:

This report outlines recent advances and future technological directions in China's ocean engineering sector. The offshore oil and gas industry has built a full chain deepwater development system covering operations from the sea surface to subsea wells. Significant breakthroughs have also been made in high end offshore wind power equipment, the "China Solution" for deep sea aquaculture, large scale marine construction vessels, and blue bay ecological restoration.

However, key challenges persist, including sensor performance limitations, adaptability to extreme marine environments, fusion of massive heterogeneous data, and uncertainties in restoration outcomes. Interdisciplinary R&D is concentrated on corrosion and pressure resistant materials, digital twins and autonomous underwater vehicle (AUV) intelligent collaboration, full lifecycle green technologies, deep sea power systems, and underwater acoustics. This work follows a clear trajectory: from device-level innovation to system integration, then to network intelligence, and ultimately to application-level synergy.

A profound paradigm shift is currently under way, characterised by four major transitions: in engineering philosophy—from confrontation and defence to symbiosis and adaptation; in technical systems—from traditional mechanisation to digital and

intelligent drives; in development models—from single layer surface utilisation to three dimensional integration spanning the seabed to the surface; and in overall vision—from resource depleting exploitation to a sustainable, circular, and ecologically regenerative approach.

## Personal Profile:

**Huajun Li** is a professor at Ocean University of China with expertise in ocean engineering and a member of the Chinese Academy of Engineering. Engaged in research on ocean engineering structures, hydrodynamics, and safety and disaster prevention technologies, Prof. Li has addressed major national needs for ocean resource development with outstanding contributions to the design, construction, safe operation, and maintenance of novel marine engineering structures. He has published over 300 papers and authored 5 books. More than 100 national invention patents have been granted. Prof. Li has received the National Science and Technology Award three times, the highest science and technology award in Shandong Province, and eight first prizes of provincial and ministerial-level science and technology awards. He also received the He-Liang-He-Li Innovation Award, the Guanghua Engineering Science and Technology Award, and was named a National Model Worker. Currently, he serves as Chairman of the Teaching Guidance Committee for Ocean Engineering Majors in Higher Education Institutions under the Ministry of Education, President of the Council of the Ocean Engineering Branch of the Chinese Society of Oceanography, and Vice Chairman of the Chinese Society of Naval Architects and Marine Engineers.

**Carlos Guedes Soares**

Centre for Marine Technology and Ocean Engineering (CENTEC),

Técnico Lisboa, Universidade de Lisboa

# Decarbonization and intelligence as the main trends in the ship industry

## Abstract:

An overview of the main trends identified in commercial shipping is provided as technology is developed and implemented in new ships and retrofitted into some existing ships. Decarbonization of the world fleet is being progressively implemented, with new technology incorporated into new ship designs and constructions and the adaptation of the existing fleet through different types of retrofits.

“Green shipping” or “sustainable shipping” is a long-term objective for the shipping industry to transport goods without greenhouse gas (GHG) emissions. This could be achieved by developing new fuels such as liquefied natural gas, methanol, hydrogen, or ammonia, alongside the simultaneous development of maritime engines to operate on these fuels and the creation of infrastructure in major ports to supply them to the shipping industry. Present forecasts suggest this may occur only after 2040. In the meantime, the industry has identified several short- and medium-term measures to reduce GHG emissions.

The generic approach to implement short- and medium-term solutions to improve energy efficiency and reduce greenhouse gas emissions, while research and development efforts focus on new fuels that do not emit greenhouse gases. The long-term solution requires new fuels to become widely available through appropriate infrastructure at the main ports that the relevant ships demand. It also requires developments in ship machinery systems to adapt them for use with the new fuels.

Another important trend in the evolution is the increasing adoption of intelligent technologies and digitalisation. Automation has been implemented for many years in various shipboard

systems, but the recent trend is an increased level of intelligence, as systems incorporate higher levels of decision-making across an increasingly wide range of operations. This trend is more evident in prototypes of autonomous ships being tested in various countries. A brief presentation is made of various autonomous systems that may be integrated into these vessels, including collision avoidance systems, path following, and path planning methods. The regulatory framework for the operation of autonomous ships continues to be extended, as well as the main technologies, which will be briefly reviewed.

## Personal Profile:

**Carlos Guedes Soares** is a Distinguished Professor of the Engineering School (Instituto Superior Técnico) of the University of Lisbon. He founded the Centre for Marine Technology and Ocean Engineering (CENTEC) in 1994, a research centre at the University of Lisbon funded by the Portuguese Foundation for Science and Technology, and he is now its Scientific Coordinator.

He concluded his postgraduate studies at the Massachusetts Institute of Technology, USA, in 1976 and at the Norwegian Institute of Technology of the University of Trondheim in 1984. Since then, he has been at the University of Lisbon (formerly the Technical University of Lisbon, until 2013).

His publications have garnered more than 50,000 citations in the Web of Science. In the Stanford World Ranking of the 2% most highly cited scientists in their careers, he ranked between first and fourth from 2019 to 2025 in Civil Engineering, which includes Marine and Ocean Engineering (out of a total of 62,000 authors). In the same period, he ranked first among all Portuguese scientists from all scientific areas.

He is now Co-Editor-in-Chief of the Journal of Marine Science and Application (Springer), the Journal of Reliability Science and Engineering (IOP Press) and the Autonomous Transportation Research Journal (Elsevier). He is also a member of the Editorial Board of more than 15 Journals.

He is the Chairman of WEGEMT, the European Association of Universities on Marine Technology, with 40 universities. He is a Member of the Portuguese Academy of Engineering and the European Academy of Sciences and an International Member of the Chinese Academy of Engineering. He received the Friendship Award from the Chinese Government in 2024 and the International Science and Technology Cooperation Award in 2026.

**Xinping YAN**

Wuhan University of Technology

## Latest developments on intelligent and green ports in China

### Abstract:

As a vital gateway for national opening-up and a core engine of regional economic growth, ports play an irreplaceable strategic role in advancing the Belt and Road Initiative and underpinning the dual-circulation development pattern. This report systematically examines the intelligent and green development of China's ports across four dimensions. First, it reviews the current landscape and strategic significance of China's ports. Second, it presents intelligent technologies for port operation equipment and their applications. Third, it analyses autonomous navigation and remote-control technologies for port tugboats. Finally, it outlines future prospects for green and intelligent port technologies.

### Personal Profile:

**Xinping Yan** is an Academician of the Chinese Academy of Engineering, a Chair Professor of Wuhan University of Technology and the Director of State Key Laboratory of Maritime Technology and Safety, China. He is the Chair of the Intelligent Waterborne Transportation System Committee of IEEE Intelligent Transportation Systems. His research interests include intelligent transport system key technologies, intelligent fault diagnosis of marine engines, renewable energy, energy efficiency management of the vessel, navigation systems for vessels, etc

**Pedro Ponte**

Portuguese Association of Ports

## Present situation and prospects of implementation of green and intelligent technologies in the Portuguese Ports

## Abstract:

Portuguese ports are embracing a transformative agenda in which sustainability, innovation, and energy efficiency are not only environmental imperatives, but also key drivers of competitiveness, resilience, and long-term economic growth within the European maritime sector.

This presentation outlines the port strategy adopted in Portugal under the PORTOS 5+ framework, providing an overview of some of the most relevant projects currently being developed across the country's main ports. It also highlights the key challenges and opportunities that lie ahead, with particular emphasis on energy efficiency, digital transformation, and innovation as fundamental enablers of the competitiveness, resilience, and sustainability of the national port system.

The Portuguese Port Association recognises that achieving these objectives will require strong collaboration among port authorities, industry stakeholders, and the academic community. Universities and research centres play a pivotal role in developing emerging technologies, advanced analytical methods, and sustainable solutions that enhance decision-making processes and improve operational performance throughout the port ecosystem. The integration of scientific knowledge into port planning and management will be essential for addressing increasingly complex environmental, logistical, and technological challenges.

This forum should also serve as an opportunity for collective reflection on how such collaboration can be structured, strengthened, and institutionalised over the long term.

## Personal Profile:

**Pedro Ponte** graduated in Naval Architecture and Marine Engineering from Instituto Superior Técnico, University of Lisbon.

He has a postgraduate degree in Maritime Transport and Port Management from ISEG - Instituto Superior de Economia e Gestão.

Guest lecturer at several educational institutions, with responsibilities in the curricular units of management systems and port concessions.

In professional terms, the summary of his activities is:

- Technical Ship Manager at S&C - Shipmanagement & Crewing, as Superintendent
- He joined APSS, S.A. Administração dos Portos de Setúbal e Sesimbra, S.A., having performed the following functions:
- Setúbal Port Protection Officer;
- Director of the Innovation, Quality, Environment and Safety Office;
- Managing Director of Port Concessions;

Currently performs the functions of:

- Director of Equipment, Infrastructure and Environment From Setubal and Sesimbra Ports.

**Jianmin YANG**

Shanghai Jiao Tong University

## Development and application of hydrodynamic experimental techniques in ocean engineering

## Abstract:

Hydrodynamic experiments are fundamental to design optimisation, safety assessment, performance evaluation, and operation and maintenance of various ocean engineering structures. In this presentation, the state-of-the-art development and application of hydrodynamic experimental techniques in ocean engineering will be introduced. Shanghai Jiao Tong University has recently established an integrated testing technology system for ocean engineering, encompassing wave basin model tests, field measurements, and sea trials to support the research and design of deep-sea equipment. Major technical innovations include advanced wave basin testing methods, such as precise wave generation, sheared current profile simulation, and high-accuracy motion measurement, enabling realistic reproduction of complex ocean environments. Furthermore, laboratory experimental technologies have been developed and extended to field measurements in real-sea conditions to avoid scale effects. With the growing demands for marine scientific research and ocean resource development, we have made further progress in full-scale sea trial technology. Some recently developed large testing facilities, including the deepwater offshore basin, the sea test field at Yazhou Bay, Hainan Province, and the national major science and technology infrastructure “Mobile-Facility of Ocean Science and Technology, MOST” under construction and developed by Shanghai Jiao Tong University, will be introduced. The above technologies have been widely applied to the following fields, such as large offshore floating platforms in the oil and gas industry, deep-sea mining vehicles and lifting pipes for the exploitation of deep-sea mineral resources, ocean renewable energy converters including floating wind turbines, and deep-sea aquaculture cages.

## Personal Profile:

**Jianmin Yang** is a Chair Professor at the School of Ocean and Civil Engineering, Shanghai Jiao Tong University. He serves as Honorary Dean of SJTU Hainan Research Institute, Vice President of China Strategy Institute of Ocean Engineering, and the Chief Scientist of National Major Science and Technology Infrastructure "Mobile-Facility of Ocean Science and Technology, MOST". Prof. Yang also serves as the editor-in-chief of the Journal of Ocean Engineering and Science, JOES. He previously served as Dean of the School of Ocean and Civil Engineering and Director of the State Key Laboratory of Ocean Engineering at Shanghai Jiao Tong University from 2009 to 2019. He served as a member of the Advisory Committee of the International Towing Tank Conference (ITTC). His long-term research addresses ocean dynamic environments and the safety of engineering equipment. His teaching and research activities encompass strongly nonlinear hydrodynamics in ocean engineering, as well as safety assurance strategies for large offshore floating structures.

**Carlos Silva**

*West Sea, Portugal*

**Tiago Carvalho**

*LISNAVE Estaleiros Navais S.A., Portugal*

## Shipbuilding and Ship Repair activity in Portugal

## Abstract:

**West Sea's** shipbuilding operations focus on the construction of high-quality, technologically advanced vessels for national and international markets. The shipyard delivers a wide range of ship types, including exploration, offshore, naval, and commercial vessels, tailored to customer requirements. By combining modern production facilities, skilled workforce, and rigorous quality standards, West Sea ensures efficient project execution from steel cutting to final delivery. Safety, innovation, and sustainability are key principles throughout the entire construction process.

**Lisnave** is one of the world's leading ship repair companies, operating the Mitrena Shipyard with six docks capable of accommodating vessels from small merchant ships to ULCC. Built on decades of engineering expertise and a strong reputation for quality, safety and reliability, Lisnave serves a diverse fleet including tankers, bulk carriers, containerships, dredgers, cruise and offshore vessels. This presentation covers the current shipyard layout, ship repair

excellence, investment in the Cryogenic Shop for the development of LNG carrier repair services, and future opportunities in responsible ship recycling, steel structures and shipbuilding, supporting a more sustainable and innovative maritime industry.

## Personal Profiles:

**Carlos Silva** is a Naval Architect with a PhD in Logistics and Maritime Management, boasting over 20 years of experience in shipbuilding. Having begun his professional career at CENTEC as a researcher, he currently holds the position of Senior Naval Architect in West Sea shipyards' technical department, in Viana do Castelo. His responsibilities primarily involve the technical coordination of new constructions, having served as Project Leader for 5 passenger ships for the Douro River, 5 polar passenger ships for ocean expeditions, and currently a cruise ship for the Japanese flag. He also coordinates approvals and certifications with external entities such as flag states or classification societies, as well as providing support to the commercial department in presenting proposals to new clients.

**Tiago Carvalho**, born in Lisbon, holds a degree in Naval Engineering and Naval Architecture from Instituto Superior Técnico. He began his professional career at Lisnave in 2005, joining the Naval Design Department, where he provided technical support to the shipyard's production areas.

In 2023, he embarked on a new stage of his career by taking on the coordination of Lisnave's Innovation and Development Department. In this role, he is dedicated to the development of strategic initiatives, the implementation of the company's continuous improvement program and the modernization of the shipyard.

**Jiabiao Li**

*Second Institute of Oceanography,*
*Ministry of Natural Resources*

## Green and Sustainable Development of Deep-Sea Mineral Resources

## Abstract:

The exploration of deep-sea mineral resources—including polymetallic nodules, cobalt-rich crusts, and massive sulfides—is vital for securing the global supply of critical metals. However, addressing potential habitat loss, biodiversity reduction, and long-term environmental impacts remains a paramount responsibility. Balancing resource utilisation with environmental stewardship necessitates the development of low-impact technologies. This study respectfully reviews recent progress and future trajectories in green mining technologies, environmental monitoring, and low-carbon processing.

China has achieved significant advancements in deep-sea mining technology. Key milestones include the development of advanced nodule collectors, a successful 1,300-meter sea trial of an integrated "ship-pipe-vehicle" system, and mining vehicles tested at depths up to 2,900 meters. While technical feasibility has been demonstrated, future efforts must prioritise minimising seabed and sediment disturbance. Green mining designs should target zero waste discharge, zero equipment abandonment, and zero fuel leakage by utilising electric or seawater hydraulic systems, alongside low-speed propulsion to mitigate underwater noise.
Environmental protection is a critical challenge. Although comprehensive baseline surveys have been conducted in China's contract areas, further research is required regarding sediment plume dynamics, biogeochemical processes, and ecological recovery. Establishing standardised environmental impact assessment frameworks is essential. We propose utilising autonomous underwater vehicles, seabed landers, and fixed platforms for long-term, high-resolution environmental monitoring.

Decarbonization across the supply chain is equally vital. Near-term strategy should optimise vessel energy efficiency through hybrid battery storage, dual-fuel systems, and intelligent

dynamic positioning. Long-term goals include transitioning to green methanol, ammonia, or hydrogen fuel cells, alongside adopting hydrogen plasma reduction for low-carbon mineral processing. Ultimately, achieving sustainable deep-sea mining requires an integrated framework of eco-friendly equipment, robust monitoring, and green processing. Broad international collaboration, transparent data sharing, and science-based governance will be indispensable to ensure ecological risks are effectively minimised.

**Personal Profile:**

**Jiabiao Li** is an Academician of the Chinese Academy of Engineering and a marine geologist. He once served as the Director General and Secretary of the Party Committee of the Second Institute of Oceanography, Ministry of Natural Resources of China, and the Founding Chair of ISO/TC8/SC13 Marine Technology. Currently, he is the Vice Chairman of the Chinese Society for Oceanography and the Vice Chairman of the Zhejiang Association for Science & Technology. He has long been engaged in researching submarine geoscience and technology, and has made important contributions to the Arctic ridge detection and ocean mineral exploration. He is the Chief Scientist of China's Marginal Sea Two-Phase 973 Programs, CNSF major basic research projects of the China's Marginal Seas and Southeast Asian Ring Subduction System, National Key R&D Program of China Sinking and floating intelligent acoustic detection technology, and UN Ocean Decade Program of the Digital DEPTH.

**Marco Ferraz**

*GALP, Portugal*

## The role of technology in offshore oil and gas production

## Abstract:

Technology has become a decisive enabler of offshore oil and gas production, allowing the industry to operate more safely, at greater depths, and with higher efficiency, while supporting energy security.

The Brazilian pre-salt is a clear example of how technological progress has made the development of resources once considered inaccessible a reality. In this context, technologies such as FPSOs have been central to this progress, combining strong production capability with improved emissions performance and operational flexibility.

Over the years, GALP has made an important contribution through technological innovation focused on the upstream business. Solutions such as RovScan and X-Flex are strong examples of innovation in practice, supporting the inspection of flexible offshore lines, the rapid identification of anomalies, and the improvement of integrity management, safety, and uptime in complex deepwater assets.

Equally important is the Id. Lab network in Sines and Brazil, which provides the laboratory and pilot-scale capabilities required to test and scale solutions with reduced technical risk.

Ultimately, technology is not only improving offshore production; it is unlocking reserves, reducing risk, and strengthening the energy system for the future.

## Personal Profile:

After starting his career as a researcher in Portugal, Marco Ferraz moved to San Francisco to work as a visiting researcher at the USGS, in collaboration with NASA. In 2009, he relocated to Australia to pursue a PhD at the University of Sydney, where he also served as a lecturer at the School of Geosciences.

Upon returning to Portugal in 2012, Marco joined GALP as a Geoscientist in Exploration and Production, contributing to some of the company's most prominent assets. Today, he leads the Upstream & Industrial Innovation Centre at GALP, managing over 60 research, development, and innovation projects in Portugal and Brazil. These initiatives span oil and gas production, refining processes, and energy transition topics such as hydrogen, low-carbon fuels, carbon capture, utilisation and storage (CCUS), and energy storage.

Marco is also chairman of the board of the Net4CO2 collaborative laboratory and board member of BIOREF.

**Cong YE**

China Ship Scientific Research Center

## Development of Fendouzhe, the Full-ocean-depth Manned Submersible for Routine Operations

## Abstract:

Deep-sea exploration is fundamental to answering profound scientific questions, securing sustainable resources for a green economy, mitigating existential threats and fulfilling our responsibility to protect the largest biome on our planet. Defining characteristics of the deep sea are shaped by ultra-high pressure, low temperature and no light, which drive the development of cutting-edge deep-sea manned submersibles. China Ship Scientific Research Center developed a full-ocean-depth manned submersible for routine operations from 2016 to 2020, named as Fendouzhe. So far, it still has the capabilities of supporting the longest seabed operation time, providing extraordinary underwater performance and accommodating the largest number of passengers per dive around the world. Its key technical challenges and breakthroughs encountered and achieved at each stage are briefly illustrated. Future application scenarios and development trends of deep-sea manned submersibles are analysed and summarised as well.

## Personal Profile:

**Cong YE**, director of China Ship Scientific Research Center and director of National Key Laboratory of Deep-sea Crewed Equipment. For China's Fendouzhe full-ocean-depth operational manned submersible, he is the chief designer and chief commander in sea trial. With long-term working in the front line of scientific research on manned submergence, he has spared systematic and creative efforts in general design of manned submersibles, design theory of deep-sea pressure structure, ergonomic design, submersible operation and pilot training.

**Carlos Bicho**

*Principle Power, Portugal*

## Principle Power's WindFloat®: Scaling to Industrial Production

## Abstract:

A floating wind platform's design process should aim to optimise for the lowest cost of energy over a 25-35-year lifetime, balancing CAPEX, OPEX, energy production, and cost of capital. Ensuring the quality and completeness of input data and applying lessons from execution and operational experience at the earliest design stages, avoids late-stage design changes that can directly affect a project's overall investment case, increase risk, or compromise long-term performance.

To date, Principle Power has installed 13 WindFloat® units across Portugal, Scotland and France. With nearly 20 years of engineering experience - including 15 years of operating projects that have collectively delivered more than 1 TWh of electricity to the grid - the company has accumulated real-world performance data under Atlantic, North Sea and Mediterranean operating conditions that are continuously fed back into its engineering processes, tools, and methodologies.

Principle Power has also established a comprehensive industrialisation program built on critical-path analysis of fabrication activities at WindFloat Atlantic (Portugal), Kincardine (Scotland) and EFGL (France) projects. The program has focused on improving constructability by reducing welding and lifting operations, increasing modularity and standardisation, optimising execution sequencing, and aligning design assumptions with current yard capabilities. The objective is to ensure efficient, predictable delivery within today's supply-chain constraints.

This session will provide insights into how Principle Power leverages its execution and operational track record to continuously enhance its engineering processes and methods, evolving WindFloat® technologies into reliable fourth-generation designs, optimised for 15+

MW turbines, therefore supporting the cost-effective delivery of a multi-gigawatt floating wind project pipeline.

## Personal Profile:

**Carlos Bicho** is Deputy Vice President of Engineering at Principle Power. With a Civil Engineering degree from IST and an MBA from ISCTE, he brings more than 25 years of experience in the energy and industrial sectors, having worked for international companies and on projects across the world as a structural engineer, engineering manager, and head of engineering. He currently leads cross-functional teams delivering multidisciplinary floating offshore wind engineering studies.

**Qiying Zhang**

*Mingyang Smart Energy Group Ltd.*

# Innovation and Practices of Floating Offshore Wind Power Technology in China

## Abstract:

Floating offshore wind power is unlocking vast wind energy potential across diverse water depth regimes — from transitional shallow waters (30–60 m) to deep offshore sites — where conventional fixed-bottom foundations are technically or economically infeasible. This presentation delivers a comprehensive account of China's latest innovations and engineering practices in floating wind technology, anchored by Mingyang Smart Energy's industry-leading portfolio of floating solutions.

The talk opens with an analysis of China's distinctive offshore environment — characterized by frequent typhoons, soft seabed conditions, and extensive shallow-water zones — and the corresponding design imperatives for floating wind systems operating in these challenging conditions. Central to the presentation is the OceanX 16.6MW dual-rotor floating wind turbine, the world's largest floating wind power system. Its revolutionary V-shaped dual-rotor configuration, combined with an advanced anti-typhoon mooring system and intelligent yaw control, enables robust operation under extreme typhoon conditions with wind speeds exceeding 70 m/s, while simultaneously maximizing energy yield per floating platform through counter-rotating wake recovery. The dual-rotor design also significantly reduces the levelized cost of energy by sharing a single floating foundation, tower, and electrical infrastructure between two rotors.

Beyond OceanX, the presentation surveys Mingyang's broader floating wind technology portfolio. This includes the MySE 7.25MW anti-typhoon floating system deployed in the South China Sea — China's first commercial floating wind turbine — as well as semi-submersible and tension-leg platform (TLP) concepts optimized for different water depth ranges and seabed

conditions. Special attention is given to shallow-water floating solutions, where unique challenges such as wave-current interaction in limited depth, mooring line snap loads, and under-keel clearance constraints demand tailored platform and mooring designs distinct from deep-water approaches.

Key technical contributions discussed include an integrated aero-hydro-servo-elastic co-design methodology, dual-rotor wake interaction modelling validated through field measurements, cost-optimized mooring solutions for typhoon-prone regions, and operational data from full-scale floating deployments in the South China Sea. The presentation also charts a pathway toward LCOE competitiveness, addressing industrialization, supply chain maturation, and the role of floating wind in hybrid offshore energy systems. Through this in-depth technical exposition, the presentation seeks to stimulate international collaboration and accelerate floating wind's transition from demonstration to commercial-scale deployment worldwide.

## Personal Profile:

**Qiying Zhang** is President of Global Business and Chief Technology Officer of Mingyang Smart Energy Group Ltd., and a professor-level senior engineer. He serves as Visiting Professor at Northwestern Polytechnic University, Deputy Director of the Committee of Wind and Machinery Standardization of China, Director of the Technical Committee of the 2nd Guangdong Wind Power Standardization, Senior Expert and Council Member of the Investment Association of China, Council Member of the 9th Chinese Renewable Energy Society, and Vice President of Silver Lake New Energy Strategy Research Center.

Mr. Zhang has dedicated his career to research and innovation in wind turbine generator system design, manufacturing processes, and wind power technology applications. He has led multiple major national and provincial R&D projects, earning first prizes in both China National and Guangdong Provincial Science and Technology Progress Awards. He holds 53 licensed patents and 12 invention patents, and has participated in the formulation of 2 international standards, 2 national standards, and 1 local standard, with 1 published monograph.

Under his technical leadership, Mingyang has developed several groundbreaking wind turbine products deployed across over 800 wind farms worldwide. Notably, he spearheaded the development of China’s first floating wind turbine, breaking the domestic market gap, and led the export of China’s first floating wind turbine technology. The OceanX 16.6MW dual-rotor typhoon-resistant floating wind turbine, developed under his guidance, stands as the world’s largest floating wind power system.

**Pedro Pousão**

Portuguese Institute for the Sea and Atmosphere (IPMA)

## Prospects for offshore fish farming in Portugal

### Abstract:

The expansion of the offshore blue economy demands robust, reliable structural designs capable of withstanding severe open-ocean dynamics. Over the last three decades, Portugal has accumulated substantial operational experience in deploying offshore installations, establishing a crucial foundation for modern offshore renewable energy frameworks. This presentation outlines the historical evolution of Portuguese offshore open-sea structures—from pioneering testing phases in 1996 to industrialized operations—and highlights how this technical heritage is driving modern multi-use platform designs integrated with offshore wind, wave, and tidal systems.

Beginning with the first offshore baseline studies in Madeira Island, which successfully demonstrated the survival of plastic collar cages and semi-submersible steel cages in deep, high-energy Atlantic waters, Portugal expanded its technical portfolio in 2001 with mainland submersed systems (IPIMAR initiatives). These early ventures validated site selection protocols, mooring dynamics, and structural longevity in high wave-action environments.

Reflecting a major shift in the blue economy landscape, there is a sharp increase in investor interest and venture capital targeting integrated ocean platforms, spurred by the urgent need to address the impacts of climate change. As the frequency and intensity of extreme weather events at sea escalate, ensuring asset survivability has become the defining challenge for open-ocean development. Consequently, commercial curiosity is

focusing on proposed pipeline projects that leverage heavy-duty structural, installation, and maintenance expertise inherited from the offshore oil and gas industry to derisk these capital-intensive installations. By adapting survival-tested oil rig mooring engineering, floating stability mechanics, and corrosion-resistant materials to multi-use systems, these proposed projects aim to optimize the structural survivability, bankability, and shared logistical costs of deep Atlantic renewable hubs under increasingly hostile marine climates. This presentation details the structural commonalities and shared anchoring architectures driving this newfound commercial interest in Portuguese waters.

## Personal Profile:

**Pedro Pousão-Ferreira** is a biologist, Principal Researcher with Habilitation and expertise in aquaculture in IPMA. He is responsible for the Aquaculture Research Station in Olhão, Algarve. He has more than 40 years' experience in the reproduction (hatchery), larval rearing, nutrition, ongrowing and production of bass, sole, meagre, grouper and 6 species of breams on in-shore (earth ponds) and on offshore (cages). He has participated in 1/6 national and international research projects. Member of Scientific Review Panel of Agência Nacional de Inovação (ANI) and Fundação para a Ciência e Tecnologia (FCT). Member of External Scientific Review Panel (ESRP) of AKDN (Aga Khan foundation).

He has 237 papers in international scientific periodicals with referees, 34 peer-reviewed short papers, 616 communications/posters in scientific meetings and workshops, 4 manuals, 6 book chapters and 1 technical book. Is also Professor of Aquaculture at the University of Porto (ICBAS), at MSc Marine Living Resources: Science, Technology and Society NOVA School of Science & Technology (2025 and 2026) and was Professor of marine larviculture and aquaculture at the University of Algarve (2011-2013).

He has participated in 119 national and international R&D projects and has been responsible for several.

Presently is also President of the Scientific Council of IPMA and President of Forum of Scientific Council of State Laboratories.

President of the Board of S2AQUA - Collaborative Laboratory for a Sustainable and Intelligent Aquaculture. This is a private, non-profit, public utility association whose mission is to undertake research and development (R&D) activities for innovation in aquaculture and which holds the status of Collaborative Laboratory, with Headquarters in Olhão, Portugal.

**Limin HUANG**

Harbin Engineering University

## Recent Advances on Ocean Waves Modeling and Forecasting by Using Deep Learning Methods

### Abstract:

Ocean wave modelling and forecasting are essential for maritime safety, offshore engineering, and the sustainable development of the blue economy. While third-generation spectral wave models have become the standard tool for operational forecasting, high-fidelity wave prediction under complex sea states remains challenging, which mainly results from uncertainties in wind forcing, source-term parameterisations and simplifications, numerical-model biases, and the representation of complex wave spectra. Deep learning provides new opportunities to address these issues by complementing physics-based models with data-driven intelligence; thus, it has been one of the major research focuses of our group.

This presentation introduces our recent advances in deep-learning-enhanced ocean wave modelling and forecasting: (1) a hybrid approach for the nonlinear interaction source-term estimation in phase-averaged wave models, which is fast and accurate in comparison to traditional counterparts; (2) an intelligent model to enhance the accuracy of phase-averaged numerical wave simulation results by merging multi-source observations; (3) a surrogate model for ocean wave forecasting at regional scales, which improves computational efficiency and enables fast prediction of the spatiotemporal evolution of wave fields; and (4) an approach for wave spectrum parameterization, including the optimization of spectral parameters and empirical spectral formulations. These studies highlight the potential of combining physics-based modelling with artificial intelligence to develop next-generation wave prediction systems that are more accurate, efficient, and reliable.

## Personal Profile:

**Limin Huang** is a Professor at the Harbin Engineering University. He has long been engaged in teaching, research, and technological innovation in ship and ocean engineering hydrodynamics. He is dedicated to the development of theories and methods for high-fidelity prediction of ocean waves and ship hydrodynamic responses, with particular interests in multiscale wave dynamics, nonlinear seakeeping, and intelligent prediction of ship motions in random seas. He has led a number of projects supported by national and ministerial programmes, including the National Natural Science Foundation of China and the Ministry of Industry and Information Technology. He published over 80 papers, obtained 39 invention patents, and received multiple scientific and technological awards at national, provincial, and industrial levels. His work has been applied to ship performance assessment, intelligent navigation systems, and digital-twin platforms, supporting safer, more efficient, and sustainable maritime operations under complex sea conditions and operational scenarios.

**Liliana Pinheiro**

*National Laboratory of Civil Engineering (LNEC)*

## Wave modelling and operational safety of ports

## Abstract:

LNEC's Ports and Maritime Structures Unit has been carrying out applied research and providing technical support for the design, expansion and operation of port infrastructure in Portugal and in various other countries for several decades. This presentation will illustrate the complementary use of physical and numerical models in the analysis of wave propagation, resonance in harbour basins and the stability of marine structures. Examples will be presented of studies carried out for the ports of the Azores, Madeira, Leixões, Sines, Aveiro, Brazil and Cape Verde, covering breakwaters, access channels, container terminals and marinas. Work on simulating ship manoeuvring and operations, which is fundamental to the design and optimisation of port terminals, will also be discussed. The presentation will also address monitoring, early-warning and decision-support systems for port operations safety, with a focus on the HIDRALERTA system. These case studies demonstrate the role of science-based engineering and experimentation in improving the resilience, efficiency and safety of ports in the face of growing operational and climatic challenges.

## Personal Profile:

**Liliana Pinheiro** is a Researcher at the National Laboratory for Civil Engineering (LNEC), where she is part of the Ports and Maritime Structures Unit within the Department of Hydraulics and Environment. Her work has focused on the fields of port and coastal engineering, including physical and numerical modelling of sea state, port resonance, ship-wave-port interaction, moored ships and terminal operations, the stability of marine structures, and monitoring and early-warning systems. She has participated in and coordinated numerous studies for ports in Portugal, the Azores, Madeira, Cape Verde and Brazil, supporting port authorities, public administrations and design firms. She is the author and co-author of various scientific and technical publications and has collaborated on national and international projects relating to the safety, efficiency and adaptation of maritime infrastructure to climate change, including navigation and port operations.